An exploration of ethnic differences of the influences of home and school on the development of young people's educational expectations for university study between ages 14 to 16

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Thesis Abstract

Class analysis suggests a strong positive link between parental social position and adolescent educational expectations. Yet, Indian, Pakistani, Bangladeshi and Black Caribbean pupils with disadvantaged parents maintain much higher expectations for university study compared to their white peers from more advantaged families. Ethnicity is key to understanding this paradox. Yet, quantitative research has not explained *how* ethnicity impacts on adolescent expectations or *whose* expectations it impacts most. This thesis investigates whether the longitudinal association between parental social position at age 14 and pupils expectations at age 16 is mediated by parent-child conflict, pupils' homework engagement, feelings about school and pupils' assessments of teacher effectiveness at pupils' age 15, net of all prior influences at age 14. It then explores whether these mediational routes are moderated by maternal ethnicity. Ecological systems theory informs a longitudinal latent variable mediation model estimated on panel data from waves 1-3 of the Longitudinal Study of Young People in England.

Parental social position at age 14 does not affect pupils' expectations at age 16 via the hypothesised home and school factors at age 15. Its longitudinal influence is weak on white, modest on Black Caribbean and Pakistani and insignificant on Indian and Bangladeshi pupils' expectations at age 16 casting doubt on classical sociological models. Moderation by maternal ethnicity strengthens the positive longitudinal influence of home-related factors on expectations and tones down the negative effect of family disadvantage or other negative influences particularly on South Asian pupils' expectations at age 16. Pupils' expectations at age 14 significantly impact on home and school factors and expectations at age 15 and are the primary indirect route of influence on expectations at age 16. Moderated by maternal ethnicity, this mediational mechanism allows South Asian pupils to develop and maintain higher expectations than white pupils despite family disadvantage.

(297 words)

Declaration and word count.

I hereby declare that, except where explicit attribution is made, the work presented in this thesis is entirely my own.

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Dedication

To my wife Olga and daughter Tanya-Maria

Acknowledgement

Simply put, my PhD project would have been impossible had his Eminence Archbishop Gregorios of Thyateira and Great Britain not shown rare kindness and benefaction to my person. The consideration and help I received from him since 2007 amounted to no less than a miracle. I shall for ever be in his debt.

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Michael Tzanakis
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Chapter 1: Research aims and questions

Introduction

This thesis presents a quantitative analysis of ethnic differences in the development of adolescent educational expectations for application and successful entrance to university (henceforth referred to simply as 'expectations'). It studies groups of white, Indian, Pakistani, Bangladeshi and Black Caribbean young people in England at ages 14 to 16. The data source is the Longitudinal Study of Young People in England (LSYPE), a panel study of a cohort of about 16,000 adolescents born in 1989-90 in England initially interviewed in 2004 at age 14 and followed in seven consecutive yearly waves. This thesis uses LSYPE waves 1-3 that provided panel data for ages 14 to 16.

There is a voluminous research literature on the impact of ethnicity on the educational performances of adolescents in the United Kingdom (UK). There is comparatively less research focusing on the longitudinal *change* of adolescents' educational expectations during ages 14 to 16. This two-year time window is short but critical to the lives of adolescents. Age 16 (year 11) represents the end of compulsory education in England. It therefore marks an important transition during which the decision to prepare for university study or entry to the workforce materialises. During ages 14-16, many influences from pupils' experiences at home and school are likely to play a role in shaping the development of their educational expectations. Based on past research in the UK, it is plausible to expect that these home and school-related factors will be impacted differentially by ethnicity. However, there is almost no quantitative research on the ways ethnicity potentially impacts on the developmental change of adolescent expectations from ages 14 to 16.

There are two probable reasons for this selective focus. First, almost all past quantitative research on ethnicity and educational performance has treated adolescent educational expectations as one of a possible set of *mediators* between social class or its correlates and educational performance. *Mediators* refer to variables accounting for the association between predictors and outcomes (Kenny, 2013). Thus, social class was assumed to affect expectations first. Expectations then affected educational performance. Expectations were therefore expected to explain, or 'mediate', at least in part, the relationship between social class and educational performance. This mediation model is implicit in the dominant theoretical perspectives in sociology regarding the connection of educational expectations and later educational and occupational achievement. This research, however, did not study expectations as a developmental outcome in itself. Thus, while previous quantitative research pointed to considerable differences in expectations among white pupils and their minority peers during adolescence, it could not easily explain *why* expectations developed differently in UK minority groups. It is likely that minority pupils' environments and experiences at home and school impact on their expectations differently (Modood, 2003; 2005). Thus, the potential influence[1] of parental social class on minority adolescents' expectations is also likely to be mediated in complex ways by more than one potential mediator at home and school. This possibility remained unexplored because research focused on educational performances rather than educational expectations.

A second reason could be that past quantitative research has treated ethnicity along with gender, social class or its correlates, as direct causes of educational performance. However in the case of educational expectations, ethnicity may function not as a direct predictor but as a *moderator* of the development of educational expectations. A *moderator* refers to a variable that impacts on the magnitude and direction of the associations between predictors, mediators and outcomes by 'interacting' with the predictor and the mediator (Hayes, 2012). Thus, the same web of relations between social class and expectations may change as a function of different ethnic membership. To test this hypothesis explicitly, we need a quantitative approach able to examine whether each hypothesised relationship involving the predictor, mediator and the outcome changes in magnitude or direction across categories of ethnic membership.

This thesis addresses those two gaps in UK research. It studies the development of pupils' expectations to study at university as the main outcome of interest. It explores the role of two home-related influences (or factors), parent-child conflict and engagement with homework; and two school-related influences (or factors), pupils' feelings about school and assessments of teachers' effectiveness, in the development of pupils' expectations between ages 14 to 16. It treats ethnicity as a moderator rather than as a direct predictor of pupils' expectations by systematically comparing influences on pupils' expectations across samples of white, Indian, Pakistani, Bangladeshi and Black Caribbean pupils and their mothers. One of the central research questions this thesis asks therefore is the following: Does maternal ethnic group membership moderate the ways the influence of parental social position and associated family material circumstances (referred to as 'parental social position'

[1] The use of the word 'influence' used here and elsewhere in the thesis does not imply causality.

henceforth) at age 14 on pupils' expectations at age 16 is potentially mediated via pupils' home and school-related experiences at age 15? Other research questions which are presented below explore whether such moderation also occurs in related longitudinal routes of influence on expectations at age 16. These involve potential *cross-lagged effects* (time-lagged influences from one mediator on another between ages 14 and 15) and *feedback effects* (time-lagged influences from the outcome at age 14 on the mediators at age 15).

In the rest of chapter, I present the theoretical argument in section 1.1. In section 1.2, I explain why the longitudinal mediation, the cross-lagged and the feedback effects are both interesting and necessary to estimate as potential routes of influence on expectations. Then, I present the subsidiary and the main research questions, and the contribution of the thesis. Finally, I outline the plan of the thesis in section 1.3.

1.1 Background and theoretical argument

It is well established that young people from poor backgrounds tend to have lower educational expectations and performances than their better-off peers (Hofferth, 1980; Leibnowitz, 1974; Murmane, Maynard and Otis, 1981; Rosen and Aneshensel, 1978; Sewell, Hauser and Wolf, 1980). More recent evidence has generally confirmed this association (Breen and Goldthorpe, 1997; Buchmann and Dalton, 2002; Sacker, Schoon and Bartley, 2002). UK ethnic minority groups vary in their socio-economic status, but most are relatively disadvantaged compared to whites (the main exception to this is the Indian people). So, one might expect minority ethnic children to have lower educational expectations than whites, and to make less progress in school. Yet precisely the opposite is the case. This presents the paradox of high expectations among less advantaged ethnic minority youth in the UK.

There are several dimensions to this paradox. The first dimension concerns the relation of social class to the educational performances of young people in minority groups. These performances are much higher than expected based on their social class profiles. Some UK research suggests that social class strongly predicts adolescent academic achievement (Rothon, 2005). But other quantitative research showed that social class was a weak predictor of academic performance, particularly of UK minority adolescents (Strand, 2007; 2008). Typically, parental socioeconomic status (SES) had a positive but weak longitudinal effect on pupils' adolescent expectations

(Goodman, Gregg and Washbrook, 2011; Kintrea, 2009). Based on the first wave of LSYPE, Strand (2007) showed that parental SES typically explained little of the variation in minority adolescents' academic performances and expectations.

The second dimension concerns ethnic gaps in adolescent educational expectations over the years. These gaps in favour of minority pupils have largely persisted during the last thirty years (Francis *et al.*, 2003; Gillborn and Mirza, 2000; Modood, 2003). The gaps remained, even when family-level multiple deprivation, gender and school effectiveness were controlled (Butler and Hamnett, 2011; Strand, 2010; Sylva *et al.*, 2004). They also remained when changes in the socioeconomic gaps between minority and white parents were taken into consideration (Archer *et al.*, 2012; Clark and Drinkwater, 2000; DeWitt *et al.*, 2010; DeWitt *et al.*, 2011; Hakanen, Schaufeli and Ahola, 2008; Modood, 2003; 2005; Strand, 2007; 2008; Van Houtte and Stevens, 2010).

The third dimension refers to an inconsistency in pupils' academic progress between pre-adolescence and adolescence. Between ages 7 and 11, Black Caribbean, Black Other and Pakistani pupils were reported to have progressed less and Bangladeshi and Chinese pupils more than their white peers (DfES, 2006; Melhuish *et al.*, 2006; Modood, 2003; Strand, 1999). However, the trend was reversed between ages 11 and 16. Pupils from all minority ethnic groups were reported to have made much more progress than their white peers (Modood, 2003; 2005). Ages 15 and 16 were highlighted as the most critical in terms of improvement in the performance of minority pupils as compared to their white peers (Wilson, Burgess and Briggs, 2005). By age 16, white British pupils were reported to have fallen behind all other UK minority ethnic groups in academic performance (Demie and Strand, 2006; DfES, 2006). As a result, many UK minority ethnic groups were overrepresented among university entrants particularly to post-1990 UK universities (Modood, 2003; Wilson, Burgess and Briggs, 2005).

Dominant theoretical perspectives in sociology are limited in explaining the above paradox. In chapter 2, I discuss three perspectives important in the UK sociology of education that involve educational expectations explicitly: rational action theory and the relative risk aversion mechanism (Breen and Goldthorpe, 1997; Goldthorpe and Breen, 2000); social capital (Coleman, 1988) and social and cultural reproduction (Bourdieu and Passeron, 1977). I agree with Modood (2003; 2004) that minority families possess orientations that are not defined by their relatively disadvantaged class position. Young members of minority groups may have deficits in class-defined cultural capital but they succeed academically by possessing peculiar variants of social and cultural capital (Basit, 2012; Siraj-Blatchford, 2010), not predicted by the above theories.

To explain the driving 'motor' of minority pupils' success, scholars have explicitly or implicitly assigned parental ethnicity a causal role in explaining the above paradox (Bowden and Doughney, 2012; Modood, 2004; Shah, Dwyer and Modood, 2010; Sylva *et al.*, 2004). But the mechanism(s) linking ethnicity to pupils' expectations remain unidentified quantitatively (Rutter and Tienda, 2005a; 2005b; 2005c). Minority members' ability to overcome large-scale, sociologically corroborated disadvantages (Modood, 2004), remains therefore unexplained.

The literature offers some tentative evidence in this direction. We know that positive attitudes to school for example, are strongly associated with higher expectations to remain in education. These attitudes are in turn significantly associated with positive home learning environments, family SES and individual characteristics (Marjoribanks, 2003a; 2003b). Minority pupils' higher academic self-concept, peer support and a higher commitment to schooling indicated by amount of homework and positive attitudes to school and teachers accounted for most of the variance in aspirations across UK minority ethnic groups (Strand and Winston, 2008; Stryker, 2007). Also, more ambitious, higher class parents invest in better schools (Haveman and Wolfe, 1995) which provide better facilities and teacher quality (Connelly, Sullivan and Jerrim, 2014). More efficient teachers are more likely to exercise better and more effective control and discipline (Butler and Hamnett, 2011), maintain a better in-class climate and promote a more favourable environment to learning (Micklewright *et al.*, 2014). Teachers who are better able to exercise effective control in class are in turn more likely to inspire higher educational expectations in pupils (Furlong, 1985). Studies based on large-scale, nationally representative samples like the LSYPE (Strand, 2007; 2008) reported that the gaps in educational expectations between white British and the Indian, Pakistani, Bangladeshi and Black Caribbean pupils were explained mostly by home- and school-related factors rather than social class per se, offering support to previous studies such as Phillips (1998) and Sylva *et al.*(2004). This matter is discussed at greater length in chapter 2.

However, factors such as positive home environment, pupils' homework, feelings about school and ideas about teachers may impact on adolescent expectations differently at different ages between age 14 and 16. Further, these factors may play multiple roles in impacting adolescent expectations, and roles may vary both over time and across minority groups. At age 15, they may, for example, mediate longitudinally the influence of parental social position at pupils' age 14 on adolescent expectations at age 16, as most of the literature has assumed. Alternatively, they may affect one another by means of mutual cross-lagged effects between ages 14 to 15 prior to influencing expectations at age 16, independently of parental social position. Finally, pupils' prior expectations at age 14 may affect these factors at age 15 and via those factors and expectations at age 15, impact on later expectations at age 16. These potential routes of influence on expectations at age 16 may be thought of as 'feedback effects' of earlier expectations at age 14 on later expectations at age 16. In a complex social reality, all these potential roles may be acted out simultaneously. However, past quantitative research on educational expectations has not explored the potential roles the above factors may play in relation to expectations nor studied their possible interrelations simultaneously.

The thesis follows a quantitative approach that investigates the roles that parent-child conflict, pupils' engagement with homework, feelings about school and assessments about teachers' effectiveness in enforcing discipline may play in influencing the development of pupils' educational expectations between ages 14 to 16. I justify the selection of these four factors and their substantive importance for educational expectations in chapter 2. These factors represent the subjective perceptions of people who engage in enduring forms of social interaction at home or school. The thesis will investigate whether these factors at age 15 potentially mediate to pupils' expectations at age 16 three types of prior effects at pupils' age 14: (a) parental social position; (b) their own prior effects; (c) the feedback of pupils' prior expectations. The proposed quantitative model and methodology will allow studying these potential mediational roles simultaneously as well as testing the hypothesis that their underlying relations change as a function of maternal ethnicity. I discuss the model and methodology in chapter 4.

The thesis is theoretically guided by ecological systems theory (Bronfenbrenner; 2005). The ecological perspective originated in developmental psychology. However its theoretical principles are easily recognized in much earlier sociological theories. It has been one of the main theoretical influences of the life-cycle perspective (Elder, 1999). Ecological systems theory offers a practical interface to test the sociological assumptions of the present thesis. It offers theoretical support to testing the hypothesis that individuals develop being exposed to multiple influences from their home and school environments, both proximal (immediate) and distal (remote). More specifically, ecological systems theory embeds phenomena that statisticians refer to as longitudinal mediation, cross-lagged and feedback effects under a unified theoretical framework. That framework justifies why it is plausible to expect these influences to (a) change over time; (b) operate simultaneously; and (c) change as a function of maternal ethnicity. I connect the statistical approach I will follow to ecological systems theory when I discuss it in chapter 3.

1.2 Research questions involving longitudinal mediation, cross-lagged and feedback effects and moderation – and the contribution of the thesis

Longitudinal *mediation* occurs when a relationship between a presumed prior cause and a later outcome is explained completely or in part by a third variable intervening over time between the cause and the outcome (Cole and Maxwell, 2003; Kenny, 2013). Mediation is considered key to understanding an association between two variables (MacKinnon *et al.*, 2002). Longitudinal *cross-lagged* relationships describe reciprocal influences between two variables over time. Their estimation is necessary particularly when influences of multiple mediators at later time points on an outcome are likely to be conditional on influences of these mediators on one another at earlier time points. For example, pupils' homework engagement and level of parent-child conflict at home at age 15 may be a direct function of earlier levels of these factors at age 14. Yet, they may also be a function of longitudinal influences on each other between ages 14 and 15. *Feedback* mechanisms concern the degree to which the outcome at an earlier time point acts on its presumed causes at a later time point and via them on itself at a subsequent time point. For example, early pupils' expectations at age 14 may impact on parent-child conflict at age 15, and via this factor, on pupils' expectations at age 16. Estimation of feedback effects is important both for substantive and statistical reasons as will be explained in chapter 4. *Moderation* occurs when any of the causal relationships suggested by longitudinal mediation, cross-lagged or feedback effects change as a function of the level or category of a third variable, which is not part of the causal model (Judd and Kenny, 1981; Wu and Zumbo, 2008). Presence of such moderation will indicate how ethnicity may impact on pupils' expectations. The structural equation model (SEM) developed for the needs of this analysis will test whether parent-child conflict, pupils' engagement with homework, feelings about school and assessments of teachers' effectiveness impact on pupils' expectations in ways which are consistent with any or all of the above causal routes. Furthermore, they will test the hypothesis that each hypothesised relationship assumed under the above causal routes is moderated by maternal ethnicity.

The thesis addresses two subsidiary (1, 2) and two main (3, 4) research questions (RQ):

1. *Do parental social position and family material circumstances, parent-child conflict, engagement with homework, feelings about school, assessment of teachers effectiveness and adolescent expectations change between ages 14 and 16?*
2. *Is this change different across the white, Indian, Pakistani, Bangladeshi and Black Caribbean pupils? In other words, are changes in these trajectories moderated by maternal ethnicity?*
3. *What are the potential interrelations of parent-child conflict, engagement with homework, feelings about school, assessment of teachers' effectiveness and adolescent expectations? Do they impact on adolescent expectations at age 16 by mediating at age 15 (a) the effects of parental social position at age 14; (b) their own prior effects at age 14 or (c) the feedback effects of prior expectations at 14? Are these potential influences exerted on the outcome, directly or indirectly?*
4. *Does the potential impact of parent-child conflict, pupils' engagement with homework, feelings about school, and assessment of teachers' effectiveness on adolescent pupils' educational expectations change over time as a function of white, Indian, Pakistani, Bangladeshi and Black Caribbean maternal ethnicity?*

The null hypothesis of no difference either longitudinally or across groups of different maternal ethnicity is tested systematically in all research questions, against the alternative hypothesis that significant longitudinal and cross-group differences exist. Specific alternative hypotheses regarding the direction and magnitude of expected effects per ethnic minority group will be spelled out in chapters 6 and 7. Research questions 1 and 2 are prerequisites for addressing to RQ 3 and 4. They explore the extent to which the latent factors that form the building blocks of the final mediator model conform to the measurement assumptions required to render those factors *comparable* over time and across ethnic groups. For this comparison to take place, necessary levels of longitudinal and cross-group *measurement invariance* must be demonstrated. The term refers to the degree of statistical equivalence exhibited by the multiple repeated measures of the above factors across time and ethnic groups. The degree of longitudinal and cross-group equivalence of these factors will determine their feasibility as building blocks in the final mediation model and therefore their inclusion in it. Provided that appropriate levels of longitudinal measurement invariance hold, then any change in the latent construct over time, as shown in its structural parameters (factor variances, covariances, means, intercepts and connecting paths) can be interpreted as ‘true change’, i.e., as emanating from the construct itself (Chan, 1998). Research question 1 establishes whether ‘true change’ can be said to occur in each latent construct from ages 14 to 16. Research question 2 then examines whether such change can also be said to be moderated by maternal ethnic group membership, provided that cross-group in addition to longitudinal measurement invariance holds. So, while for example the substantive interest of this thesis is not on parental social mobility, I estimate longitudinal change in parental social position between pupils’ ages 14 to 15 as part of the necessary process of including parental social position as a predictor in the final model. However, as research question 2 and 4 make clear, moderation by maternal ethnicity will be assessed both by means of the subsidiary as well as the main analyses. Provided measurement invariance assumptions are met, I will draw heavily on the findings for research question 1 and 2 to address research questions 3 and 4. I present all the models in chapter 4, the analysis addressing research questions 1 and 2 in chapter 6 and that addressing research questions 3 and 4 in chapter 7.

The thesis fills a gap in present UK research on adolescent educational expectations. There are bodies of literature in sociology, psychology and related disciplines regarding parent-child conflict, engagement with homework, feelings about school and assessments of teachers’ effectiveness. However, recent comprehensive literature reviews in the UK suggest there is no literature on the association of those factors with adolescent educational expectations (Gorard, 2012; Gorard, See and Davies, 2012). This is the first time that the above factors are systematically linked to adolescent educational expectations in a longitudinal model using panel data.

The statistical model will explore mediation, cross-lagged and feedback effects simultaneously and allow systematic assessment of their potential moderation by maternal ethnicity. To the best of the author’s knowledge at the time of writing, this is the first time this type of modelling is used to explore the potential link of ethnicity to adolescent educational expectations. This thesis is an important contribution to past research on ethnicity and expectations. The potential influence of maternal ethnicity on the development of adolescent expectations is studied under rigorous tests of the required measurement assumptions associated with longitudinal modelling in general and longitudinal mediation modelling in particular. These measurement assumptions are discussed in chapter 6.

It is also the first time comparisons across white, Indian, Pakistani, Bangladeshi and Black Caribbean groups in England across ages 14 to 16 are attempted under a psychometric longitudinal modelling framework at the individual level. It is expected to offer enhanced insight on possible pathways via which adolescent expectations developed between ages 14 to 16 and on whether these pathways were moderated by maternal ethnic group membership.

1.3 The plan of the thesis.

Chapter 2 discusses the pertinent literature on the UK Indian, Pakistani, Bangladeshi and Black Caribbean minorities focusing on their educational achievement and expectations. The chapter will also review the evidence on parent-child conflict, pupils' engagement with homework, feelings about school and assessments about teachers' effectiveness and their interrelations. Chapter 3 presents the basic tenets of ecological systems theory and the Process-Person-Context-Time ecological research framework on which I draw. It shows why mediation, cross-lagged and feedback effects and moderation can be embedded into a unified theoretical perspective capable of examining these relationships over time. Chapter 4 reviews the methodological literature on the fundamental assumptions, concepts, advantages and limitations of the measurement methodology, and formally presents the estimation procedure and the latent variable SEMs to be estimated in the analysis. Chapter 5 describes the LSYPE as the data source of this analysis, discusses how the data used in the analysis were treated (weighting, missingness, imputation, handling of sample discrepancy, preparation of input data files) and offers descriptive information for each variable.
Chapter 6 addresses research questions 1 and 2 and presents the estimation of the building blocks of the final model. These include all the longitudinal latent SEMs for the hypothesised predictor, the mediators and the outcome. Systematic tests of longitudinal and cross-group measurement invariance are also performed before comparing each model across the white, Indian, Pakistani, Bangladeshi and Black Caribbean groups. Chapter 7 presents the estimation of the final longitudinal SEM which combines all the building blocks developed and estimated in chapter 6. The final model addresses research questions 3 and 4 as it estimates potential longitudinal mediation, cross-lagged and feedback effects involving the above four factors as well as potential moderation by maternal ethnicity. Chapter 8 (conclusions), summarizes the findings for each ethnic group in the analysis, discusses the strengths and limitations of the analysis and makes suggestions for further research.

The Annex provides the Appendices that include the necessary syntax files, supplementary analyses not included in the body of the thesis, as well as my personal communications with a number of scholars.

Chapter 2. Review of literature

Introduction

In this chapter I will discuss the literature on adolescent educational expectations focusing on the paradox of high expectations for UK ethnic minorities associated with low parental social class backgrounds. In section 2.1, I first set the scene with a brief historical account of the socio-economic experiences of the UK Indian, Pakistani, Bangladeshi and Black Caribbean minority groups. Against that background, I discuss the literature on the adolescent educational expectations of UK minority groups in section 2.2. This is followed by a more focused discussion of the evidence on the various dimensions of the above paradox in section 2.3. In search of theoretical support for the paradox, I examine the dominant sociological theories involving adolescent expectations in section 2.4, and argue that they do not satisfactorily explain the observed trends. In section 2.5, I discuss the literature on the two home-related and two school-related factors I introduced in chapter 1: parent-child conflict, pupils' engagement with homework, feelings about school and assessments about teachers' effectiveness in maintaining discipline. I argue that since educational performance and educational expectations are related, it is possible that the proposed factors which affect educational performance may also affect educational expectations and thus help us understand the paradox.

2.1 Minority ethnic groups in the UK: a brief historical profile

The socioeconomic experience of UK ethnic minorities is the result of a complex set of push and pull factors at origin and destination that shaped their patterns of migration (Castles and Davidson, 2000) and affected their market integration at destination (Dustmann and Glitz, 2011). The migrants' qualification profiles, particularly English language skills, were the result of selection mechanisms at work at the country or origin (Rutter and Tienda, 2005c). The initial settlement patterns and geographic clustering of the migrant first generation were functions of their selection and the reception environment at destination (Butler and Hamnett, 2011). Different migration policies addressing different labour market needs (Tienda, 2005), discrimination and the socioeconomic and demographic profiles of the migrants themselves largely shaped both the reception environment and their market integration.

Black Caribbean people were the first to arrive to the United Kingdom. Their migration started soon after the end of WWII and peaked around the late fifties and sixties. Few Black Caribbean migrants were highly qualified, and most lacked transferable qualifications (Modood, 2003). First generation Black Caribbean women were more likely to be English-fluent (Shaw, 2007) and much more likely to be qualified than men (Modood *et al.*, 1997). As a result, they responded well to a market demand in the health industry, particularly in nursing (Owen, 2003) and were relatively protected from discrimination and institutional racism (Owen *et al.*, 2000). The second generation of Black Caribbean people still lagged behind their white counterparts in general, while Black Caribbean men made the least progress. Third generation Black Caribbean women made the most dramatic progress reaching parity with the white group in the 1990s. In contrast, Black Caribbean males were reported to have the lowest employment probabilities (Modood, 2003).

The post-war migration of Black Caribbean people in the 1940s was soon followed by a massive wave of migrants from the Indian subcontinent in the 1950s and 1960s corresponding to growing demands for labour in the expanding British economy. Better qualified Indian people migrated into Britain from East Africa in the early seventies (Bhachu, 1985). Their migration created important within-group differences in the UK Indian group. In general, migrants from the Indian subcontinent were still much less qualified than their counterparts who migrated from East Africa (Maughan, 2005). The latter were urban professionals possessing transferable qualifications and skills in much larger proportions and were more successful in securing better jobs and faster market integration (Dale *et al.*, 2002; Dustmann *et al.*, 2003). These qualities gave them a head start in the resettlement process in the UK (Shaw, 2007). Indian migrants from the Indian subcontinent searched for work mainly in Birmingham, Manchester, Leeds and other industrial cities where the manufacturing industries and public sector services were available (Owen *et al.*, 2000). Their greater concentration in less developed inner-city boroughs and greater lack of transferable qualifications created ethnic penalties in their economic adjustment and integration. These penalties were mostly evident in the first generation of these migrants but became less severe in the second generation, due to parental investments in their offspring's education. In general, Indian people reached parity with the white group in the third generation (ONS, 2012). They are overrepresented in university entrants, well exceeding the proportions of their white counterparts (Modood, 2006; Owen *et al.*, 2000).

Pakistani and Bangladeshi people marked the third wave of immigration into the UK during the eighties and early nineties. Most of the Pakistani and Bangladeshi migrants came directly from rural farming communities such as Mirpur, possessed few qualifications and practically no English language skills. The Pakistani and Bangladeshi groups came with important gender gaps in qualifications. The overwhelming proportions of Pakistani and Bangladeshi women possessed no formal qualifications and could not speak English (Maughan, 2005). The restructuring of the British economy in the 1980s meant that these migrants could not follow in the footsteps of the earlier migrants due to the scarcity of manufacturing jobs in the periphery. As a result, a considerable proportion of those migrants was oriented towards the service sectors of the economy. Many became small business proprietors and taxi drivers in Greater London (Dale *et al.*, 2002) or filled market niches that did not attract local labour (Dench *et al.*, 2006b). The first generation of these migrants and a good proportion of their offspring suffered ethnic penalties and greater unemployment than similarly educated native groups (Heath, Rothon and Kilpi, 2008). There was marked improvement in the market integration of the second generation but earning and unemployment gaps remained (Algan *et al.*, 2009). Indian, Pakistani and Bangladeshi people are among the fastest growing UK minorities (Owen, 2003). However, most inner-city concentrations of the above minority population are associated with severe area disadvantage. Over two thirds of Britain's Muslim minorities are concentrated in its 88 most fiscally-deprived districts compared to only about 10% of the general population (Tienda, 2005). Their concentration is attributed to the recency of their arrival, low language skills and to their less effective establishment in the labour market (Dench *et al.*, 2006a). Disadvantage was further compounded by their much larger family sizes and the unemployment of economically active women (Modood, Beishon and Virdee, 1994).

Comparatively speaking, Indian people made the most progress in increasing their proportions with A-level or higher qualifications surpassing their white counterparts. In contrast, Bangladeshi people made the least progress. In general however, greater proportions of Indian, Pakistani, African Indian and Chinese people gained GCE or equivalent qualifications than their white counterparts during early adulthood (Modood, 2003). Attainment gaps undoubtedly narrowed in the third generation. Yet, Pakistani and Bangladeshi people still lag behind their white counterparts. They have the highest proportions of 16-24 year-olds without qualifications (Dustmann and Glitz, 2011; Maughan, 2005) and are the least likely to speak, write and read English fluently (Dustmann and Fabbri, 2003). Further, Black Caribbean and Bangladeshi men leave full-time education about half a year earlier than their native counterparts (Algan *et al.*, 2009).

In terms of market integration, with the exception of Black Caribbean women, migrants found it very difficult in the beginning to secure a niche in the labour market (Khan, 1979). They suffered downward mobility regardless of their qualifications (Modood, Beishon and Virdee, 1994). Religion and culture prohibited Muslim women from working in the service sector. On the contrary, Sikh and Hindu women from India could find work in unskilled or semi-skilled factory jobs (Khan, 1979). Institutional racism is argued to have held many minorities back in the 1990s despite the relatively higher qualifications in relation to whites of the children of South Asian immigrants (Butler and Hamnett, 2011). Yet, progress in the occupational profiles of minority parents has undoubtedly occurred between the first and the second generation (Algan *et al.*, 2009). Members of the second generation acquired academic and vocational qualifications in Britain. As a result, ethnic minority groups are now overrepresented in certain professions (Dale *et al.*, 2002; Modood, 2006). Despite progress, unemployment remained high in the 1990s and 2000s, particularly among Pakistani, Bangladeshi and Black Caribbean males (Maughan, 2005). Pakistani and Bangladeshi women are still overrepresented among those without formal qualifications (Tienda, 2005). Pakistani, Bangladeshi and Black African males are currently at least twice as likely (16%) and Black Caribbean males almost three times as likely (18-20%) to be unemployed compared to Indian males who reached parity with white British (8.1%)(ONS, 2010).

Older patterns of disadvantage still persist in various degrees among South Asian and Black Caribbean minorities (Heath and Cheung, 2006; Platt, 2007). Given that disadvantage, it is puzzling to see persistently higher parental and adolescent educational expectations for the pursuit of higher education in UK minorities as compared to their white counterparts. Educational expectations in connection to this paradox are discussed below.

2.2 Educational expectations in UK minority pupils

Educational *aspirations* and *expectations* are related but distinct concepts (Quaglia and Cobb, 1996). In sociology both terms have been used (Alexander and Eckland, 1975; Kerckhoff, 1977; Sewell, Haller and Portes, 1969; Sewell, Hauser and Wolf, 1980). In psychology the term *aspirations* is preferred (Ritchie, Flouri and Buchanan, 2005). In theory, adolescent *aspirations* are argued to describe unrealistic or idealistic perceptions of future education or occupation (Goyette, 2008; Portes, McLeod and Parker, 1978; Woelfel and Haller, 1971) including fantasies (Furlong and Biggard, 1999) during a natural developmental stage (Gottfredson, 1996). Aspirations are heavily gendered and reflect a limited perception of surrounding market reality (Furlong, 1986; Kelly, 1989). *Expectations*, on the other hand, are realistic assessments or predictions of future attainments, job category (Woelfel and Haller, 1971) and available resources (Thompson, Alexander and

Entwisle, 1988). This thesis is concerned with young people's reported *probability estimates* for applying to university after year 11 and for being accepted if applied (see chapter 4). Pupils' responses were therefore more likely to reflect reality-based expectations rather than idealistic aspirations about post-16 university study. Accordingly, the term *expectations* is used in this thesis. Minority young people's expectations are likely to be shaped by a number of structural and cultural factors that may explain why their expectations are higher than those of their white peers. I review the evidence on such influences below.

Influences on adolescent expectations

Minority pupils' exposure to culturally different home environments and different school experiences has been linked to their generally higher educational expectations. Minorities differ greatly in terms of their typical family structure. Black Caribbean women have been noted in the literature for having the greatest probabilities of being lone mothers and of being household heads (Dale, Lindley and Dex, 2006). However, Black Caribbean lone-mother households represent atypical lone-parent families with very unique mother-daughter ties (Modood *et al.*, 1997; Shaw, 2007). Shaw (2007) argued that the current pattern of Black Caribbean household formation in Britain is a continuation of Caribbean matrilineal culture that explains lone motherhood and close ties between women across generations (Shaw, 2007, p. 275).

Unlike the typical white double-earner nuclear family, Pakistani and Bangladeshi nuclear families represent different points in multigenerational family formation. Nuclear Pakistani and Bangladeshi households typically comprise parts of larger family formations living nearby. Kinship ties remain strong and traditional particularly regarding child-care (Shaw, 2007, p. 277). Because of this fact, these nuclear families are likely to follow different traditions about the nature of relationships among family members (Beishon, Modood and Virdee, 1998). Parenting practices that may have an impact on adolescent educational expectations are likely to be more traditional (Modood *et al.*, 1997).

US evidence suggests that in general, gainfully employed higher SES mothers in double-earner nuclear families exerted stronger maternal influences on daughters' than on sons' aspirations, self-perceptions and occupational orientations (Hofferth, 1980; Hoffman, 1979; 1985; 1989; Leibnowitz, 1974; Murmane, Maynard and Otis, 1981). More recent studies also confirmed that both adolescent boys' and girls' educational aspirations depended more on mothers' educational capital compared to those of fathers and teachers (Marjoribanks, 1999). Educated mothers in employment in particular, provided a career role model for high educational and occupational expectations for their adult daughters (Buchmann and Dalton, 2002; Kalmijn, 1994; Modood, 2005; Shu and Mooney-Marini, 1998). More recent UK longitudinal studies reached similar conclusions. Flouri (2008) found that mothers' expectations had significant positive effects on daughters' but not on sons' adult outcomes.

However, none of the above research studied ethnic groups. This focus has neglected the possible moderating influences that parental ethnicity may have on adolescent expectations. A working mother's achievement orientation may be moderated by her ethnicity in complex ways and might not necessarily be class-based or sex-stereotypical. Some qualitative evidence in the UK has suggested for example that some working class Muslim families with low educational qualifications supported greater opportunities for education and work for their daughters than for their sons (Dwyer and Shah, 2009 p. 69). On the other hand, a daughter's scholastic performance and educational aspirations may also influence her mother's expectations. As a result, a lower-educated mother with traditional family values may de-emphasise those values in support of her daughter's future achievement. Qualitative evidence suggests that the higher the daughters' educational achievement, the greater her ability to negotiate and contest patriarchal restrictions. Daughters in today's Muslim families had higher chances of forming higher educational expectations for a market-based career (Bagguley and Hussain, 2007; Dwyer and Shah, 2009; Mohammad, 2005).

Minority people's cultural predispositions emphasising the successful pursuit of educational achievement affect parental and adolescent expectations across UK minority groups. Practically all minority parents valued education highly (Modood *et al.*, 1997). Indian, Pakistani and Bangladeshi adolescents and their parents maintained very high expectations about continuing to university after age 16 (Strand, 2007). Differential parental employment and disadvantage among minority groups did not seem to lower the value attributed to education. Higher parental expectations were just as likely among Indian and Black Caribbean women with greater likelihoods of employment (Modood *et al.*, 1997) as among Pakistani and Bangladeshi women who were much less likely to be employed outside the home (Khan, 1979; Modood, 2003). Black Caribbean (Rhamie, 2012; Rhamie and Hallam, 2002) as well as Indian, Pakistani and Bangladeshi (Crozier and Davies, 2006; 2007; Siraj-Blatchford, 2010) pupils' expectations were developed at home and supported by the community. These environments provided protection from negative school experiences and disadvantage.

Apart from the family and community, the school is also an important ecological environment for the adolescent (Bronfenbrenner, 2005). It is therefore linked to the development of minority pupils' educational expectations (Maughan, 2005; Strand, 2008). However, the school experiences of minority pupils are unique for a number of reasons. Because family structures in UK minority groups are atypical, family-school links are likely to be atypical as well (Crozier and Davies, 2007). Some evidence suggests that this is true for most Pakistani and Bangladeshi parents' school contacts (Bhatti, 1999) owing to different parental cultural values (Sharp, Keys and Benefield, 2001); institutional racism (Goulbourne and Solomos, 2000); or lack of understanding by the school authorities (Crozier and Davies, 2006). Thus, disadvantage, seclusion and reliance on ethnic community networks, cause some minority parents to have unequal access to educational resources (Maughan, 2005) or high-achieving schools (Gillborn and Youdell, 2000).

The within-school experiences of minority pupils are different as suggested by ethnographic accounts of the school experiences of South Asian (Abbas, 2002; 2003; Ahmad, 2001; Basit, 2012; Mirza, 2003; Siraj-Blatchford, 2010) and Black Caribbean pupils who were found to be discriminated against in schools (Archer and Francis, 2005; Connoly and Neill, 2001; Furlong, 1986; Gillborn, 1995; Mac an Ghaill, 1988). Teachers' negative perceptions about Black Caribbean pupils were argued to create negative staff-room cultures. These cultures are conducive to lower examination tier placements of these pupils (Modood, 2003). Black Caribbean pupils react to what they perceive as 'mainstream' white culture with the dice loaded against them (Furlong, 1985), become confrontational and are more frequently excluded than other minority pupils (Rhamie, 2012; Strand, 2012). Pupils in different minority groups may therefore form different interpretations about their school environment and teachers' effectiveness reflected in their feelings about school and assessments of teacher effectiveness. Based on wave 1 of the LSYPE data, Strand (2007; 2008) found that such feelings about school and pupils' ideas of teachers' control were positively related to academic performance (Strand, 2008). These factors together explained more variance in pupils academic achievement at age 16 than parental SES. These impressions may affect their educational expectations as well but this hypothesis remains untested so far.

2.3 The paradox of high adolescent expectations from low class parental backgrounds in UK minorities

The above review of evidence suggests that two associations hold in the general UK population. First, there was a positive association between parental social class and adolescent educational expectations. Adolescents from higher parental class backgrounds had higher educational expectations. Second, there was a positive association between adolescent educational expectations and later achievement. Thus, higher educational expectations during adolescence were associated with higher adult educational and occupational achievement. In the case of minority ethnic groups, the paradox emerges because the first association holds much less while the second works in most of the cases as expected (Gorard, See and Davies, 2012). This means that the role adolescent expectations play for the general UK population in mediating the association between parental social class and educational achievement, does not apply automatically in the case of UK minority ethnic groups. Adolescent expectations of minorities in short, appear to mediate far less of the effect of social class on offspring's later achievement.

Evidence showed that amongst UK minority parents and adolescents, family-based disadvantage was associated with high rather than low educational aspirations (Francis, 2005; Francis *et al.*, 2003; Modood, 2005). Regardless of their social class background, most minority pupils at age 16 in Britain reported high educational aspirations and expectations (Francis *et al.*, 2003). Most of minority young people consistently opted to remain in full-time education and enter the labour market after 21 (Bhavnani and PTI, 2006; Cassidy, O'Connor and Dorrer, 2006; Strand, 2007; 2008). Based on the LSYPE waves 1 to 7, Anders and Micklewright (2013) studied how expectations of applying to university of young people in England changed longitudinally and the extent to which they predicted actual applications as reported at age 20/21. They reported that 66% of teenagers with high SES parents and high KS2 performances actually applied at age 20/21 as contrasted to 50% of teenagers with low SES and similarly high KS2 performances. This suggests that controlling for KS2 performance, parental SES matters for but it is a rather weak influence on pupils' adolescent expectations about and actual applications for university study. Similarly, Croll and Attwood (2013) confirmed that teenagers' early expectations to apply and to be admitted if applied were basically driven by KS3 performance and to a much less extent by parental SES. Conditioning on the probability to apply and controlling for KS3 performance, Fumagalli (2012) using the same LSYPE data showed that teenagers from disadvantaged homes did *not* hold lower expectations of being admitted to university as compared to those from advantaged homes. Other studies also showed that minority parents held much higher educational expectations for their children to remain in full-time education (FTE) than did their white counterparts (Chowdry, Crawford and Goodman, 2009; 2010a; 2010b; Strand, 2008). However, the paradox of high adolescent expectations from low SES homes in UK minority groups is only part of a larger picture involving social class and minority educational outcomes in the UK. In what follows, I place the above paradox in its larger context.

Social class and educational performances of UK minority pupils

Both UK and international evidence suggests that children from higher SES performed better at school. This finding was consistent whatever measures of SES were used (Shavit and Blossfeld, 1993; Treiman and Yip, 1989). However pupils from some UK ethnic groups performed much higher than expected based on their social class profiles. Based on LSYPE data, Strand (2007, p. 65-6) reported that only 28% of Indian, 19% of Pakistani and 9% of Bangladeshi pupils were from the top two social classes as compared to 41% of white British and 37% of Black Caribbean pupils. Yet, Indian pupils made significantly more progress in their academic performance than their white peers. Social class alone could not satisfactorily account for the widening gaps in favour of Indian pupils after age 14 (Strand, 2008).

The white-Black Caribbean gap during the same period cannot be explained solely on the basis of social class background either. Black Caribbean parental class profiles and maternal educational levels were similar to those of their white counterparts (Strand, 2007, p 28). Yet, Black Caribbean pupils made significantly less progress from age 11 to age 14 as compared to their white British counterparts (Strand, 2008). Similarly, Pakistani and Bangladeshi groups are both disadvantaged relative to the white group. Moreover, the proportion of Pakistani pupils coming from the top two social classes was more than twice that of Bangladeshi pupils. However, Bangladeshi pupils achieved higher results while Pakistani lower results at age 16 than would be expected based on their socio-economic circumstances (Strand, 2008, p. 9). When social class was controlled, Chinese, Irish and Indian pupils outperformed their white peers (Gillborn and Mirza, 2000). By contrast, Bangladeshi and Pakistani pupils in particular had lower performances than their white peers (Demack, Drew and Grimsley, 2000).

According to Rothon (2005), the low performances of the Pakistani and Bangladeshi pupils could be explained by their low parental SES. Rothon (2005; 2007) used nationally representative samples of minority pupils from the Youth Cohort Study. She measured parental social class by including the socioeconomic positions of both parents based on a 7-class NS-SEC schema which she recoded to derive a 3-class schema. Results showed that parental social class strongly predicted pupils' achievement at GCSE level. However, the analysis also showed that certain minority pupils performed consistently better while others consistently worse *regardless* of the level of parental social class. Thus, Indian pupils had higher performances, while Pakistani / Bangladeshi (merged in that analysis into a single group) had lower performances across every class category. Thus, class alone was not enough to explain between-group differences in performance (Rothon, 2007, p. 312).

In UK longitudinal designs using the ALSPAC, LSYPE and BCS datasets, parental SES had a positive but moderate longitudinal effect on pupils' adolescent expectations and performances (2010a; Chowdry, Crawford and Goodman, 2010b; Goodman, Gregg and Washbrook, 2011; Kintrea, 2009). However, none of these longitudinal studies focused on ethnic minorities. When longitudinal change in achievement was compared across UK ethnic minority groups, results showed a different picture. Pupils from Indian and Bangladeshi minorities who differed markedly in terms of their parental class backgrounds experienced similarly higher increases in achievement than their white counterparts. By contrast, Black Caribbean and Pakistani groups which were also dissimilar in terms of parental background and level of maternal education (Rothon, 2007), had lower increases than their white peers (DfES, 2006). Black Caribbean and white people had roughly similar parental class profiles (Strand, 2007, p. 28), but their gap in achievement increased between 1992 and 2004 (Strand, 2007).

Social class is argued to explain more variance in pupil attainment than do gender or ethnicity (Heath, 2000; Strand, 2014). It has positive longitudinal effects on achievement (Schoon and Parsons, 2002) and can affect it both directly and indirectly (Sacker, Schoon and Bartley, 2002). Yet, parental SES typically explained only a moderate proportion of variance in minority adolescents' academic performances. This proportion varied greatly depending on the age of adolescents (10-20% at age 16) when nationally representative datasets were used (Strand, 2007; 2008). Social class differences alone, particularly those based on parental income (Micklewright and Schnepf, 2010) are not enough to explain why similarly disadvantaged minority groups increased their academic performances *differently* over time. I discuss this longitudinal dimension in pupils' performances below.

Ethnic gaps in adolescent educational performances and expectations over time

Some UK research has studied ethnic gaps in performance over time. Wilson, Burgess and Briggs (2005) followed two cohorts of pupils in England from age 11 to 16 and from age 7 to 11 using cohort data from the Pupil Level Annual School Census (PLASC). They controlled for parental level of poverty based on receipt of free school meals (FSMs). They found that the white group obtained lower outcomes than any minority group (except the Black Caribbean male pupils). This ethnic gap in performances was pervasive and persisted between ages 11 to 16. Strand (2008) using LSYPE data, confirmed this trend as well. Pupils with working class parents were the ones mostly affected by disadvantage (Sammons, 1995).

Using data from the UK Cabinet Office, Tienda (2005) reported that the Indian-white gap in proportions of pupils attaining more than 5 GCSE Grades A*-C widened in favour of the Indian pupils between 1992 and 2000. The gap between the white and Pakistani and Bangladeshi pupils narrowed but remained in favour of the white pupils. In contrast, the Black Caribbean-white gap changed very little. Both groups made progress but the much lower initial starting level for Black Caribbean youth was responsible for maintaining the gap (Wilson, Burgess and Briggs, 2005). Racial/ethnic groups were less affected in general by parental disadvantage and made considerably more academic progress. The ethnic gap generally persisted in favour of most minority pupils.

A parallel ethnic gap in educational expectations was also pervasive (Francis *et al.*, 2003; Gillborn and Mirza, 2000; Modood, 2003) but with a notable difference. Black Caribbean pupils, along with all the other minority pupils had much higher expectations than their white peers (Strand and Winston, 2008). This ethnic gap in expectations remained, even when family-level multiple deprivation, gender and school effectiveness were controlled (Butler and Hamnett, 2011; Strand, 2010; Sylva *et al.*, 2004).

The reversal in academic progress in primary and secondary education

In terms of overall progress between ages 7 and 11, Black Caribbean, Black Other and Pakistani pupils are reported to have progressed less and Bangladeshi and Chinese pupils more than their white peers (DfES, 2006; Melhuish *et al.*, 2006; Modood, 2005; Strand, 1999). However, the trend is reversed between ages 11 and 16 (Wilson, Burgess and Briggs, 2005). All minority ethnic pupils are reported to have made much more progress than their white peers in post-secondary education (Modood, 2003; 2005; Stevens, 2007). Ages 15 and 16 are highlighted as the most critical in terms of improvement in the performance of minority pupils as compared to their white peers (Wilson, Burgess and Briggs, 2005). By age 16, white British pupils were reported to have fallen behind all other UK minority ethnic groups in academic performance (Demie and Strand, 2006; DfES, 2006).

Other studies which have used longitudinal designs and followed the same minority pupils as they progressed through primary and secondary education reached similar results. In general, minority, especially Black Caribbean, pupils made less progress during their primary education. During secondary education however, minority pupils made more progress, caught up with their white peers and surpassed them by age 16 (Haque and Bell, 2001; Sammons, 1995). Following this trend, many UK minority ethnic groups are overrepresented among university entrants particularly to post-1992 UK universities (Modood, 2003; Wilson, Burgess and Briggs, 2005).

There is no straightforward explanation for this reversal (Strand, 2007). Although the influence of social class becomes stronger in secondary education, this seems to apply more to the white group (Sammons, 1995). Disadvantaged white boys were reported to have 'the most problematic path through secondary schooling' (Wilson, Burgess and Briggs, 2005, p. 3). But in the case of Indian, Pakistani and Bangladeshi pupils during their compulsory education, this reversal cannot be easily explained by improvements in their parents' social class. Even if parental social class did improve that fast, it would still have explained little for the South Asian pupils' school progress. In post-compulsory education, these groups provided similar numbers of university entrants from both manual and non-manual class backgrounds (Ballard, 1999; Modood, 2003). This evidence suggests that parental social class alone does not drive adolescent academic achievement in certain South Asian groups.

The paradox of minority pupils' high educational expectations from low class parental backgrounds remains unexplained. The evidence consistently points to the limited power of social class to account for differences in minority pupils' educational outcomes. I complete the discussion on this paradox by discussing the extent to which the dominant theoretical perspectives in sociology can account for the above reviewed evidence.

2.4 Explaining the paradox through the dominant sociological perspectives

I briefly review the main tenets of three dominant sociological theories which have suggested explicit mechanisms related to educational expectations and are more relevant to the UK case (a) rational action theory (RAT) and in particular, Goldthorpe's (2000) relative risk aversion theory (RRA) which is an outgrowth of RAT; (b) Coleman's (1990) theory of social capital and (c) Bourdieu's (1977) theory of social and cultural reproduction. This is not an exhaustive review of all theories related to adolescent expectations. There are theories involving expectations in other disciplines, notably Gottfredson's (1996) theory of circumscription and compromise and Eccles and Wigfield's (2002) expectancy-value model of achievement motivation. None of these theories however concern ethnicity per se and draw mainly on psychological maturational processes that are not the focus of the present analysis. While none of the sociological theories below was developed for minority ethnic groups either, all theories involved adolescent expectations as part of class analytic schemes with an explicit sociological focus to which the present analysis adheres.

Rational action theory and educational expectations

Educational expectations enter rational action theory (RAT) (Boudon, 1974; Goldthorpe, 1996a; Hechter, 1986) as part of the relations between overarching societal macro-processes and micro-processes at the individual level. The theory asserts that Western free market economies will eventually manifest gross resemblances in their macro-processes, including *generally* converging social mobility flows (Erikson and Goldthorpe, 1985; Erikson, Goldthorpe and Portocarero, 1983). As a consequence of this convergence, individuals' expectations about the pursuit of education and decisions governing investments in it will tend to be characterized by a common overarching rationality. This rationality will produce similar responses to similar opportunities created as a function of similar overarching macro-processes across Western post-industrial societies. In a 'weak' version of RAT Goldthorpe (1996b) conceded that a parent or his/her offspring may form irrationally high educational expectations. Overarching effects at the macro-level, however, will eventually exert an equalizing 'adjustment' effect on the micro-processes affecting parental decisions to invest in the pursuit of their children's education. The direction and strength of the effect of the overarching macro-process on a micro-process at the individual level will be determined by the relative class position of actors.

Based on Keller and Zavalloni's (1964) 'positional' expectations model, Goldthorpe (1996b) argued that similar educational expectations will be adjusted relative to the actors' class position. To realize similar university aspirations for their offspring, parents from working and service classes would have to traverse quite different distances. Covering those distances was argued to be a function of *structurally* based constraints and opportunities (Boudon, 1974, p. 23) but *not* of different class-based values. Traversing the distances involved differing calculations of costs and benefits as a function of parental class position relative to the level of educational ambition. Thus, similar values about education would lead to different parental decisions about investments in it. Decisions would be based on different evaluations of the costs and benefits for either remaining in education or not. *Perception* of the chances of success in the educational system was seen as being *relative* to one's social class. Such estimates of potential success were argued to constitute the main driver of the cost and benefit evaluation. The more ambitious an option and the less advantaged the starting position, the greater the level of aspiration needed and the less favourably this option will be seen (Goldthorpe, 1996b, p. 491). This process was later refined as a relative risk aversion mechanism.

The relative risk-aversion mechanism (RRA) (Breen and Goldthorpe, 1997; Goldthorpe, 2000) also implied an overarching rationality. Since cost/benefit calculations were determined by parental class position, children would regard parental social position as the *lower* reference limit of their aspired achievement. Thus, their decision to pursue educational attainment was not guided by class-based cultural scripts but by a tendency to avoid downward mobility *relative* to the position achieved by their parents. A minimal stay in education was therefore required so as to guarantee that that objective would be realized. People from *all* classes were assumed to be concerned with the risk of downward mobility and that they would therefore invest minimally in education to avert it. However, pupils of lower social origins would need to be more ambitious and have better scholastic performances to augment their cost/benefit estimation (van de Werfhorst and Hofstede, 2007, p. 394).

Some of the predictions of 'weak' rational action theory involving the relative risk aversion mechanism would appear to apply in the case of UK minorities. For example, risk aversion certainly worked between the migrant and later generations (Modood, 2003). However, both RAT and RRA are upturned when they are required to explain the apparent *irrationality* of low-SES minority parents in forming and transmitting high educational expectations to their children. Minority parental class position relative to the level of educational ambition apparently did *not* lead minority parents to abandon investments in education. Also, relative risk aversion would predict that most minority pupils, especially pupils coming from occupationally-low parental backgrounds, would abort once compulsory education was complete. Based on the reviewed evidence, minority pupils did not expect to complete only 'a minimal stay' in education. Precisely the opposite was the case. Finally, the risk aversion mechanism implies that decisions to stay or abort were not driven by different *values* for education. Yet, the reviewed evidence suggests that South Asian minority groups were driven by a deep belief in the value for education as the only avenue for occupational success (Modood, 2003; 2004; 2005). Although theoretically education may have the same value across the board, it seems to inspire higher expectations in some minority groups than in others.

Coleman's theory of social capital and educational expectations

Educational expectations are explicitly linked to Coleman's (1988) concept of social and cultural capital. For Coleman (1988), social capital is a resource that is embedded in social structure and adds to its integration by creating and maintaining trust within families and communities. Potentially, trust can become a shared public good and social capital is a mechanism that generates, controls and maintains such trust. Social capital starts in the family and parents invest in it via their involvement in their children's education. Parental involvement was expected to pay dividends in young people's high educational expectations and positive school performances. High parental investments in their offspring's education involved securing information and expanded existing social networks. More expanded parental social capital networks generated higher adolescent educational expectations. Social networks required *closure* to generate social capital. Closure referred to the existence of strong links amongst members of a social network, like those existing in a close-knit network of families. In those networks, parents know their children's friends' parents and the network is closured. Friendship ties produce a norm of reciprocity, trust and investments in social capital.

Some aspects of Coleman's social capital theory seem to apply to UK ethnic groups. Bangladeshi and Pakistani families were reported to depend on both familial and extended community networks (Shaw, 2007). Further, those networks were more likely to be closured. However, they were also too exclusive, making expansion beyond the ethnic network unlikely (Crozier and Davies, 2006; Cuthbert and Hatch, 2011; Modood, 2004). This negative function of social capital was not predicted by Coleman's (1988) functionalist formulation. This type of social capital reproduced community-level disadvantage for particular South Asian groups (Butler and Hamnett, 2011; Holloway and Pimlott-Wilson, 2011).

Further, within minority families social capital was not generated in the way Coleman (1988) predicted. Parental involvement of low-educated, non-English speaking minority parents was atypical and indirect. Shaw (2007) brought attention to the extended kinship networks in and around Pakistani and Bangladeshi families that substituted direct parental involvement in children's education. Such networks also provided vital assistance in parent-school contacts (Basit, 2012; Crozier, 2009; Siraj-Blatchford, 2010) and made up for the lack of direct parental involvement in pupils' homework (Modood, 2003). A similar role of extended kinship networks in minority families has also been documented in the USA (Alba and Nee, 2005; Light, 1984; 1994; Light and Bonacish, 1988; Portes and Sensenbrenner, 1993; Portes and Stepick, 2003).

The mother-daughter links in Caribbean families also upturn Coleman's predictions. Matrilineal traditional networks are sustained in today's single-parent Black Caribbean family structure (Shaw, 2007). Yet, Coleman's (1988) formulation that predicted penalties accruing to single-parent families as a result of less social capital, is less likely to apply in those cases. The social capital at work in UK minorities cautions against applying Coleman's (1988) formulation unquestionably on their case. The type of social capital responsible for the transmission of educational expectations acquires an ethnic character in minority groups (Devine-Eller, 2005) that is ignored in Coleman's (1988) theory. Surprisingly, Coleman's (1988) functionalist social capital theory has much in common with Bourdieu's (1986) neo-Marxist ideas about social capital. I summarise this theory below.

Bourdieu's theory of social and cultural reproduction

Bourdieu's (1986) notions of social and cultural capital are embedded in his theories of social and cultural reproduction (Bourdieu and Passeron, 1977). Educational expectations are the mechanisms of class reproduction at home and school. Thus, in contrast to Coleman's (1988) formulation, Bourdieu embedded educational expectations directly into social class analysis. As in RAT and RRA, parental class position is central in this theory as well. Here however, parental class position is defined by social inequalities in the possession of social, cultural, economic and symbolic *capitals*. Differential access to, possession of and control over these capitals defines a parent's class position. Adolescent educational expectations are a function of parental class position. They are produced and maintained by the family's *habitus*. Habitus refers to the family social, economic, cultural and symbolic environment. Thus, adolescent educational expectations are habitus-based and represent parents' transmissible investments of cultural codes, practices, aesthetic dispositions and speech patterns, what Bourdieu refers to as *cultural capital*. Since the habitus reflects parental class positions, expectations reflect inequalities in parental class positions and reproduce this inequality. Habitus-based expectations condition a societal outlook that predefines 'acceptable' or 'legitimate' expectations in children. Children's class-based cultural capital is recognized and differentially rewarded at schools. Teachers exercise symbolic violence by reproducing hegemonic notions favouring pupils who possess upper or middle-class cultural capital and by excluding other that do not.

Theories of social and cultural reproduction are similarly limited in accounting for the paradox of high expectations from low-SES minority parents. Social class-determined 'cultural scripts' expected to reproduce family orientations do not seem to operate as theorized (Goldthorpe, 2007). Instead, South-Asian families possess orientations that are not defined by their (low) class position. Moreover, their success in an enclave-linked economy required social and financial, rather than class-based cultural capital (Li, Devine and Heath, 2008). Young members of minority groups may have deficits in class-defined cultural capital. They may lack the 'appropriate' capital for later educational success. Yet, minority pupils succeed academically by possessing peculiar variants of social and cultural capital (Basit, 2012; Bennett and Silva, 2006; Siraj-Blatchford, 2010). These capitals were not predicted by the theory. Minority pupils succeed academically in the face of disadvantage. Schoon, Parsons and Sacker (2004) termed this ability 'educational resilience'. The theory does not help us understand how ethnic identity rather than class-based ideologies activate social capital networks or generate 'educational resilience' among minority people. Nor why such capitals protect them from disadvantage.

The posited cultural reproduction mechanism in schools and the role of teachers also do not fit the data. If teachers discriminated as predicted by the theory, pupils' performances would follow the same trajectories during primary and secondary education. The evidence reviewed above however indicate a reversal in these trajectories. White pupils are academically surpassed by practically all their minority peers by the end of the secondary education. The theory of social and cultural reproduction cannot explain why teachers would appear to reward minority pupils whose families may lack 'high-brow' culture but penalize white pupils for the same reason. Further, the theory cannot explain why ethnic gaps in educational expectations favouring minority pupils persist in the face of the presumed exclusion. Nor why minority pupils' educational expectations keep rising relative to those of their white peers by the end of compulsory education despite such exclusion. Instead, the experience of UK ethnic minorities suggests that they have successfully used the educational system for their upward social mobility (Modood, 2004). The dominant ideology aiming at class reproduction did not stop them from being upwardly mobile (Modood, 2005). Thus, the drivers for upward social mobility in UK minority groups cannot be explained satisfactorily by social reproduction theory.

In sum, the dominant theoretical perspectives in sociology cannot satisfactorily account for the high educational expectations of UK minority youth from disadvantaged backgrounds. There are however other aspects of home and school environments whose potential impact on adolescent expectations has not been studied. Parent-child conflict, pupils' engagement with homework, feelings about school and assessments of their teachers' effectiveness, are four such factors. The evidence suggests that these factors are all related to pupils' school performances. We know that school performances are also related to pupils' educational expectations (Gutman and Akerman, 2008; Ritchie, Flouri and Buchanan, 2005). Therefore, the above four factors can plausibly be also longitudinally related to pupils' educational expectations as mediators of the effect of parental social position; of their own cross-lagged effects and of the feedback of prior expectations on themselves at later time points. Below I discuss the four factors with emphasis on their interrelations to support the above argument.

2.5 Factors potentially associated with adolescent educational expectations examined in this thesis.

Some UK scholars have looked beyond any class-related explanations and into the particular conditions in the homes and schools of minority groups to account for the higher academic progress and expectations in South Asian minorities. Modood (2003), for example, suggests that

> '…what [ethnic minority parents] do is to foster *high expectations* (even to the point of *pressuring* their children, *give encouragement, maintain discipline* (such as ensuring that *homework* is done)…in short, what they give is not a transfer of knowledge and skills but a sense that *education is important*, that *teachers should be obeyed*, and that academic success takes priority over other pursuits' (p. 64, emphasis added).

Modood identifies four factors capable of explaining the paradox: parenting characterised by encouragement but also pressure, discipline and control; homework which is closely monitored; a positive attitude to school and education, and obedience to teachers. These four factors foster higher educational expectations. In a later article, Modood (2004) suggested that the mechanism via which high educational ambitions are inculcated in minority pupils started with parental personal ambition. Parents and other significant others share a common ambition for upward mobility. Their parenting style and cultural endowments regarding parental authority makes it possible to convey this ambition efficiently and successfully to the children at an early stage. Parental authority is reinforced by significant others and the community. Attitudes to school and teachers are consistent with parental values assigned to education as a vehicle for upward mobility. These beliefs, attitudes and worldview are internalized by their children to a high degree and develop ambitions and priorities consistent with those of their parents (Modood, 2004, p 95). Strand (2007) using LSYPE data found that these factors at age 14 explained a greater amount of variance in GCSE scores at age 16 than parental background. Since these factors predicted scholastic achievement, and scholastic achievement is associated with educational expectations (Gutman and Akerman, 2008), the hypothesis can be tested that these factors are also related to educational expectations. I discuss the four factors below but embed them into a theoretical perspective in chapter 3 and subsequently operationalise them as complex mediators linked to adolescent expectations in chapter 4.

Parent-child conflict

Parent-child conflict reflects the extent to which parents subjectively perceived their communication with their adolescent child as strained. Parental ratings of this home-related proximal process may reflect adolescents' sense of autonomy, level of obedience to parental authority (Deci and Ryan,

1987) or an adolescent's temperament and impulsiveness (Deković, 1999). Such perceptions depend on parenting style and quality of control (Baumrind, 1991) and the bond between the parent and the child (Deković, Janssens and As, 2003). Specific parenting styles were more likely to incite parent-child conflict (Branje *et al.*, 2009). Quality of parental control was of key importance (Sorkhabi and Middaugh, 2013). *Confrontive* as opposed to *coercive* parenting was generally found to be associated with higher cognitive competence, individuation, self-efficiency, lower rates of problem behaviours and less parent-child conflict (Baumrind, 2012; Baumrind, Larzelere and Owens, 2010). Parents who exercise confrontive control show willingness to monitor adolescents' compliance with rules and deal with incompliance constructively. By contrast, parents who exercise coercive control impose their control by verbal hostility, arbitrary discipline, psychological control and unqualified power assertion (Baumrind, 2012). Such parents value authority and obedience but are much less responsive to adolescents' needs for freedom and independence and incite bitterer and more frequent parent-child conflicts (Deković, Janssens and As, 2003; Smetana, 1995; 2005). Recent evidence in the US (Sorkhabi and Middaugh, 2013; Waller *et al.*, 2012) and the UK (Scott *et al.,* 2012) supported Baumrind's (2012) hypotheses.

Not all kinds of parent-child conflict reflect dysfunctional interaction, however (Cicognani and Zani, 2010). When conflict involves minor everyday issues, like chores, appearance, homework, school performance, it is considered normal and functional in transforming family relationships (Allison and Schultz, 2004; Bosma *et al.*, 1996). Moderate frequencies of parent-child conflicts show better family-level adjustment (Adams and Laursen, 2001), necessary for renegotiating roles and relationships in the family (Steinberg, 1990). The frequency of parent-child conflict peaks around middle adolescence and then declines. However, around age 16, parent-child conflicts become less frequent but more intense (Laursen, Coy and Collins, 1998). Adolescents' perceptions of their parents' willingness to relax or assert their power and restrictiveness on them may lead to parent-child estrangement, lower intimacy and increase conflict (Fuligni and Eccles, 1993). Parent-child conflict may also increase simply as a function of normal development during adolescence (Paikoff and Brooks-Gunn, 1991). Parental attempts to monitor teenage activity may incite parent-child conflicts (Kurz, 2002) as the legitimacy of parental control is increasingly questioned (Darling *et al.*, 2009; Laird *et al.*, 2009; Smetana, 1995; 2006).

Some evidence suggests that family ethnic or cultural background moderate age-related rates of parenting style and parent-child conflict. Parent-child conflict was generally lower in US (Fuligni, 1998; Smetana, Campione-Barr and Metzger, 2006) and UK minority families (Scott *et al.*, 2010) as compared to white families. Similarly, Turkish and Moroccan parents in the Netherlands had a more authoritarian parenting style but less parent-child conflict than Dutch parents (Wissink, Dekovic and Meijer, 2006). In general, there were higher levels of discipline but lower parent-child conflict across ethnic groups (Dixon, Graber and Brooks-Gunn, 2008). Ethnicity of minority groups therefore appeared to moderate parent-child conflict when rates were compared between minorities and the general population (Fuligni, 1998; Fuligni, Tseng and Lam, 1999; Maynard and Harding, 2010). There were no comparisons however among minorities themselves. This gap in research is addressed in the present analysis.

By contrast, parental social class did not affect parenting or parent-child conflict. Parenting styles varied tremendously within social class as a function of the more general context (Kohn, 1979). Parents from all social backgrounds exhibited both individualistic (fostering independence) and collectivistic (fostering interdependence) orientations in their parenting styles (Kusserow, 1999). The general surrounding context, not social class, appeared to promote particular aspects of parenting (Chan and Koo, 2011, p. 394). Supportive parental involvement had generally positive effects on adolescent outcomes regardless of ethnicity or parental SES (Desforges and Abouchaar, 2003; Hoover-Dempsey *et al.*, 2005; Windle *et al.*, 2010).

Typically, parent-child conflict has been related to adverse developmental outcomes. There is a rich body of literature on these relations that is also beyond the scope of this review (see, Brennan, Le Brocque and Hammen, 2003; Klahr *et al.*, 2011; Patterson, Reid and Dishion, 1992; Stewart-Brown, Fletcher and Wadsworth, 2005). By contrast, I found no studies that specifically tested the relationship between parent-child conflict and adolescent educational expectations. However, we know that parenting is related to adolescent educational expectations. Parents promote engagement with school and academic motivation through valuing, monitoring, helping and doing as part of their parent-child interaction (Scott-Jones, 1995). Therefore, it can be hypothesised that lower parent-child conflict will be associated with higher adolescent educational expectations. Based on the above evidence, parental SES is not expected to have a significant effect on parent-child conflict across minority groups but maternal ethnicity is expected to moderate the relationship between parent-child conflict and pupils' expectations.

Pupils' engagement with homework

Homework involves centrally important processes of social interaction. Directly or indirectly, homework involves parents, siblings, other relatives, peers and teachers in enduring forms of interaction. It is a major point of connection between pupils, parents and schools (Sharp, Keys and Benefield, 2001, p 34) promoting parent-child cooperation and enhancement of communication (Cowan and Hallam, 1999); the home-school liaison (Hallam, 2004; Muschamp *et al.*, 2010); and personal skills and individual development (Sharp, Keys and Benefield, 2001). Amount of weekly homework is argued to be the primary interface between home and school (Cowan and Hallam, 1999; Rogers and Hallam, 2010). How parents and children deal with homework has important consequences for children's concept of and behaviour at school as well as the self-concept of everyone involved in this proximal process (Hallam, 2004; Luster and Okagaki, 2009). However pupils' engagement with homework (Cooper, 1989) must be distinguished from related aspects of homework, such as quality or type of parental involvement with homework, or quality of homework (Dettmers *et al.*, 2010; Heimgartner-Moroni *et al.*, 2012) which will not be reviewed here. Also, pupils' engagement with homework is typically a function of amount of homework assigned and emphasis placed by the school as well as of the pupil's compliance with school demands.

A pupil's compliance with homework may also however depend on home-related processes. Amount of homework is related to parental involvement in homework and pupils' academic achievement (Hallam, 2006; Heimgartner-Moroni *et al.*, 2012) but also to parent-child conflict (Cowan and Hallam, 1999; Davies, 2013). If parents get involved to help weaker pupils, this involvement may lead to frustrated and strained relationship (Epstein, 1988; Levin *et al.*, 1997) and greater likelihoods of parent-child conflict (Hallam, 2004). Indeed, low-achieving pupils experienced higher levels of parental control and more parent-child conflict about homework resulting to lower academic outcomes (Dumont, Trautwein and Nagy, 2012). Studies based on international datasets showed that amount of homework was inversely related to pupils' ability and parental involvement with homework (Chen and Stevenson, 1989).

The effects of homework engagement on academic achievement and parent-child conflict depend on pupils' age. Homework had positive effects on academic achievement during secondary education but uncertain influences during primary education (Holmes and Croll, 1989; Hudson and Kendall, 2002; Patall, Cooper and Robinson, 2008; Sharp, Keys and Benefield, 2001). During adolescence, the relation between amount of homework and academic achievement has been shown to be curvilinear. Attainment was highest with moderate amounts of homework (Cooper, Lindsay and Nye, 2000; Cooper *et al.*, 1998). But other research using international datasets (PISA 2003) found no consistent pattern at the pupil level between amount of homework and achievement (Dettmers, Trautwein and Lüdtke, 2009). When a pupil's prior attainment was controlled, the moderate positive correlation between amount of time spent on homework and achievement decreased further or changed direction (Sharp, Keys and Benefield, 2001; Tymms, 1997). This could indicate that homework mediated the association between prior attainment and achievement (Cooper, 1989).

Pupils' homework engagement was positively related to their feelings about school. Pupils who liked and identified with their school and teachers also did more homework because they believed it was worthwhile (Hallam, 2006; Keys and Fernandes, 1993; Keys, Harris and Fernandes, 1995; Sharp, Keys and Benefield, 2001). On the other hand, amount of homework was associated negatively with pupils' attitudes towards teachers and school if school policies promoted disciplinary action for non-completion of homework (Cooper and Valentine, 2001; Heller *et al.*, 1988; MacBeath and Turner, 1990). Thus apart from parenting style, homework also reflects pupil-teacher relations (Rogers and Hallam, 2006; 2010). In fact, the relation among parent-child conflict, amount of homework and pupils' feelings about school is expected to be reciprocal. This hypothesis remains untested in the literature but will be tested in the present analysis.

The evidence on the influence of parental SES and ethnicity on amount of homework is inconsistent. Some British studies reported that greater amounts of homework generally promoted achievement in a wide range of subjects regardless of parental SES, gender or ethnicity (Epstein and Van Voorhis, 2001; Holmes and Croll, 1989; Lee and Bowen, 2006; Tymms and FitzGibbon, 1992). Other studies reported that more educated parents generally spent more time with their children doing homework implying a positive effect by parental social class (MacBeath and Turner, 1990). In general however, when parents took an active interest in their children's homework, pupils tended to engage more with homework regardless of their social class, (Gorard, 2012; Gorard, See and Davies, 2012; Keith *et al.*, 1993). Similarly, ethnicity and cultural differences affected time spent on homework. Pupils in Japan and China generally spent greater amounts of time on homework than their American peers (Chen and Stevenson, 1989) and so did UK Chinese and South Asian minority pupils (Modood, 2003; 2004; Sharp, Keys and Benefield, 2001); US Asian-American pupils (Keith and Benson, 1992); and Australian Chinese and Vietnamese pupils (Dandy and Nettelbeck, 2002). However, other US (Featherstone, 1985)); UK (Keys, Harris and Fernandes, 1995) and German

(Dettmers, Trautwein and Lüdtke, 2009) studies did not confirm this moderation by ethnicity. It may be that teachers across ethnic groups assign more homework to more able pupils who are more successful academically (Hallam *et al.*, 2003). But by the same token, we should expect more homework to be associated with higher adolescent educational expectations. This hypothesis also remains untested in the literature but will be tested in the present analysis.

Pupils' feelings about school

Most evidence on pupils' feelings about school was discussed above in connection with parent-child conflict and engagement with homework and will not be repeated here. Pupils' feelings about school reflect pupils' impressions about their school quality, standing and contribution to their lives. They are very important indicators of a pupil's interpretations of his/her school environment. The evidence reviewed above suggests that pupils' homework and feelings about school are positively related. It has also shown that pupils' feelings about school are likely to be affected by parent-child conflict (Grolnick and Ryan, 1989) and homework (Hallam, 2006; Sharp, Keys and Benefield, 2001). Homework in particular, may also affect feelings about school (Hallam, 2006). This effect is argued to occur mainly via parental involvement with homework which inculcates positive feelings about school in both parents and pupils in the process (Dumont, Trautwein and Nagy, 2012; Hoover-Dempsey *et al.*, 2005).

On the contrary, frustrated parents who have to face demands on their skills and time posed by their children's homework may develop negative feelings about school (Toomey, 1989; Xu and Corno, 1998) and transfer them to their children (Hoover-Dempsey, Bassler and Burrow, 1995). Hallam (2004) brought attention to another source of frustration and friction. Some pupils simply do not have enough time to do homework at home because of imposed family or community commitments as is the case with some UK Muslim pupils (Hallam, 2004). This friction may cause negative feelings about school as well as parent-child conflict, particularly if pupils are high achievers.

Pupils' feelings about school might also be related to the type of school pupils attend. Independent schools rank higher in terms of higher ability pupil intakes as compared to academies and maintained schools (Machin and Vernoit, 2011; Micklewright *et al.*, 2014). Evidence suggests that teachers in UK independent schools have more positive views of pupil behaviour than teachers in academies and maintained schools (Micklewright *et al.*, 2014). Pupils' feelings about school might therefore be associated with both their own as well as their teachers' impressions about school quality and performance. However, there is no research that has examined this hypothesis specifically. British quantitative research using the LSYPE dataset suggested that pupils' feelings about school and their expectations were positively related to their academic achievement (Strand, 2008). But the relation between feelings about school and educational expectations was not systematically investigated. For example, this relation could be reciprocal or mediated by parent-child conflict and homework. Pupils may maintain different feelings about school as compared to those they have about their teachers. Alternatively, teachers may determine pupils' feelings about school. Moreover, these hypothesized relationships could vary across UK minority ethnic groups. The present analysis will explicitly address these hypotheses.

Pupils' assessments about teachers' control and discipline

Using this factor at pupils' age 15 as a potential mediator of the effect of parental social position at pupils' age 14 on their expectations at age 16 rests on the following rationale. Pupils' assessments about their teachers' effectiveness is a measure of the pupils' subjective perceptions of an important aspect of school environment that concerns discipline. Better teachers are generally associated with fewer discipline problems, better in-class climate and schools with higher ability pupil intakes (Ofsted, 2013). It is well known that advantaged parents are more likely to select such schools (Ball and Vincent, 2007; Burgess *et al.*, 2009; Butler and Hamnett, 2011; Gewirtz, Ball and Bowe, 1995; Haveman and Wolfe, 1995). Disadvantaged families are more likely to be associated with lower-quality schools, and less effective teachers in enforcing discipline (Connelly, Sullivan and Jerrim, 2014; Micklewright *et al.*, 2014). Lower-quality schools are more likely to be associated with larger pupil intakes from disadvantaged families, lower ability pupils, and more unresolved discipline problems (Goodman, Gregg and Chowdry, 2010). There seems to be a positive association between proportion of pupils receiving free school meals (FSM) and likelihood of disciplinary problems in class (Micklewright *et al.*, 2014). Therefore, a positive association is expected between parental social position and pupils' subjective assessments of their teacher effectiveness in enforcing discipline. These assessments may reflect pupils' ideas of the incidence of disciplinary problems at school and the proportion of teachers deemed capable of handling them effectively. Teachers who are effective in control and discipline are expected to be more successful as teachers.

The extent teachers can maintain order and discipline in class is a critical feature of an effective teacher (Furlong, 1985; Lewis *et al.*, 1999). Experienced teachers deal with potential disruptions or lack of commitment on the part of pupils more efficiently (Goddard, Hoy and Woolfolk, 2004).

There is some evidence suggesting a positive link between a teacher's efficiency in managing pupils' in-class behaviour and pupils' management of their own behaviour (Gibbs and Powell, 2012) and academic achievement (Goddard, Hoy and Woolfolk, 2004). Successful class management is related to teachers' expectations about their class as a whole and these expectations are perceived and shared by pupils (Bergin and Bergin, 1999; Rubie-Davies, 2010). High teacher efficacy creates a school ethos that promotes pupil achievement and maintains pupils' positive attitudes about school (Goddard, Hoy and Woolfolk, 2004). Recent evidence similarly reports a negative association between teacher experience and behavioural problems in class. Teachers with over 16 years' experience reported significantly higher in-class climate than teachers with less experience (Micklewright *et al.*, 2014). There is a significant positive association between teacher self-efficacy ratings and teacher-pupil relations that tended to persist when school-level and other factors were controlled for (Micklewright *et al.*, 2014). There is also some evidence to suggest that higher pupils' academic outcomes are associated with teachers' authoritative rather than authoritarian standards of discipline (Pellerin, 2005). Teachers, in other words who enforce high standards of discipline but also maintain fair and warm relationships to them are associated with more responsive and better performing pupils (Gill, Ashton and Algina, 2004).

Teacher efficiency and effectiveness appear to be positively associated more with teachers' years of experience rather than with teacher qualifications *per se* (Micklewright *et al.*, 2014). However, experienced teachers are more likely to be found in better-quality independent schools which are less likely to be attended by disadvantaged minority children (Connelly, Sullivan and Jerrim, 2014). For England, there is some evidence that teachers who regarded themselves as more efficacious were more likely to be found in schools with higher ratings by Ofsted (Micklewright *et al.*, 2014). Schools with larger pupil intakes from disadvantaged backgrounds are reported to be less likely to retain experienced and highly qualified teachers (Lupton, 2005). Although it is unclear whether teacher self-efficacy varies with school intake from disadvantaged backgrounds (Micklewright *et al.*, 2014), there have been policy initiatives to incentivise good teachers to work in such schools (Allen and Allnutt, 2013). Evidence from specific interventions suggests strong positive effects (Muijs *et al.*, 2010).

On the other hand, teachers' disciplinary action has not been the same across all minority groups. Black Caribbean pupils in the UK are overrepresented in school suspensions and exclusions (Maughan, 2005; Tienda, 2005). Similar racial disparities in school suspensions and expulsions are also reported in the USA (Losen, 2011). It is therefore plausible to expect that pupils from different UK minority groups in this study will maintain different perceptions about teachers' in-class disciplinary effectiveness.

Surprisingly, there is no quantitative research on the association between pupils' assessment of teachers' control and effectiveness and their educational expectations to continue in education past age 16 (Gorard, See and Davies, 2012). There are a number of early UK ethnographic studies on how teachers' expectations may impact on pupils' expectations (Furlong, 1985) following various theoretical traditions (see Stevens, 2007 for a review). Based on the studies reviewed above however, it appears that pupils tend to like efficacious teachers who promote authoritative disciplinary styles and get productively engaged with pupils, regardless of school type. Pupils' assessments reflect the quality of school environment which is associated with parental social class. It seems therefore plausible to hypothesise that schools that are perceived as having greater numbers of teachers who are effective in control and discipline are less likely to tolerate disaffected pupils and more likely to promote higher educational expectations in their pupils. It is therefore expected that pupils' perceptions of higher proportions of their teachers being efficient in in-class control and discipline will generally be associated with higher positive feelings about their school and higher expectations. Pupils' subjective assessments of their teachers' effectiveness in enforcing discipline could therefore be a mediator between parental social class and pupils' expectations.

The longitudinal link between pupils' assessments of teachers' overall effectiveness in control and discipline and educational expectations has not been investigated. Nor have potential reciprocal effects between pupils' subjective assessments of teachers' effectiveness and educational expectations, parent-child conflict, engagement with homework and feelings about school been systematically followed over time nor compared across UK minority ethnic groups. This is also a task which will be directly addressed in this thesis.

2.6 Conclusions

The review has shown that adolescent educational expectations have routinely been used in past research as mediators of the influence of parental SES on later educational attainment. However, much less attention has been paid to the causal antecedents of adolescent educational expectations.

The paradox of high adolescent expectations in low parental SES minority families discussed in this review suggests that this mediation model holds much less value in the case of UK minority groups.

None of the reviewed major theoretical perspectives in sociology could adequately explain the development of educational expectations among minority ethnic adolescents. Rational action and social and cultural reproduction that suggested explicit mechanisms involving educational expectations at the individual level failed to help us understand the paradox. The reviewed evidence suggested that minority parents' educational ambitions for their offspring are neither rational nor class-based while their social capital networks both help and restrict members. The mechanism responsible for the development of high adolescent educational expectations in low-SES minority families remains elusive. The review has shown that parent-child conflict; pupils' engagement with homework; feelings about school; and assessments of their teachers' efficiency are associated with academic performance. Since we know that academic performance and educational expectations are related, it is plausible to expect these factors to influence educational expectations as well. This link seems to be suggested by some scholars (Modood, 2003) but there is a gap in UK research in this respect.

In addressing this gap, this analysis will provide a direct test of a set of interrelated hypotheses concerning the potential mediation of three types of prior influences at pupils' age 14 on adolescent expectations at age 16 via the above four factors at age 15: the effect of parental social position at pupils' age 14; the prior effects of the four factors at age 14; and the feedback effects of prior pupils' expectations at age 14. As I will show in chapter 5, the LSYPE on which the present secondary analysis is based, offers panel data for pupils' ages 14-16 for all four factors I have discussed in section 2.5. These potential mediators form the focus of my empirical modelling to be presented in chapter 4. Finally, although the review has shown that ethnicity did not moderate the association of the above four factors with academic performance, ethnicity may still moderate their relationship to educational expectations in many ways that have not been tested explicitly in the literature. The present analysis will address this gap as well.

Chapter 3 introduces ecological systems theory that embeds all hypothesised interrelations among these four influences, parental social position and associated family material circumstances and pupils' educational expectations into a coherent theoretical framework.

Chapter 3 Ecological systems theory in relation to the present thesis

Introduction

The purpose of this chapter is to introduce a theoretical framework that provides support for exploring the following four hypotheses regarding the potential mediational role of parent-child conflict, pupils' engagement with homework, feelings about school and assessments at age 15. First, that the above factors at age 15 affect adolescent expectations at age 16 as mediators of the influence of parental social position at age 14. Second, that these factors at age 15 are mediators of their own prior cross-lagged effects between ages 14 to 15; third, that these factors at age 15 are mediators of the prior effects of pupils' expectations at age 14 on expectations at age 16. Fourth, that the above hypothesised relations are moderated by maternal ethnicity. Ecological systems theory (EST) (Bronfenbrenner, 1988) provides general theoretical support for the exploration of the above hypotheses. The chapter shows why this was so and how the quantitative model in this thesis was conceptualised and specified under the theoretical framework of EST. In section 3.1, I first present the principles of EST which are directly relevant to my analysis. In section 3.2, I discuss the topology of EST, identify the factors, the relations and the relevant contexts of my analysis in it and show that the quantitative model that will be presented in chapter 4 is in fact a 'person-process-context-time' model (Bronfenbrenner and Morris, 1998).

3.1 Principles and topology of ecological systems theory

Principles of ecological systems theory

Principles of ecological schemes predate Bronfenbrenner's (1979) *Ecology of Human Development*. They are traceable to earlier theorists like Park, (1916), Mead (1967), Lewin (1948) and Garfinkel (1967). But Bronfenbrenner's unique contribution lies in integrating these concepts into a *general practical theory* of human development (Bronfenbrenner, 2005, p. xxix). 'General' theory meant that it was versatile enough to provide specifications for contextual models that could range from age-specific intervention studies (Powell, 2009) to expanded models encompassing the life course (Elder, 1999). 'Practical' theory meant that its hypotheses were operationalisable and ultimately testable. It also meant that it was falsifiable (Popper, 2009) in that it provided for validity checks and permitted the emergence of results contrary to the investigator's original hypotheses (Bronfenbrenner, 2005, p. 51).

In addition to being general and practical, Bronfenbrenner's theory is also integrative because it fused its post-empiricist emphasis on validity checks with its diametrically-opposed philosophical tradition, phenomenology. Phenomenology rejects empiricists' efforts to 'explain' human consciousness in objective terms (Morrow and Brown, 1994, p. 118). Bronfenbrenner fully adhered to the principle that 'reality is socially constructed' (Berger and Luckmann, 1991). His ecological orientation '[stresses] that what matters for behaviour and development is the environment *as it is perceived* rather than as it may exist in 'objective' reality (Bronfenbrenner, 2005, pp. 51-52), (emphasis added).

This principle was formalised in the first proposition of the bioecological theory of human development (Bronfenbrenner, 2001):

> '*Proposition 1*: Far more important than the objective features of any environment linked to human development are the *subjective* experiences of these objective features by persons living in the environment' (Bronfenbrenner, 2005, p. 5).

By their nature such interpretative processes develop over time. They are a product as well as a cause of interaction, and depend on changes in the surrounding context. What Bronfenbrenner added to this well-known principle were two additional elements: First, that every individual engaging in interaction *develops as a function* of these processes; second, that the emergence of every individual's positive innate (or genetic) potential is a complex function of these relational processes. These principles were formalised into the following two theoretical propositions:

> '*Proposition 2*: Human development not only depends on but *occurs* through progressively more complex and extended *forms* of reciprocal interaction between an active, evolving biopsychological human organism and the persons, objects and symbols in its immediate external environment. Such enduring forms of reciprocal interaction are referred to as *proximal processes* […] and are posited as the primary engines of development' (Bronfenbrenner, 2005, p. 6).
>
> '*Proposition 3*: 'The form, power, content and direction of the proximal processes producing development vary systematically as a joint function of the characteristics of the *developing person* (including *genetic inheritance*); of the *environment* – both immediate [proximal] and more remote [distal] - in which the processes are taking place; of the nature of the *developmental outcomes* under consideration; as well as of the continuities and changes occurring in the environment over *time*, through the life course, and specific to the historical period in which the person has lived' (Bronfenbrenner, 2005, pp. 6-7), (original emphasis).

In what follows, I complete the presentation of ecological systems theory by discussing its topology and identifying the factors and relations examined in this analysis in it.

Locating factors and relations in my analysis in Bronfenbrenner's ecological topology

Bronfenbrenner (1979) conceived of the ecological environment as a set of nested structures or contexts. The individual develops by being constantly exposed to the relations across these contexts over time. The innermost and most important context is the so-called *microsystem* which situates the person amidst ongoing proximal processes that sustain intentional interactions with their own momentum and a specific goal (Bronfenbrenner, 1988). Salient features of the microsystem are the interconnections between people in it. These interconnections are sustained by reciprocal interaction in multiple proximal processes and are the primary engines of human development for all persons involved in them (Bronfenbrenner, 2005, p. 6).

In this analysis, parent-child conflict, pupils' engagement with homework, feelings about school and assessments of their teachers' collective effectiveness represent subjective interpretations of aspects of home- and school-related proximal processes. As already discussed in the review of literature in chapter 2, parent-child conflict is related to parenting style and parental control. Thus, it reflects the extent to which aspects of home-related proximal processes involving parent-child relations are subjectively reported by the parent as frictional. Parent-child friction at home could reflect parental pressure, misalignment between pupils' wishes and parental demands, disagreement in perspectives and goals or dissatisfaction in general. Earlier parent-child conflict at age 14 may therefore be directly related to later pupils' educational expectations at age 15 and via them affect their expectations at age 16. This hypothesis will be explicitly tested in this analysis.

Pupils' engagement with homework represents pupils' subjective understanding of the amount of and time spent on homework. Homework may involve multiple interactions of the adolescent with parents via parental monitoring or direct involvement (Hallam, 2004) or with peers via SMS texts, the internet or actual home visits. Thus, subjective reports of pupils' homework engagement are indicators of important proximal processes at home and school. An adolescent's homework engagement reflects the child's obedience to both parental as well as to school authority. This is a dimension that South Asian and Black Caribbean pupils may differ considerably, given their different pupil profiles and academic progress in the literature. Pupils' *perceptions* of their engagement with homework reflect therefore the proximal processes associated with this activity.

This analysis will explore whether pupils' *perceptions* of prior homework engagement at age 14 potentially influence adolescent educational expectations at ages 15 and 16.

Pupils' feelings about school represents pupils' perceptions of aspects of their school environment which make them like or hate school. They measure pupils' degree of disaffection with their school environment. These responses do not represent objective measures of school context. Rather, they convey pupils' *interpretations* of aspects of their school context. The review of literature in chapter 2 suggested that minority pupils' academic progress over time was quite different when compared among themselves and their white peers. Their interpretations of their school environment are expected to reflect these differences at ages 14 and 15 and may affect their expectations at age 16.

Finally, pupils' assessments of their teachers' effectiveness in control and discipline convey their immediate interpretations of their teachers' in-class behaviour regarding discipline. Pupils' reports do not reflect objective ratings of teacher effectiveness or efficacy but pupils' subjective interpretations based on those pupils' experiences with teachers in class. For the same reasons as above, we should expect that minority pupils will differ in their interpretations of teachers' effectiveness at ages 14 and 15 which may affect their expectations at age 16.

The next level of ecological environment is the *mesosystem*, which is defined as 'a system of microsystems' (Bronfenbrenner, 2005, p. 46). A mesosystem incorporates the relations among two or more settings in which the developing person may become an active participant. For a 14-year old adolescent for example, the mesosystem would comprise his or her family, school(s) and peer-group. Microsystems in a mesosystem are in reciprocal communication. This relational link between two microsystems is of critical importance to the developing individual. The individual who is an active participant in each, imports effects from every microsystem into the one in which he or she is currently engaged. Thus, problems at school are likely to be imported into the family and affect its proximal processes there and vice versa.

Following EST, this thesis examines the interrelations of parent-child conflict and pupils' engagement with homework, representing two aspects of home-related proximal processes, with pupils' feelings about school and assessments of teachers' effectiveness, representing two aspects of school-related proximal processes. It then explores how these interrelationships impact on the development of pupils' educational expectations. As the review of literature in chapter 2 suggested, it is likely that Black Caribbean and South Asian adolescents differ from the white norm in their family and school experiences. EST provides support to exploring whether such differences lead to different subjective interpretations which in turn impact on their adolescent expectations differently.

An *exosystem* is a system that does not include the developing person but influences the setting that includes the person. An exosystem can be virtually any social institution that might influence the functioning of the proximal process in an individual's microsystem. For example, laws permitting parents to select schools outside the jurisdiction of the local educational authority affected parents' ability to choose schools, which in turn had consequences for pupils, parents and schools (Butler and Hamnett, 2011).

The *macrosystem* represents the outermost ring that encompasses 'the overarching patterns of stability, at the level of subculture or the culture as a whole, in forms of social organisation and associated belief systems and lifestyles' (Bronfenbrenner, 2005, p. 47). Such macrosystems are social class and ethnicity. Such influences are *distal* because they are overarching rather than proximal, e.g., less immediate to the individual. As the review in chapter 2 suggested, there are atypical interactions between social class and ethnicity in UK minorities. The ethnic variants of social and cultural capital at work in UK minorities are not predicted by the dominant sociological theories. Proximal processes at home and school foster high educational expectations and promote adolescents' 'educational resilience' despite disadvantage (Schoon, Parsons and Sacker, 2004). Culture and ethnicity in South Asian groups have protected young people from class-induced disadvantage (Crozier and Davies, 2007; Modood, 2004).

EST therefore provides theoretical support to testing the hypotheses referred to in the introduction. Namely, that parent-child conflict, engagement with homework, feelings about school and assessments of teachers' effectiveness at age 15 mediate three types of influences to expectations at age 16. First, the influence of parental social position at pupils' age 14; second, their own prior effects at age 14; and third, the feedback effects of pupils' prior expectations at age 14. Finally, that these three types of potential mediation are moderated by maternal ethnicity.

EST explains how distal moderation affects proximal settings. Influences from distal environments enter an actor's proximal (immediate) space and affect proximal processes by virtue of that actor's group memberships, identities and roles. In ecological terms, the potential moderating effect of maternal ethnicity reflects the generalized influence of the surrounding ethnic environment in the family, the school, the peer group and the community. This surrounding ethnic culture is expected to affect proximal processes at home and school for which the actors' particular ethnic or racial identity represents an important endowment and defines the in-group and the out-group (Tajfel, 1982). EST predicts that potential moderation by maternal ethnicity will be reflected in the actors' subjective interpretations of such processes.

Microsystems, mesosystems, exosystems and macrosystems are all subject to the effects of sociohistorical time as well as to the particular timing and period in the life-courses of the participants who are active in them. Factoring in all time, period and cohort effects turns the ecological model into a *chronosystem* (Bronfenbrenner, 2005).

3.2 The conceptualisation and specification of the model based on EST

Model conceptualisation

EST provided a general theoretically-guided framework that identified the underlying processes according to which the above discussed home- and school-related factors were hypothesised to influence the development of adolescent educational expectations. EST defined what a proximal process *is* as distinguished from actors' *subjective interpretations* of a proximal process. Ecological system theory has provided theoretical support to my claim that LSYPE respondents' reports, assessments and estimates captured the important *subjective understandings* of the home- and school-related processes in which mothers and young people participated. In short, EST theoretically validated these responses as valid operationalisations of the underlying home- and school-related proximal processes and provided the theory that justified why they are expected to impact on each other. The thesis will examine these *mesosystemic relations* (Neal and Neal, 2013) between the home and school and explore their role in the development of adolescent educational expectations between ages 14 to 16.

But most importantly, EST provided theoretical support for the conceptualisation of maternal ethnicity as a distal moderator of proximal processes in the microsystem and the framework that specified the mechanisms via which this is done. The same could be said about social class. Ecological systems theory does not specify which of the two distal influences is the most potent moderator of causal relations involving adolescent educational expectations. However, the review in chapter 2 showed that social class was less likely to affect parental and adolescent educational expectations. Ethnicity on the other hand, was shown to provide a buffer from class-induced disadvantage and was associated with higher educational expectations than expected just on the basis of social class. This evidence suggests ethnicity as a more probable moderator of the influence of parental social class on the development of adolescent educational expectations rather than social class as a moderator of the effect of ethnicity on the same outcome. My analysis will provide a direct test of the first hypothesis.

Model specification

EST also guided the actual specification of the model in this thesis. First, EST provided the theoretical grounds to explore the potential interrelations among the hypothesised home- and school-related factors. The theory presupposes that the contexts that sustain human interaction involve *multiple* proximal processes. The form, power, content and direction of these proximal processes producing development were argued to vary systematically as a joint function of personal characteristics and surrounding context. Thus, EST provided the theoretical basis for testing *simultaneously* the effect of multiple proximal processes on the developmental outcome in this thesis.

EST provides theoretical support for specifying a quantitative model capable of investigating all possible causal routes that may involve the outcome. Such a model investigates systematically

> ‘the relation of development to variously combined characteristics of the person and the environment involving a set of processes through which the course and consequence of development are determined. These processes may involve […] feedback mechanisms, sequential stages and alternative paths of direct and indirect influence’ (Bronfenbrenner, 2005, p. 69).

Thus, EST provided the framework for systematic exploration of three *types* of potential mediation of background influences at pupils’ age 14 on pupils’ expectations at age 16 via multiple proximal processes represented by the above four factors at age 15. These background influences at pupils’ age 14 are first, the effect of parental social position; second, the prior effects of the four factors, and third the feedback of pupils’ prior expectations. The same framework of EST also supports a model specification for systematic exploration of potential moderation of the above three types of mediation by maternal ethnicity. It is thus well-suited to test for *moderated mediation* (Muller, Judd and Yzerbyt, 2005). Thus specified, the model will explore whether the hypothesized proximal processes exert effects of different type, magnitude and direction on the developmental outcome;

whether these effects change as a function of an external factor representing surrounding distal context (i.e., across categories of different maternal ethnicity); whether these effects change as a function of time.

Modelling time explicitly is also theoretically supported. Thus, chronosystem designs (i.e., longitudinal contextual models) ‘permit one to identify the impact of prior life events and experiences, singly or sequentially, on subsequent development’ (Bronfenbrenner, 2005, p. 83). Following this principle and related methodological issues to be discussed in chapter 4, every home- and school-related proximal process as well as the developmental outcome was followed over ages 14-16. The model which will be formally presented in chapter 4, included measurements of all factors at baseline (age 14) as well as at least another measurement occasion at age 15, followed in most cases by another at age 16. Thus, each hypothesised proximal process at ages 15 and 16 explicitly controlled for its prior occasions under the theoretical premise of EST that each proximal process is a function of its own (prior) development.

Specifying my model as a Person-Process-Context-Time model

The Person-Process-Context-Time (PPCT) model is a dynamic ecological systems model representing Bronfenbrenner’s (Bronfenbrenner and Morris, 1998) later developments of his theoretical formulation. It incorporates all the insights gained from EST referred to above. It provides a blueprint for conceptually coherent and operational research designs (Bronfenbrenner, 1988) informed by EST. This section defines the conceptual specification of the present research design as a person-process-context-time model. It identifies which elements of the model to be presented in chapter 4 were specified as ‘person’, ‘process’, ‘context’ and ‘time’.

Process, *person*, *context* and *time* are the four basic elements in the PPCT model. *Process* refers to an enduring form of interaction that the person is exposed to and participates in, like a pupil’s engagement with homework. *Person* refers to personal characteristics. A process or a person model simply offer very limited information of the ecological process because they measure either the *extent* of interaction or categorize people according to their characteristics.

The *person-process* models are capable of testing the hypothesis that various combinations of contextual and personal characteristics can produce developmental effects that cannot be predicted by knowledge about each of these domains examined independently (Bronfenbrenner, 2005, p. 73).

In quantitative models these effects on the outcome are typically tested as person by context statistical interactions controlling for the main effects of each predictor. Class by ethnicity or gender by ethnicity are examples of such interactions. If shown to be significant, these statistical interactions would be typically interpreted as showing moderation of the effect of the predictor on an outcome by ethnicity, social class or gender.

The *person-process-context* model permits testing of a much larger set of hypotheses involving multiple interactions between personal characteristics, multiple proximal processes and different contexts. These models are capable of testing 'synergism, [i.e.,] the joint operation of two or more forces producing an effect that is greater than the sum of the individual effects' (Bronfenbrenner, 2005, p. 117). Thus, it is capable of testing the hypothesis that different contexts are associated with different developmental processes and outcomes (Bronfenbrenner, 2005, p. 118). This typically leads to more expanded regression models with more interaction terms and their combinations.

When specified as structural equation models (SEM), person-process-context models are capable of exploring and analyse direct and indirect effects (Bronfenbrenner, 2005, p. 85). However a major limitation of person-process-context models is that they are cross-sectional. In other words, they do not model time specifically. Failing to model time specifically typically creates a number of methodological and interpretive problems that will be discussed in chapter 4.

Person-process-context-time (PPCT) models are described by Bronfenbrenner as *chronosystem models* (Bronfenbrenner, 2005, p. 84). These models include time explicitly in their specification acknowledging the fact that time 'alters the existing relation of a person and the environment […] creating a dynamic that may instigate developmental change' (Bronfenbrenner, 2005, p. 119). They are longitudinal models that specify that the hypothesized predictors precede the hypothesized mediators which in turn precede the outcome. In case of multiple mediators, as is the case here, these models also permit analysis of cross-lagged effects among mediators and feedback effects from earlier occasions of the outcome on the mediators at later time points and via them, on subsequent occasions of the outcome.

My model, presented in chapter 4 and estimated in chapter 7, is a *short-term chronosystem model* (Bronfenbrenner, 2005, p. 120) as it will examine developmental changes in adolescent expectations between ages 14 to 16[2]. '*Person'* is defined by mothers and young people. '*Process'* is defined by the four factors representing home and school-related proximal processes; '*context'* is defined by the white, Indian, Pakistani, Bangladeshi and Black African group memberships; '*time'* is defined by the two-year time window between pupils' ages 14 to 16. As explained in the introduction, this is a short but critically important time window. Age 16 signals the end of compulsory education in England and the time when educational expectations begin to actualise. Year 11 (age 16) marks therefore an important transition in an adolescents' life course. This ecologically important two-year period leading to this transition is captured by three consecutive yearly measurement occasions, at age 14, 15 and 16 based on LSYPE panel data.

In the chronosystem model of this thesis, factors are placed at different times depending on the role they are hypothesized to play in the longitudinal mediation model, following Cole and Maxwell's (2003) recommendations, as will be explained in chapter 4. The predictor, parental social position and family material circumstances for example, is measured at age 14. The mediators, parent-child conflict, pupils' engagement with homework, feelings about school and assessments about teachers' effectiveness are measured at age 15. The outcome, adolescent expectations, is measured at age 16. However the prior occasions of all the mediators at age 14 and of the outcome at ages 14 and 15 are also specified in the model. As it will be explained in chapter 4, this model specification permits more reliable assessment of the three types of potential influences to adolescent expectations via the longitudinal mediation of the four mediators. This is because the model allows for time to operate between the following critical time lags. First, between the hypothesized predictor at age 14 and the mediators at age 15 as well as between the mediators at age 15 and the outcome at age 16. Second, between the prior measure of the mediators at age 14 and their repeated measure at age 15. Finally, between the prior measure of the outcome at age 14, the measure of the mediators at age 15 and the measure of the outcome at age 16. To analyse potential moderation by specific distal contexts, like, social class and ethnicity, Bronfenbrenner (1988; 1992) suggests that the same SEM should be estimated across different categories of the potential moderator. Elder (1999) used such a technique to test for moderator effects, and it is also the technique typically recommended for mediation SEM (Baron and Kenny, 1986; MacKinnon, 2008; Muller, Judd and Yzerbyt, 2005).

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[2] Chronosystem models also examine the impact of *historical time*, described as *cohort effects* (Ruspini, 2002). Studying the effect of historical time requires comparisons of identical survey data and participants of similar profiles belonging to different cohorts. This aspect of the chronosystem model is not addressed in the present analysis.

3.3 Conclusions

The purpose of this chapter was to justify why EST provides a theoretically consistent framework supporting the potential roles parent-child conflict, pupils' engagement with homework, feelings about school and assessments of teachers' effectiveness are hypothesised to have in this thesis. The chapter presented and discussed the principles of ecological systems theory relevant to the analysis that follows, described its topology and situated the factors included in my model in it.

It was shown how the conceptualisation and the specification of the quantitative model were informed by EST to become a mesosystemic ecological model (testing relations in a mesosystem). Specifying the model as a mesosystemic ecological model will enable testing explicit hypotheses about the potential influence of these proximal microsystems on the development of adolescent expectations. The model will permit systematic exploration of three types of background influences at pupils' age 14 on pupils' expectations at age 16 via the potential mediation of parent-child conflict, engagement with homework, feelings about school and assessment of teachers' effectiveness at age 15. These background influences are first, the influence of parental social position; second, the influence the mediators at ages 14; and third, the feedback of pupils' prior expectations at age 14. The model will also permit exploration of the potential moderation of all of these potential causal routes by maternal ethnicity. EST offers strong theoretical support for these analyses. Finally, it was shown that the model that captures these effects simultaneously is a chronosystem model in that it includes all the elements for the person-process-context-time model. The formal presentation of the model follows in chapter 4.

Chapter 4 Models and measurement methodology

Introduction

The purpose of this chapter is to formally present the statistical models that will be estimated to address the research questions and to discuss the consequent measurement methodology. The review of literature suggested that parent-child conflict, pupils' engagement with homework, feelings about school and assessment of teachers' effectiveness may potentially mediate at age 15 three types of background influences at age 14 to adolescent expectations about continuing to university, measured at age 16. These background influences at pupils' age 14 are first, parental socioeconomic position including family material circumstances (referred to simply as 'parental social position'); second, the prior effects of the four mediators; and third, the feedback effects of pupils' expectations.

In the type of mediation modelling followed in this thesis, the predictor, the hypothesised mediators and the outcome, are not represented by single points in time. Instead, all times of measurement for the predictor, the mediators and the outcome are specifically modelled over time as longitudinal chains (see Figure 4.1, and section 4.3 below). 'Feedback effects' in this context are not meant to denote effects going somehow backwards in time. Instead, they are conceptualised as a special case of cross-lagged effects from the outcome at age 14 on mediators at age 15 and via the latter, on the outcome at age 16. They are termed 'feedback effects' because they involve the outcome explicitly and therefore denote time-lagged influences from the outcome at age 14 on other endogenous variables (the mediators at age 15, in this case). Provided that the time-lagged repeated measures of the mediators and of the outcome at ages 14, 15 and 16 represent statistically *equivalent* constructs, *feedback* influences from the outcome at age 14 on its predictors (the mediators in this case) at age 15 can be modelled over time. In that case, a mediator at age 15 affecting the outcome at age 16, may be thought of as also being affected by the same outcome at age 14 if the outcome exhibits longitudinal invariance[3] at ages 14, 15 and 16. Figure 4.1 below, shows the three types of mediation. Following Cole and Maxwell's (2003) modelling specification which is adopted in this thesis, three time-lagged measures for the predictor (P), the mediators (M1 and M2) and the outcome (Y) are specifically modelled. The Figure includes only two mediators for simplicity. Horizontal paths

[3] Longitudinal equivalence only means that the construct is psychometrically similar across time. It does not however remain *identical*. Age-specific differences in factor means will still reflect the effect of change over time. As I explain in later chapters, tests of invariance simply make it more *plausible* for us to interpret longitudinal change as emanating from factor means. They do not guarantee it. Thus, if longitudinal invariance holds, 'feedback' is *more likely* to refer to 'true' age-specific influences from the outcome at age 14 on another factor (mediator or outcome) at age 15.

denote the correlation, also referred to as *time dependence*, between repeated measures of P, M and Y (Bijleveld *et al.*, 1998). Oblique paths are involved in the three types of potential mediational routes (Cole and Maxwell, 2003) to expectations at age 16 referred to above. Type 1 involves mediation of parental position at age 14; type 2 describes mediation of prior effects of mediators at age 14; type 3 refers to mediation of feedback from the outcome at age 14. I formally define these

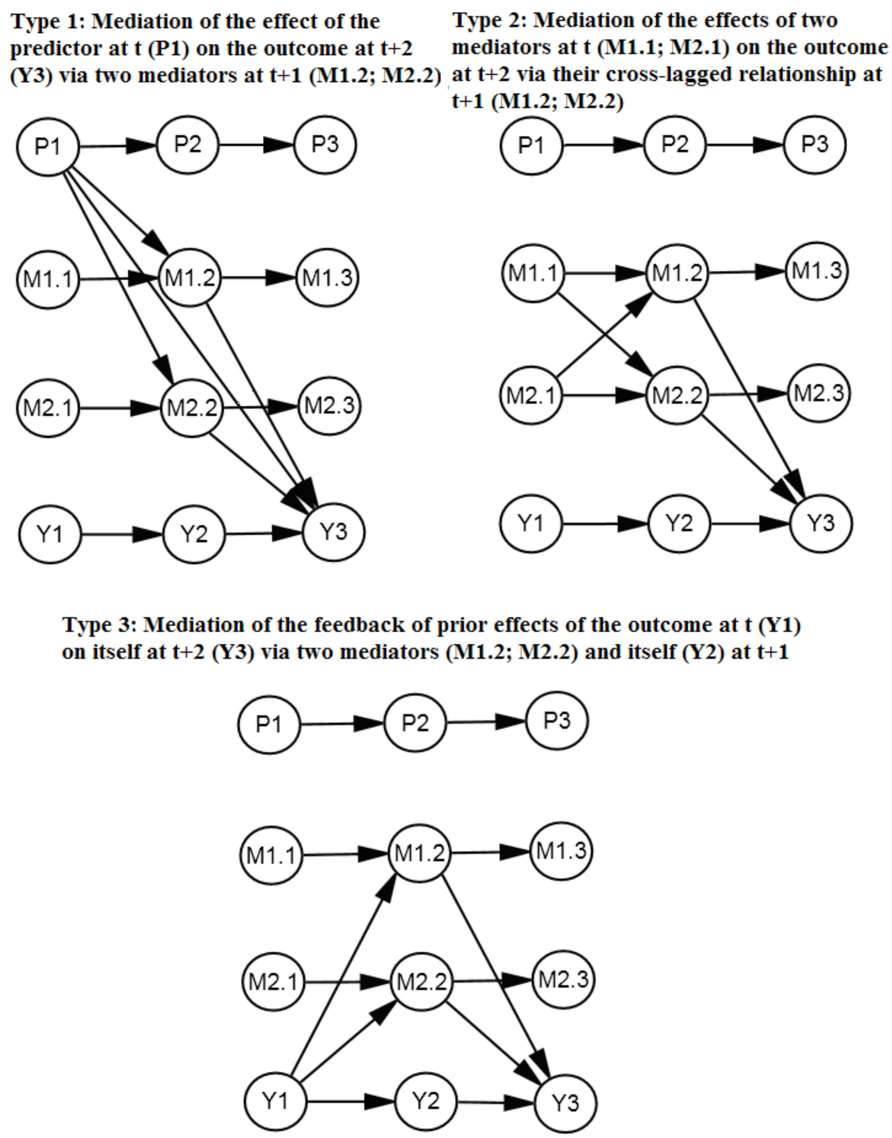

Figure 4.1 Three types of potential mediation showing mediation of the background effects at age 14 of the predictor (type 1), the mediators (type 2) and the outcome (type 3).

paths below in a general manner but discuss them more specifically in chapter 7 where they are estimated. These three routes (or types) of potential mediation may also change as a function of the moderating effect of maternal ethnicity, the focus of the thesis. Chapter 3 justified why all of these potential routes of influence were supported by ecological systems theory and the person-process-context-time (PPCT) ecological design. This chapter explains how these potential effects will be operationalised, specified and tested in the statistical models, based on the methodological choices I have made. As referred to in chapter 1, this thesis addresses 2 subsidiary and 2 primary research questions:

(1) *Do parental social position and family material circumstances, parent-child conflict, engagement with homework, feelings about school, assessment of teachers' effectiveness and adolescent expectations change between ages 14 and 16?*

(2) *Is this change different across the white, Indian, Pakistani, Bangladeshi and Black Caribbean pupils? In other words, are changes in these trajectories moderated by maternal ethnicity?*

(3) *What are the potential interrelations of parent-child conflict, pupils' engagement with homework, feelings about school, assessment of teachers' effectiveness and adolescent expectations? Do they impact on adolescent expectations at age 16 by mediating at age 15 (a) the effects of parental social position at age 14; (b) their own prior effects at age 14 or (c) the feedback effects of prior expectations at 14? Are these potential influences exerted on the outcome, directly or indirectly?*

(4) *Does the potential impact of parent-child conflict, pupils' engagement with homework, feelings about school, and assessment of teachers' effectiveness on adolescent pupils' educational expectations change over time as a function of white, Indian, Pakistani, Bangladeshi and Black Caribbean maternal ethnicity?*

As explained in chapter 1, research questions 1 and 2 form an integral part of the whole analysis. They are subsidiary in that they set the ground for addressing the primary research questions 3 and 4. Parental social position, parent-child conflict, pupils' engagement with homework, feelings about school, assessments about teachers' effectiveness and expectations are smaller longitudinal models which comprise the 'building blocks' of the final model and are presented below. However, their goodness of fit and level of measurement invariance over time and across groups will determine whether they will be included in the analysis or form part of the final model.

Two basic preconditions for their inclusion in the final model need to be met first. Each 'building block' must demonstrate good fit to data, stability and statistical equivalence (or invariance) over time as well as across ethnicity groups. In short, it must possess the psychometric properties that make it comparable across ages 14 to 16 and across ethnic groups. If this precondition of measurement invariance is met, then analysis of differences in change parameters, latent means and intercepts which will address research questions 1 and 2 can proceed, because it could be interpreted as 'true change' (Chan, 1998). This prerequisite analysis will be discussed in chapter 6 and will complement the analysis of structural estimates of the final model that addresses research question 3 and 4 in chapter 7. Thus, for example, although little change (if any) in parental social position is expected over pupils' ages 14 to 15, the model estimating longitudinal change in parental social position presented below will be estimated as part of a necessary preliminary step of the main analysis.

This analysis incorporates recent methodological developments in mediation modelling at the individual level (Maxwell, Cole and Mitchell, 2011) which will be discussed in section 4.3. Mediation models developed in this way require that multiple measures of the hypothesized predictor, the mediators and the outcome should be modelled explicitly across the specified time lags. As a result, six separate stand-alone models were developed to address research question 1 (one for the hypothesised predictor, parental social position, four for the mediators, parent-child conflict; pupils' homework engagement; feelings about school and assessments of their teachers' effectiveness; and one for the outcome, pupils' expectations). These are referred to as 'models 1-6'. To address research question 3, models 1-6 were combined into a final multiple mediator model. It is referred to as 'model 7'. To test the hypothesis of moderation by maternal ethnicity in research questions 2 and 4, models 1-6 as well as model 7 were estimated on LSYPE wave 1-3 data for the white, Indian, Pakistani, Bangladeshi and Black Caribbean groups in multigroup analyses using AMOS Graphics 20 (Arbuckle, 2011). AMOS 20 latent variable software offered a thorough means of conducting multigroup analyses, testing invariance and performing bootstrapping under a user-friendly interface. Although it fulfilled almost all of the needs of the present analysis, AMOS did not include certain useful features. It did not provide for a cluster variable, weighting or certain fit indices other software such as MPlus (Muthén and Muthén, 2010) or LISREL (Jöreskog and Sörbom, 1996) provide. I have used AMOS 20 as it was the only freely available software at the time of the preliminary analyses at the Institute of Education. However, I have compensated for its limitations in the present analysis. I explain how below as well as in chapter 5.

Models 1-6 required to address questions 1 and 2 were developed in a latent variable confirmatory factor analytic (CFA) and structural equation modelling (SEM) framework. I review the fundamental assumptions, concepts, advantages and limitations of this analytic framework below. In section 4.1, I discuss the methodological literature pertaining to the statistical framework necessary to address research questions 1-4. In section 4.2, I present the models developed under this framework for parental social position, parent-child conflict, pupils' engagement with homework, feelings about school, assessments of teachers' collective effectiveness and educational expectations between ages 14 to 16. In section 4.3, I present the final overarching multiple mediator model that combines the above six models to explore their interrelations. I address its particular measurement issues in section 4.4, where I discuss its advantages over typical mediation and moderation modelling. I summarise the advantages and limitations of the methodology followed in section 4.5 (conclusions).

4.1 Latent variables and confirmatory factor analytic models

Latent variables are unobserved constructs which are measured only via a set of observed variables, called *indicators* (or *manifest variables*) for which there are collected data. It is assumed that an unobserved construct exists separately from its observed measures without contradicting observed data (Raykov and Marcoulides, 2006, p 10). Theoretically, the interrelations between indicators are due to their common dependence upon the unobserved construct. If, in other words, the influence of the latent variable on the indicators was partialled out, the correlation among the indicators would be zero (Bollen, 1989a). In practice, the relations of the construct to its indicators (called *loadings*) must be positive and of considerable magnitude for a latent construct to have construct validity. Latent variables are derived in the context of exploratory (EFA) and confirmatory factor analysis (CFA). While EFA is a data reduction exploratory statistical method, CFA is a theory-driven modelling framework for hypothesis-testing (see, Brown, 2006).

Latent variables (or factors) are considered superior to observed (manifest) measures because they minimize measurement error. Instead of assuming that each observed variable in a multiple regression is measured without error, this assumption is explicitly tested in a CFA model. The variance of each measured indicator is partitioned into the variance explained by the latent factor (also called *communality*) and the variance which is accounted for by measurement error or other unobserved influences (called '*unique'* variance, '*error variance'* or simply '*uniqueness'*). Partitioning the indicator variance in this way allows the researcher to test hypotheses about potential relationships among indicator uniquenesses in a CFA model with multiple latent constructs. Thus, common variance due to respondents' systematic similarities in their responses due to like mindsets or common methods in eliciting responses to multiple-choice questions (called shared *method variance*) or shared traits (called *trait variance*) can be extracted in a CFA model.

A CFA model possesses two parts: a *measurement model* which includes the estimates of the indicator loadings, the indicator errors, and the covariances among the indicator errors. If there are no covariances hypothesized among the indicator errors, it is assumed that such covariances are constrained to zero. When these covariances are specified, they are unconstrained and freely estimated. The hypothesized relations among the error terms of a CFA model are called '*error theory*' or '*error structure'* (Kline, 2005).

The second part, called the *structural model*, includes the relations among the latent constructs themselves. Typically, in a CFA model these are factor covariances. When a CFA model is extended to become a latent variable structural equation model (LV-SEM), the structural model includes all hypothesized regression paths among the independent (called *exogenous*) and the dependent (called *endogenous*) variables. A LV-SEM is confirmatory in that it tests a postulated structure informed by causal hypotheses (Raykov and Marcoulides, 2006) as is the case in mediation modelling (Shrout and Bolger, 2002). Figure 4.2 (a) shows the notation of a *congeneric* (Jöreskog, 1969; 1971) latent variable defined by four indicators. The term means that its four indicators load only on a single latent variable. X notation pertains when the construct is used as an exogenous factor while Y notation is used when the construct is an endogenous factor. Regardless of the notation, the relations of the indicators to their construct are given by the equations 4.1-4.4 below (using Y notation), under the assumptions of normally-distributed, homoscedastic errors with zero means which are uncorrelated with the latent factor ($\boldsymbol{\eta}$); univariate normal and multivariate normal y indicators (Tabachnick and Fidell, 2001). However, the assumption of uncorrelated residuals among themselves typically made in multiple linear regression is relaxed. In a CFA model, it is possible to test this assumption. Thus, a covariance between two or more indicator errors may be specified (see Figure 4.2 (a)).

$$y_1 = \lambda_1 \boldsymbol{\eta} + \varepsilon_1 \qquad (4.1)$$
$$y_2 = \lambda_2 \boldsymbol{\eta} + \varepsilon_2 \qquad (4.2)$$
$$y_3 = \lambda_3 \boldsymbol{\eta} + \varepsilon_3 \qquad (4.3)$$
$$y_4 = \lambda_4 \boldsymbol{\eta} + \varepsilon_4 \qquad (4.4)$$

The intercept in equations 4.1-4.4 is suppressed because typically, indicator intercepts and means are not included in the analysis of covariance structures in CFA (Blunch, 2010; Brown, 2006). However, the analysis may include means and covariance structures (MACS) (Bowers *et al.*, 2010; Byrne and Stewart, 2006; Hertzog and Schaie, 1988; Jöreskog, 1974; Little, 1997; Widaman and

Reise, 1997) if a covariance matrix including a vector of indicator means is supplied as input (called *augmented variance-covariance matrix*). Equations 4.1 – 4.4 can be summarized in matrix form:

$$y=\boldsymbol{\Lambda}_y\boldsymbol{\eta} + \boldsymbol{\varepsilon} \qquad (4.5)$$

which expands and generalises to

$$\boldsymbol{\Sigma}_y = \boldsymbol{\Lambda}_y\boldsymbol{\Phi}_{\eta\eta}\boldsymbol{\Lambda}_y' + \boldsymbol{\Theta}_y \qquad (4.6)$$

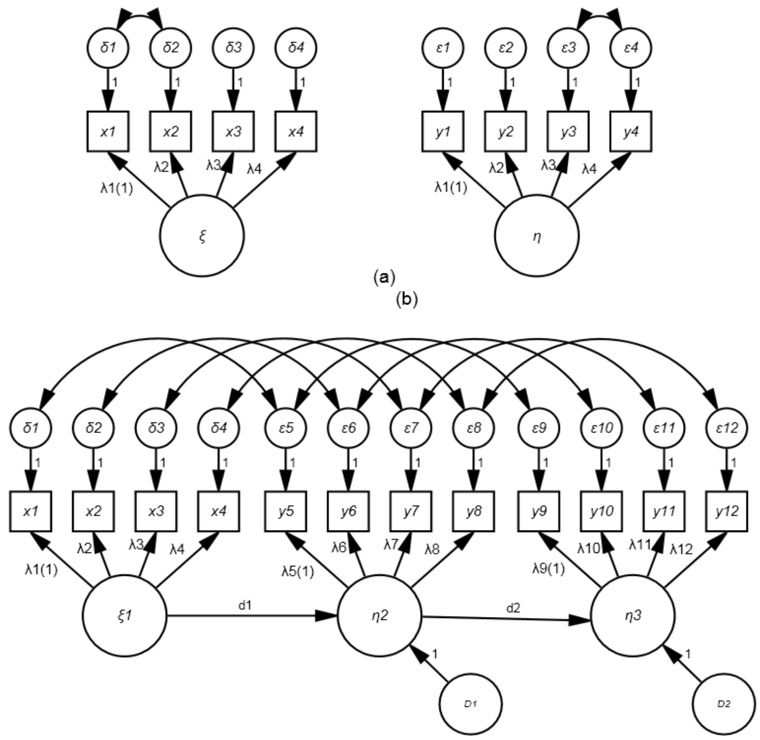

Figure 4.2: X and Y notation for a congeneric latent variable with two correlated errors (a) and a longitudinal autoregressive SEM with an autocorrelated error structure (b)

while the indicator error covariances of the model in Figure 4.2 (a) can be expressed as

$$COV(x_1,x_2) = \boldsymbol{\sigma}_{2,1} = \lambda_1\boldsymbol{\xi}\lambda_2 \quad \text{and} \qquad (4.7)$$

$$COV(y_4,y_3) = \boldsymbol{\sigma}_{4,3} = \lambda_3\boldsymbol{\eta}\lambda_4 \qquad (4.8)$$

If *p* codes each of the individual elements in the indicator matrix, and *m* the individual elements in a factor matrix, $\boldsymbol{\Sigma}_y$ in equation 4.6 represents the model-implied *p*p* covariance matrix of the observed indicators y, $\boldsymbol{\Lambda}$ represents a symmetric *p*p* matrix of loadings (here λ_1-λ_4), $\boldsymbol{\Lambda}'$ the transpose of matrix $\boldsymbol{\Lambda}$ and $\boldsymbol{\Phi}$ represents a symmetric *m*m* factor covariance matrix. $\boldsymbol{\Theta}$ represents a symmetric *p*p* matrix of residuals of indicators y ($\varepsilon_1 - \varepsilon_4$). However, since indicators are measures drawn from a sample S of the population, their variance-covariance matrix $\mathbf{S}_y$ is only an approximation of $\boldsymbol{\Sigma}_y$ (Cudeck and Henly, 1991). The distance between the model-implied covariance matrix $\mathbf{\Sigma}_y$ and the sample-based covariance matrix $\mathbf{S}_y$ is called *discrepancy* $\hat{C}$ (Arbuckle, 2011). CFA models that have a good fit to data minimise $\hat{C}$ such that the difference between the $\mathbf{\Sigma}_y$ and $\mathbf{S}_y$ matrices, typically assessed by the model chi-square value, is not significant.

To test the fit to data of a CFA model, this model must be *identified*. Identification in MACS analyses is achieved when the number of the known elements q in the S matrix exceeds the number of unknown model parameters t that need to be estimated (see, Raykov and Marcoulides, 2006, p. 17-19). Typically, t includes the variances of all independent factors, including all error terms, covariances among independent factors, factor loadings, and structural paths. However, it does not include variances and covariances among dependent or endogenous factors or those parameters that are fixed apriori to a certain value for identification purposes (see below). If only covariance structures are analysed, the number of q is given by

$$q = p\,(p+1)/2 \qquad (4.9)$$

and includes all the nonredundant observed sample variances and covariances (Arbuckle, 2009, p. 34). Means must be identified separately (Brown, 2006). In this case, q is defined as

$$q = [p\,(p+1)/2] + p \qquad (4.10)$$

while t is defined (Brown, 2006) as

$$t = (p*m) + [m(m+1)/2) + p - m^2 \qquad (4.11)$$

with p and m defined as above. In both cases, the difference between q and t defines the *degrees of freedom* (df) and $df = q - t \geq 0$. Fixing certain model parameters to a predetermined value decreases t, thus offering more degrees of freedom. If $df = q - t = 0$, the model is *saturated* (i.e., the elements in the $\mathbf{\Sigma}$ and $\mathbf{S}$ matrices are equal in number) and model fit cannot be calculated. If the df are negative, the model is unidentified and the source of nonidentification must be located. Thus, the smaller the ratio of $\hat{C}$ relative to df (i.e., the lower the obtained model chi-square and the greater the number of available df), the better the overall model fit.

Because latent factors are unobserved constructs, they have unknown measurement scales, means and intercepts. Their scale is identified typically by fixing one of their indicator loadings or the latent factor variance to unity (Brown, 2006). Because error terms in the CFA model are also unobserved constructs, their loadings are also fixed to unity (see Figure 4.2). To identify latent means and intercepts other methods are used that require multigroup analyses (Arbuckle, 2009).

The sample-based matrix **S** has typically more elements than the model-implied **Σ** (θ) matrix representing the unknown population parameters θ. The purpose therefore of the analysis of covariance structures is to find population estimates of the unknown model parameters θ (loadings and variances of independent factors, factor variances and covariances) using the data contained in the **S** matrix. If these estimates closely reproduce the model-implied **Σ**(θ) variance-covariance matrix when fitted to it via equation 4.6, the fit function *F* has achieved *minimisation*. In the ideal case, the discrepancy between **Σ**(θ) and **S** is minimised such that **S** – **Σ**(θ) = 0, or **S** = **Σ**(θ) in which case, the minimum value of the discrepancy $\hat{C}$, becomes zero ($\hat{C} = 0$) with a probability of 1.00. Different estimators exist for minimizing the distance, or discrepancy $\hat{C}$, the most widely applied of which is maximum likelihood (F_{ML}).

Longitudinal autoregressive CFA/SEM models

When a CFA model includes identically-worded repeated measures of observed variables as indicators, the latent constructs represent latent repeated measures. That is, each latent factor represents the same construct at various consecutive measurement points called '*occasions'*. For each occasion there is a CFA model with its own variance-covariance matrix **S**. The assumption that these matrices, $\mathbf{S}_1$, $\mathbf{S}_2$,…,$\mathbf{S}_n$ are invariant can be explicitly tested. Figure 4.2 (b) illustrates a longitudinal autoregressive latent variable SEM with three repeated measures (occasions) representing each construct and an autocorrelated error structure. These models are called 'autoregressive' latent variable SEM, because each occasion-specific latent construct is regressed onto its temporally prior occasion-specific latent construct (see, Bijleveld *et al.*, 1998, p. 234).

The autoregressive SEM of Figure 4.2 (b) above has a measurement model (loadings, error variances, error covariances) and a structural part (structural means, intercepts and paths among latent factors). However, because in this case the first occasion is exogenous, it is symbolised by **ξ** while the second and third occasions are endogenous and are symbolised by $\boldsymbol{\eta}_2$ and $\boldsymbol{\eta}_3$ and have their own disturbance terms *D1* and *D2*. These terms capture all the variance in $\boldsymbol{\eta}_2$ and $\boldsymbol{\eta}_3$ not explained by their prior occasions. The following matrix equations express the relations of the **ξ** and **η** factors to their respective measurement models.

$$y=\boldsymbol{\Lambda}_y\boldsymbol{\eta} + \boldsymbol{\varepsilon} \qquad (4.12)$$

$$x=\boldsymbol{\Lambda}_x\boldsymbol{\xi} + \boldsymbol{\delta} \qquad (4.13)$$

where y and x code the vectors *p* of the indicators of endogenous and exogenous latent constructs and $\boldsymbol{\Lambda}_y$ and $\boldsymbol{\Lambda}_x$ the *p*p* matrices of x and y loadings (λ of **ξ** and λ of **η** in Figure 4.2). If *m* codes the number of endogenous and *n* the number of exogenous factors, $\boldsymbol{\eta}$ represents an $m*m$ and $\boldsymbol{\xi}$ an $n*n$ matrix of the endogenous and exogenous latent factors, while $\boldsymbol{\varepsilon}$ and $\boldsymbol{\delta}$ the $p*p$ matrices of indicator uniquenesses of the $\boldsymbol{\eta}$ and $\boldsymbol{\xi}$ factors. The original specification of a structural equation model was described as 'Linear Structural Relationships' or LISREL and defined algebraically (Jöreskog, 1969; 1993; Jöreskog and Sörbom, 1984) as:

$$\boldsymbol{\eta} = \mathbf{B}\boldsymbol{\eta} + \boldsymbol{\Gamma}\boldsymbol{\xi} + \boldsymbol{\zeta} \qquad (4.14)$$

with $\boldsymbol{\eta}$ and $\boldsymbol{\xi}$ defined as above and $\boldsymbol{\zeta}$ representing unexplained variability (error). $\mathbf{B}$ is an $m*m$ matrix describing the relations among the endogenous latent variables and the $\boldsymbol{\Gamma}$ an $m*n$ matrix representing the relations between any endogenous (*m*) and exogenous (*n*) latent variables. In addition, an $\boldsymbol{\Phi}$ covariance ($n*n$) matrix specifies the covariances among any exogenous $\boldsymbol{\xi}$ and a $\boldsymbol{\Psi}$ covariance ($m*m$) matrix the covariances between any endogenous $\boldsymbol{\eta}$ (see, MacKinnon, 2008, p. 177). Equation 4.14 can be expanded to include the above $\boldsymbol{\Phi}$ and $\boldsymbol{\Psi}$ covariance matrices plus a $\boldsymbol{\Psi}$ covariance matrix for the correlation of error terms. Thus, the sample-based equivalent of the above $\boldsymbol{\Sigma}_y$ population matrix would be:

$$\boldsymbol{\Sigma}_{y} = \boldsymbol{\Lambda}\boldsymbol{\Psi}_{\eta\eta}\boldsymbol{\Lambda}' + \boldsymbol{\Lambda}\boldsymbol{\Phi}_{\xi\xi}\boldsymbol{\Lambda}' + \boldsymbol{\Theta}\boldsymbol{\Psi}_{\eta\xi}\boldsymbol{\Theta}' \qquad (4.15)$$

where $\boldsymbol{\Psi}_{\eta\eta}$ represents covariance of the $m*m$ endogenous factors (the $\mathbf{B}$ matrix), the $\boldsymbol{\Phi}_{\xi\xi}$ represents the covariance of the $n*n$ exogenous factors (the $\boldsymbol{\Gamma}$ matrix) and $\boldsymbol{\Psi}_{\eta\xi}$ the correlation matrix of the indicator errors $\boldsymbol{\Theta}_x$ and $\boldsymbol{\Theta}_y$.

Assumptions tested explicitly in autoregressive models, advantages and limitations

There are clear advantages in using longitudinal autoregressive models. The first advantage is the ability of autoregressive models to test the assumption of autocorrelated errors. If repeated measures do not control for autocorrelated error, estimates of indicator loadings and the overall fit of the model are compromised (Fabrigar *et al.*, 1999). This is because all repeated measures of the same indicator carry some proportion of shared method variance (Cole and Maxwell, 2003) which needs to be extracted from indicator measurement error. In a similar vein, correlated errors between two theoretically related measures both of which are indicators of the same construct (like father's and mother's socioeconomic status) can be specified.

A second major advantage of autoregressive models is that they can test hypotheses about longitudinal invariance explicitly. To compare the three occasions representing repeated measures of the latent construct in Figure 4.2 (b), the latent construct must remain similar across time. If this condition is not met, any interpretation of change among occasions is misleading. It is not certain whether the observed change is due to true change or change due to sampling variability in respondents' perceptions or interpretations, or other reasons (Chan, 1998).

Testing hypotheses of equivalence in the structural part typically proceeds after tests of equivalence of the measurement parts have been completed and the required level of longitudinal invariance achieved. Autoregressive models in MACS analyses offer three important pieces of information as regards the structural model: First, how much each occasion depends on its prior one. A high standardized coefficient between occasions signifies high dependence and less change between occasions. In case of more than two occasions, tests of structural equivalence of the paths connecting occasions can be made. Second, the latent means among consecutive occasions can be compared. This indicates whether average between-individual differences in the first occasion increased or decreased in subsequent occasions. If necessary, differences in latent means across occasions can be directly estimated and their significance assessed under a MACS framework. Contrary to the observed means, latent means are considered unbiased (Millsap, 2011). Third, estimation of latent intercepts in the endogenous constructs suggests how much net change in the subsequent latent construct has resulted from a prior occasion over time if the effect of the prior occasion was zero. A significant positive or negative latent intercept suggests that the net change in the latent means between longitudinally comparable occasions has been significant.

When the MACS analysis involves more than one group, representing different subgroups of the population as is the case here, cross-group measurement invariance needs to be established in addition to longitudinal invariance. Typically, tests of longitudinal measurement invariance precede tests of cross-group measurement invariance but the order can be reversed (Millsap, 2013). The latent constructs must share a minimum level of cross-group measurement invariance so that the structural parts of the models can be compared across groups as defined by the hypothesised moderators. Significant cross-group differences in latent means and intercepts suggest the presence of moderation of these structural parameters by group membership. Cross-group comparisons of structural path estimates are similarly central in this analysis and are supplemented by the cross-group comparisons of means and intercepts. As in the case of latent means and intercepts, statistically significant differences between ethnic groups in structural paths signify moderation by ethnic group membership. Autoregressive models provide therefore equivalent information to latent growth curve models (LGM) in studying trajectories of developmental change but enable more extensive tests for longitudinal and cross-group invariance. Thus, in contrast to LGM, autoregressive models are capable of gauging moderation in both their measurement (indicator loadings, intercepts and errors) and structural (latent means, intercepts and structural paths) models (Byrne, 2010). They are also better suited to guard against bogus moderator effects (Chen, 2008). For the needs of the present analysis targeting moderation by ethnic group membership on longitudinal relationships at the individual level, longitudinal autoregressive latent variable models are therefore ideal.

However, there are also limitations in longitudinal autoregressive models. Although they may provide equivalent information to growth curve models (Brown, 2006), they can explore only between- but not within-individual variation (Duncan, Duncan and Strycker, 2010; Shrout, 2011). Unlike multiple indicator-multiple causes (MIMIC) models, autoregressive models can only indirectly study *differential item functioning* (DIF), an important consideration in scale development (Brown, 2006). Further, autoregressive models are typically individual-level models. They do not control, in other words, for between-cluster variation as is the case with multilevel modelling (MLM). Also, autoregressive models typically assume that indicators are continuous. Although simulation studies have shown that this assumption holds if ordinal-level variables have ≥ 4 categories (Babakus, Ferguson and Jöreskog, 1987; Bentler and Chou, 1987; Byrne, 2010; Muthén and Kaplan, 1985) as is the case in this thesis, autoregressive models typically do not include binary variables. Thus, they do not perform the analysis in an *item response theoretic* (IRT) framework that treats each response as a latent response (Muthén, 1983). Autoregressive latent trajectory models (ALT) are argued for example to be capable of incorporating person-level latent variables to represent individual differences in the level and trajectory of process variables (Bollen and Curran, 2004; Shrout, 2011).

Also, autoregressive models do not model the actual time lag. We do not know what the optimum time lag is according to which, measurements should be spaced apart so that change in a process may be optimally indicated (MacKinnon, 2008). Autoregressive models can only test whether the time dependence paths connecting different occasions are equivalent. This is the stationarity assumption which however does not indicate whether the selected time lag is optimally spaced (Reichhardt, 2011). However, despite their limitations, autoregressive models are powerful tools in modelling change in process variables over time at the individual level (Maxwell, Cole and Mitchell, 2011). They can offer valuable insights provided that tests of the measurement assumptions, easily performed in this methodological framework, precede interpretations of results.

Multilevel latent growth and latent SEM models have been recently developed (Kline, 2011). However, these models concern mostly single CFA or cross-sectional SEM. Similarly, multilevel latent variable mediation models (MSEM) accommodate relatively simple cases of mediation. Recently, Preacher (2011), Pituch (2011) and others before them (see, Krull and MacKinnon, 2001; MacKinnon, 2008; Pituch, Stapleton and Kang, 2006) developed frameworks for multilevel latent variable mediation models. However, none of them has generally addressed multilevel mediation in longitudinal latent variable autoregressive SEM. It is possible to develop designs that repeated measures are clustered under each individual (Kline, 2011, p. 564). But in the interest of parsimony, it is generally difficult to extend these models into multiple-mediator models built from full-fledged multiple-occasion autoregressive models at two levels of analysis. Even if such an extension were possible, multigroup analysis and longitudinal and cross-group invariance tests would have been impossible across two levels simultaneously. Thus, moderator effects in either within- or between-cluster variation would have been difficult to assess.

4.2 The building blocks of model 7: autoregressive models 1-6

Models 1-6 developed for this analysis are described in Table 4.1. The table presents the latent factor names and the LSYPE manifest variables that were used as indicators in each model. Models 1-6 are presented in their *generic* form, with invariance constraints imposed on their measurement model before actual estimation. When the models were actually fitted to each minority sample, their error structure was modified to achieve optimal fit. The estimated models with their final error structures are fully described and discussed in chapters 6 and 7. All models were developed in a 4-step procedure, following the recommendations of Mulaik and Millsap (2000). This procedure involved selection of the original optimal set of indicators for all occasions by means of exploratory factor analysis (EFA) (step 1); specifying a congeneric CFA model with simplex factor structure per occasion, if such specification was supported by the data (step 2); specifying the complete autoregressive CFA model and testing for goodness of fit (step 3) and respecifying the autoregressive CFA model as longitudinal autoregressive SEM (step 4). Step 4 produced baseline

Table 4.1: Operationalization of models 1-7

Name, role in the final model (Exogenous or predictor (P), endogenous or Outcome (O); endogenous or Mediator (Me) and number of occasions in local model (2 or 3)	***LSYPE wave-specific Indicators and derived scales used in models 1-7***	***Actual wording of LSYPE variables that were used as indicators or in scale construction(parcels)***	***Type of variable***	***Type and level of longitudinal factorial invariance achieved***
Model 1 **FAMCIRC1** **FAMCIRC2** (*parental social position and associated level of family material circumstances*, measured at two occasions based on LSYPE wave1 and wave2 repeated measures); Role in final model (7): exogenous	r_W1nsseccatdad r_W2nsseccatdad	Derived variable: father's socioeconomic classification ('What is/was your (main) job?; What do/did you mainly do in your job?; What training or qualifications are/were needed for that job?; Did you have formal responsibility for supervising the work of other employees?', LSYPE waves 1-2	Ordered-categorical [8 categories representing a shortened version of the 17 category NS-SEC (8=higher managerial, 1=never worked/ long-term unemployed)]	Configural (equal form across occasions) Full metric (equal loadings) Full scalar (equal intercepts)
	r_W1nsseccatmum r_W2nsseccatmum	Derived variable: mother's socioeconomic classification, ('What is/was your (main) job?; What do/did you mainly do in your job?; What training or qualifications are/were needed for that job?; Did you have formal responsibility for supervising the work of other employees?' LSYPE waves 1-2	Ordered-categorical [8 categories representing a shortened version of the 17 category NS-SEC (8=higher managerial, 1=never worked/ long-term unemployed)]	
	W1GrssyrHHbands W2GrssyrHHbands	LSYPE-derived variables based on W1 and W2 all-source gross family income, respectively ('What is your basic hourly rate?; and what time period did this cover?; and what your TAKE-HOME pay, that is, AFTER all deductions?'.	Ordered-categorical (8 categories of gross family income ranging from 1 (lowest to 8 (highest)	
	HHdepW1 HHdepW2	Wave1 and wave2 unweighted summative scales including 3 items per wave (drawn from LSYPE wave1 and 2 variables): (a) r_W1condur4MP (r_W2condur4MP) ('Does your household have any of the following items: a telephone' at wave1 (wave2) with 4 categories, 4=Yes, both mobile and landline; 3=Yes, fixed telephone only; 2=Yes, mobile only; 1=No (neither mobile nor fixed) (b) r_W1condur5MP, (r_W2condur5MP) a binary categorical variable ('Does your household have any of the following items in your (part of) accommodation?: a home computer' with 2=Yes, 1=No) (c) r_W1condur6MP, (r_W1condur6MP) a binary categorical variable ('Can you, or other members of your household, get access to the internet either just for email or to browse the Web, from home?') with 2=Yes and 1=No. Cronbach's α, wave1 =0.57 (3 items) Cronbach's α, wave2 =0.58 (3 items)	Ordered-categorical variable (parcel) with values 3=lowest; 8=highest	
Model 2 **PAR1** **PAR2** **PAR3** Representing potential 'home-related' mediator 2 (Me1), operationalising a measure of 'parent - child conflict' based on LSYPE wave1, 2 and 3 repeated measures. Role in final model (7): endogenous	W1parqualMP W2parqualMP W3parqualMP	Parent-reported frequency of arguing with the young person ('Young people often have arguments with their parents about things like young person's friends, their clothes or hairstyle, things they do when they go out or what time they come back. How often would you say you argue with the YP?)	Ordered-categorical variable with four categories originally coded as 4=never and 1=most days. The original coding was retained so that a high value denoted good parent-child relationship.	Configural (equal form across occasions) Full metric (equal loadings) Full scalar (equal intercepts)

	r_W1kiddifMP r_W2kiddifMP r_W3kiddifMP	Parent-reported assessment of quality of relationship with the young person ('All in all, how well or how badly would you say you get on with YP?)	Ordered-categorical variable with four categories, reverse-coded so that a high value denoted good parent-child relationship with 4=very well and 1=very badly.	
Model 3 **HW1** **HW2** Representing potential 'home-related' mediator (Me2), operationalising a measure of pupils' 'engagement with homework' based on LSYPE wave1 and 2 repeated measures. Role in final model (7): endogenous	W1hwndayYP W2hwnday1YP	W1hwndayYP: 'During an average week in term time, on How many evenings do you do any homework? (Please just think about Monday to Friday evenings during term time)' and W2hwnday1YP: 'During term time, how many evenings a week do you do any homework?'	Interval-level variables with 5=five evenings per week and 0=does not do any HW/not assigned homework.	Configural, Partial metric (2/3 loadings invariant) Partial scalar (2/3 intercepts invariant)
	W1hwdoYP W2hwdoYP	Young person-reported frequency of homework set in term time: 'How often are you given HW?' asked at LSYPE wave 1 and 2	Ordered-categorical variables with five categories, reverse-coded so that 5=most days and 1=never assigned any homework	
Model 4 **SCH1** **SCH2** **SCH3** Representing potential 'school-related' mediator 1 (Me3), operationalising a measure of 'young people's feelings about their school' based on LSYPE wave1, 2 and 3 repeated measures. Role in final model (7): endogenous	r_W1yys1YP r_W2yys1YP r_W3yys1YP	Young person-reported agreement with statement: 'Below are some things young people have said about how they feel about school. For each statement below, please say whether or not you agree with it. Please give an answer for each of them: How much do you agree or disagree that: I'm happy when I am at school' asked at LSYPE wave1-3	Ordered-categorical variable with four categories reverse coded so that a high value denoted strong positive feeling about school with 4=strongly agree and 1=strongly disagree	Configural (equal form across occasions) Full metric (equal loadings) Full scalar (equal intercepts)
	W1yys4YP W2yys4YP W3yys4YP	Young person-reported agreement with statement: 'Most of the time I do not want to go to school' asked at LSYPE wave1-3.	Ordered-categorical variable with four categories originally coded as 4=strongly disagree and 1=strongly agree. The original coding was retained so that a high value denoted strong positive feeling about school.	
	r_W1yys6YP r_W2yys6YP r_W3yys6YP	Young person-reported agreement with statement: 'On the whole, I like being at school' asked at LSYPE wave1-3.	Ordered-categorical variable with four categories reverse coded so that a high value denoted strong positive feeling about school with 4=strongly agree and 1=strongly disagree	
	W1yys9YP W2yys9YP W3yys9YP	Young person-reported agreement with statement,: 'I'm bored at lessons' asked at LSYPE wave1-3.	Ordered-categorical variable with four categories originally coded as 4=strongly disagree and 1=strongly agree. The original coding was retained so that a high value denoted strong positive feeling about school.	

Model 5 **TCH1** **TCH2** Representing potential 'school-related' mediator 2 (Me4), operationalising a measure of 'young people's assessments about their teachers' disciplinary effectiveness based on LSYPE wave 1 and 2 repeated measures. Role in final model (7): endogenous	r_W1yys15YP r_W2yys15YP	Young person-reported assessment of the proportion of their teachers who are effective in keeping order and discipline ('Now please answer the next few questions by typing the number which is closest to what you think is true…To how many of your teachers does the following statement apply: The teachers in my school make it clear how we should behave') asked at LSYPE wave1-2.	Ordered-categorical variable with five categories reverse coded so that a high value denoted higher proportions of young person's teachers at school with 5=all of my teachers and 1=none of my teachers	Configural (equal form across occasions) Full metric (equal loadings) Full scalar (equal intercepts)
	r_W1yys16YP r_W2yys16YP	Young person-reported assessment of the proportion of their teachers who are effective in keeping order and discipline ('How many teachers this applies to: The teachers in my school take action when see anyone breaking school rules') asked at LSYPE wave1-2.	Ordered-categorical variable with five categories reverse coded so that a high value denoted higher proportions of young person's teachers at school with 5=all of my teachers and 1=none of my teachers	
	r_W1yys18YP r_W2yys18YP	Young person-reported assessment of the proportion of their teachers who are liked by pupil ('How many teachers this applies to: I like my teachers') asked at LSYPE wave1-2.	Ordered-categorical variable with five categories reverse coded so that a high value denoted higher proportions of young person's teachers at school with 5=all of my teachers and 1=none of my teachers	
	r_W1yys19YP r_W2yys19YP	Young person-reported assessment of the proportion of their teachers who are effective in keeping order and discipline ('How many teachers this applies to: My teachers can keep order in class') asked at LSYPE wave1-2.	Ordered-categorical variable with five categories reverse coded so that a high value denoted higher proportions of young person's teachers at school with 5=all of my teachers and 1=none of my teachers	
Model 6 **YPEX1** **YPEX2** **YPEX3** (Outcome, representing *young people's educational expectations regarding continuing in full-time education (FTE) after year 11 or age 16*, measured at three occasions, based on LSYPE wave1-3 repeated measures. Role in final model (7): endogenous	r_W1heposs9YP r_W2heposs9YP r_W3heposs9YP	Young people's self-reported likelihood to continue in FTE after year 11 ('How likely do you think is it that you will ever apply to go to university to do a degree?' asked at LSYPE waves1-3) r_W1heposs9YP	Ordered-categorical with four categories reverse coded so that 4=very likely, 1=not at all likely.	Configural (equal form across occasions) Full metric (equal loadings) Full scalar (equal intercepts)
	r_W1hlikeYP r_W2hlikeYP r_W3hlikeYP	Young people's self-reported likelihood of being accepted at t he university, if applied ('How likely do you think it is that if you apply to go to university you will get in?' asked at LSYPE waves1-3)	Ordered-categorical with four categories reverse coded so that 4=very likely, 1=not at all likely.	

models for models 1-6 described below which could then be tested for longitudinal and cross-group measurement and structural invariance. These invariance tests are reported in chapter 6.

I necessarily included the names and actual wording of the LSYPE variables involved in each model in this chapter. This might seem a little unorthodox since the data source will be formally presented in chapter 5. However, this transgression was done for two important reasons. The first served the interest of describing models 1-6 as completely as possible. The second was to help the reader identify which variable goes to which model so that their interconnection as integral parts of model 7 can be unambiguous. I therefore believe that this presentation will give a more rounded picture of each model than if the models were presented in a more abstract form leaving the reader to match variables to models after the fuller LSYPE data description in chapter 5. Also, in choosing this order of presentation, I have followed the order of presentation in quantitative journals where the model specification typically precedes description of the sample and data source. Having an unambiguous picture of each model, the reader can then focus on the cross-group comparisons of their observed indicators when the LSYPE data are presented in chapter 5.

Model 1: Parental social position and family material circumstances (level of deprivation) (FAMCIRC, truncated to FAM in certain Tables in chapter 7)

Model 1 (parental social position, FAMCIRC) examines change in parental social position including family material circumstances between pupils' ages 14 to 15. FAMCIRC is the exogenous predictor in the final multiple mediator model (model 7). Table 4.1 above describes the LSYPE variables at wave 1 and 2 that were used as indicators of FAMCIRC1 (occasion 1, age 14) and FAMCIRC2 (occasion 2, age 15). Figure 4.3 illustrates Model 1.

FAMCIRC is defined by father's and mother's NS-SEC status, gross family income for waves 1 (age 14) and 2 (age 15) and a measure of family-level material circumstances (deprivation) at LSYPE wave 1 and 2 which is described below. Father's and mother's NS-SEC status corresponding to wave 1 (age 14) and 2 (age 15) were recoded to arrive at an 8-level father's and mother's socioeconomic classification schema. This classification followed the subcodes and rank order suggested by the original LSYPE coding of father's and mother's NS-SEC consisting of 17 codes for occupations[4]. The variables for gross family income retained their original LSYPE coding

[4] Collapsing the original occupational codes derives 3 NS-SEC schemas (ONS, 2010). The 8-point schema used in this thesis aggregates 'broad social class groupings' (Dex, Ward and Lindley, 2007, p. 6); the 5-point and a 3-point schemas are considered more ordered. However, when the models were run with all three versions of the NS-SEC schemas, there

and ranged from 1= < £5000 to 8 = >£ 50000 per annum (see Table 4.1 or Figure 4.3 for variable labels).

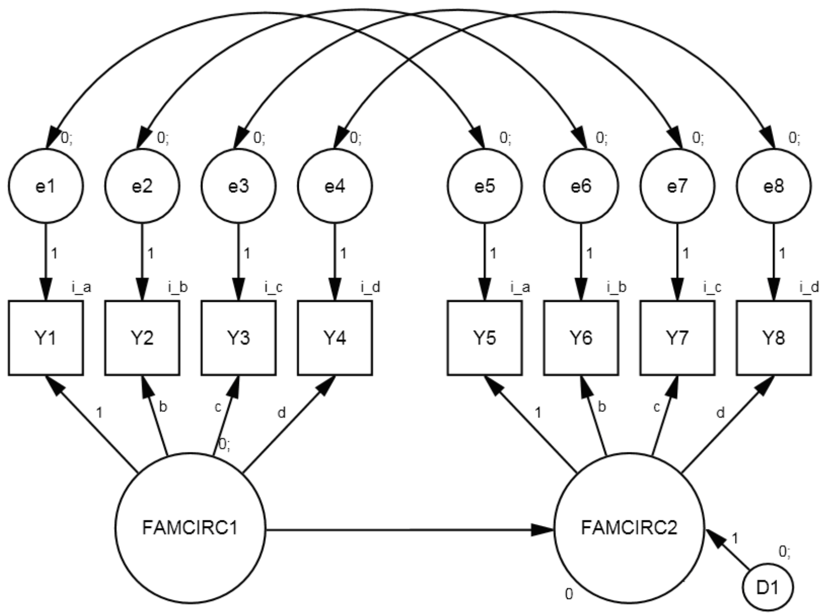

Figure 4.3: The autoregressive model for FAMCIRC (Model 1) with metric and scalar invariance constraints in place.
Legend: Y1, Y5 = r_W1nsseccatdad, r_W2nsseccatdad (father's NS-SEC, LSYPE waves 1-2), Y2, Y6 = r_W1nssecmum, r_W2nssecmum (mother's NS-SEC, LSYPE wave 1-2), Y3, Y7 = HHdepW1, HHdepW2 (family level deprivation (material circumstances) score, LSYPE waves 1-2), Y4, Y8 = W1GrssyrHHbands, W2GrssyrHHbands (gross family income, LSYPE waves 1-2)

The measure for family level material circumstances (deprivation) was an unweighted summative scale derived from the following three LSYPE wave 1 and wave 2 variables: (a) '*Does your household have any of the following items: a telephone'*, a categorical variable with 4 categories, 4=Yes, both mobile and landline; 3=Yes, fixed telephone only; 2=Yes, mobile only; 1=No (neither mobile nor fixed). (b) '*Does your household have any of the following items in your (part of) accommodation?*': 'a home computer', a binary categorical variable with two categories (2=Yes, 1=No). (c) '*Can you, or other members of your household, get access to the internet either just for email or to browse the Web, from home?*', a binary categorical variable with two categories (2=Yes and 1=No).

were no significant differences in either the loadings of the FAMCIRC construct or the structural estimates of the multigroup solution of model 7. This suggests that the models were robust to the three different versions of the NS-SEC scales.

The order of the four categories of the variables (a) and (b) above was confirmed by regressing the W2 Index of Multiple Deprivation (LSYPE wave 2 *IMD score*) on the categories of the variables by means of two logistic regressions. The z-score distribution of the LSYPE wave 2 Index of Multiple Deprivation (IMD) coded as 1 (including all the IMD scores above the mean ranging from 0.00 to +3.00SD) and 0 (including all the IMD scores below the mean, ranging from -3.00SD to 0.00 = 0) was the dependent variable in both regressions. The derived odd ratios were contrasted to the reference category (highest, coded '4' in the original variable = having both fixed and mobile phones). The analysis indicated a ranking of the differential propensity of each category of the above variables at age 14 to be associated with above the average IMD scores at age 15. Unsurprisingly, the category coded 1 (lowest) was more likely to be associated with below the average IMD scores, while the category coded 3 was more likely to be associated with above the average IMD scores as compared to the reference category (category 4). Categories 1-4 of the variables could therefore be construed as reflecting an underlying dimension of family-level material circumstances (deprivation), with 1 signifying the worst material circumstances (highest deprivation) and 4 the best (lowest deprivation).

With the three items combined, the additive scales *HHdepW1* (wave 1, age 14) and *HHdepW2* (wave 2, age 15) ranged from 3=lowest to 8=highest. The reliability of the scale with only 3 items, was acceptable at wave 1 (Cronbach's $\alpha = 0.607$ for *HHdepW1*) and marginally acceptable at wave 2 (Cronbach's $\alpha = 0.589$ for *HHdepW2*). All the indicators of FAMCIRC were treated as continuous based on simulation studies that suggested that an ordinal variable can be treated as continuous provided it had ≥ 5 categories (Babakus, Ferguson and Jöreskog, 1987; Bentler and Chou, 1987; Byrne, 2010). Full description of the variables entering the two occasions of the FAMCIRC model per each minority group will be shown in chapter 5.

Model 2: Parental-child conflict (PAR)

Model 2 (parent-child conflict, PAR) estimates change in parental-child conflict between pupils' ages 14 to 16. PAR is a potential mediator in the final mediator model (model 7). The LSYPE wave 1, 2 and 3 variables used as indicators of PAR1 (age 14), PAR2 (age 15) and PAR3 (age 16) are discussed below. Figure 4.4 presents Model 2.

Model 2 includes (a) mother's frequency of arguing with young person at ages 14, 15 and 16; (b) mother's assessments of how bad her relationship with the young person was at ages 14, 15 and 16 (see Table 4.1 or Figure 4.4 for variable labels). Both variables are ordered-categorical with four categories originally coded as 4=never and 1=most days as a Likert scale. The original coding was retained so that a high value denoted low-parent child conflict. The variables were treated as continuous. Full description of these variables can be found in chapter 5.

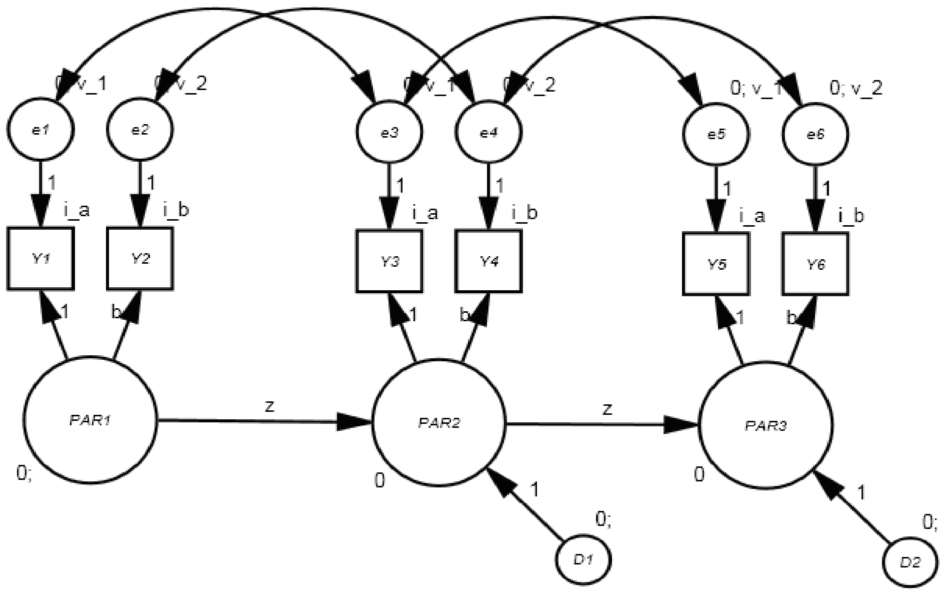

Figure 4.4: The autoregressive model for PAR (Model 2) with metric, scalar and theta invariance constraints in place.
Legend: Y1, Y3, Y5 = r_W1parqualMP, W2parqualMP and W3parqualMP (mother's frequency of arguing with young person, LSYPE waves 1-3), Y2, Y4, Y6 = r_W1kiddifMP, r_W2kiddifMP and r_W3kiddifMP (mothers' assessment of how bad relationship is with young person, LSYPE waves 1-3).

Model 3 Pupils' engagement with homework (HW)

Model 3 (pupils' engagement with homework, HW) examines change in young people's engagement with homework between ages 14 to 15. The LSYPE did not include these measures at wave 3. Along with parent-child conflict (PAR), engagement with homework is a potential mediator representing influences of the home context. Figure 4.5 shows Model 3 (HW).

Model 3 captures two dimensions of homework available in the LSYPE: (a) time spent on homework (in number of weekday evenings spent on homework) by the pupil during a typical term time week at ages 14 and 15, an interval-level variable; (b) amount of homework set, expressed by the pupil as the frequency homework was assigned during term time, ranging from 1 = 'never assigned homework' to 5 = 'most days', at ages 14 and 15, an ordered-categorical variable (see

Table 4.1 or Figure 4.5 for variable labels). Because the autoregressive model for HW has only two occasions and two indicators per occasion, further constraints had to be imposed to identify the measurement model with positive degrees of freedom (i.e., to decrease *t*, equation 4.11). The

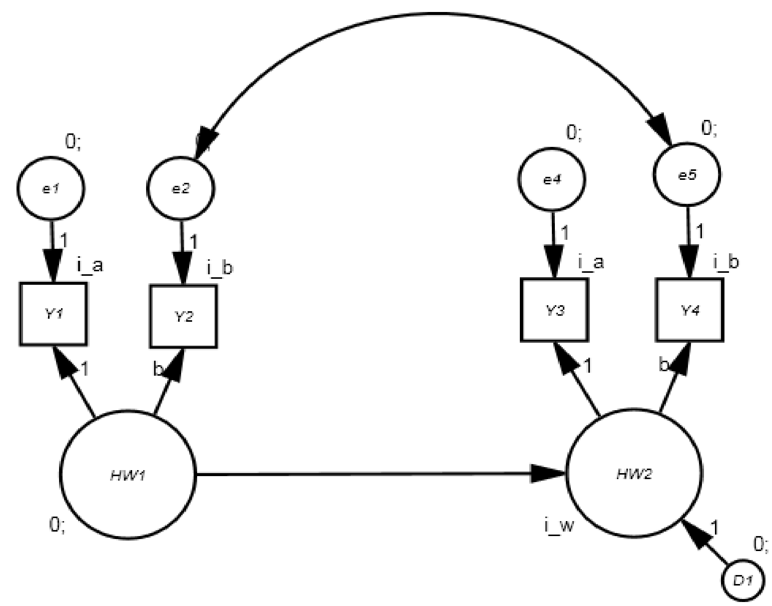

Figure 4.5: The autoregressive model for HW (Model 3) with metric and scalar invariance constraints in place.

Legend: Y1, Y3 = *W1hwndayYP*, *W2hwnday1YP* (pupil-reported number of evenings spent on homework, LSYPE waves 1-2), Y2, Y4 = *W1hwdoYP*, *W2hwdoYP* (pupil-reported frequency homework was assigned during term week, LSYPE waves 1-2).

invariance constraints imposed on the indicator loadings and intercepts produced extra degrees of freedom and the model was identified (Arbuckle, 2009). These constraints are illustrated in Figure 4.5. However, because indicator errors were freely estimated, the measurement model allowed the free estimation of only a single error covariance.

Model 4 Pupils' feelings about school (school affect, SCH)

Model 4 (pupils' feelings about school, SCH) operationalised pupils' feelings about their school. SCH is a potential mediator in the final model. Figure 4.6 shows model 4. Based on the result of prior EFA, the model used four LSYPE items out of possible 14 that loaded consistently the highest on the latent construct SCH at ages 14, 15 and 16. The items reported pupils' agreement with the following statements : (a) '*I'm happy when I am at school*' (b) '*Most of the time I do not want to go to school*'; (c) '*On the whole, I like being at school*'; (d) '*I'm bored at lessons*' (see Table 4.1 for variable labels). All items were ordered-categorical variables ranging from 1=strongly agree to 4=

strongly disagree. The positively-worded items were recoded so that a high value reflected high positive feelings for school. The negatively-worded items were not recoded. All variables were

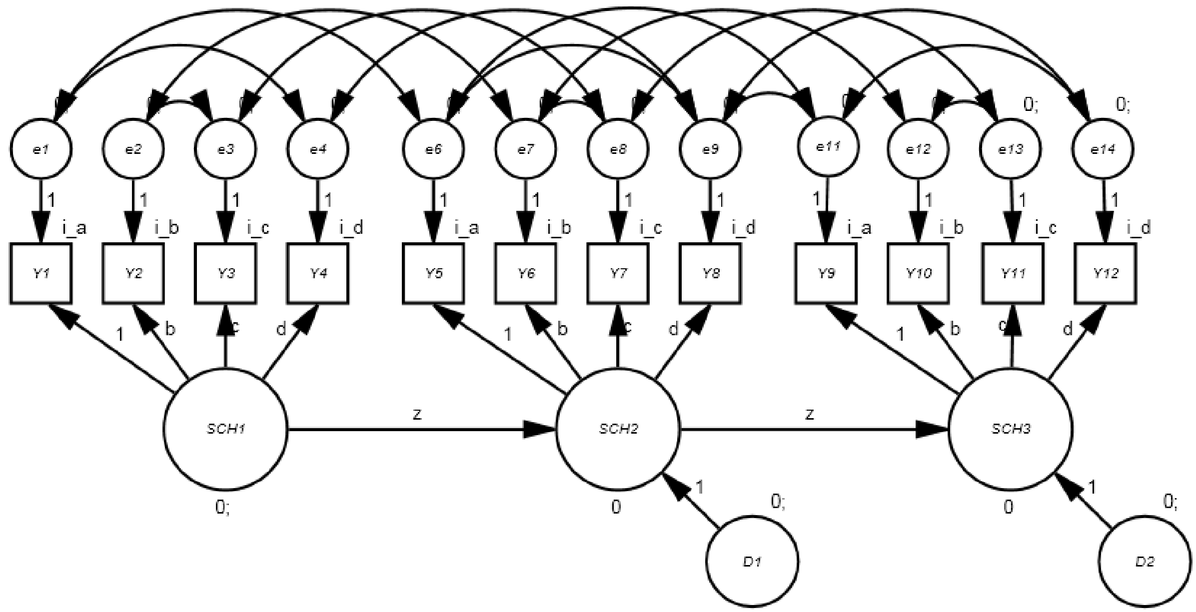

Figure 4.6: The autoregressive model for SCH (Model 4) with metric and scalar invariance constraints in place.

Legend: Y1, Y5, Y9 = *r_W1yys1YP*, *r_W2yys1YP* and *r_W3yys1YP*, LSYPE waves 1-3), Y2, Y6, Y10 = *W1yys4YP*, *W2yys4YP* and *W3yys4YP*, LSYPE waves 1-3), Y3, Y7, Y11 = *r_W1yys6YP*, *r_W2yys6YP* and *r_W3yys6YP*, LSYPE waves 1-3), Y4, Y8, Y12 = *W1yys9YP*, *W2yys9YP*, and *W3yys9YP*, LSYPE wave 1-3).

treated as continuous, for the reasons explained above. Full descriptives for these variables by minority group are found in chapter 5.

Model 5 Pupils' assessments of teachers' effectiveness (TCH)

Model 5 (Pupils' assessments of teachers' effectiveness, TCH) examines the change in pupils' assessments of their teachers' effectiveness in enforcing and maintaining discipline in class. Together with pupils' feelings about school (SCH), model 5 (TCH) represents aspects of the school context. Provided it satisfies invariance requirements, it will be included in the final model as a potential mediator as well. Figure 4.7 illustrates model 5.

Based on prior EFA, model 5 used four out of a possible 12 items available in the LSYPE which tapped pupils' assessments of their teachers and for which there were repeated measures for waves 1 and 2 but not wave 3. The four items had consistently the highest loadings on the latent construct TCH in waves 1 and 2. The four items reported pupils' assessments at ages 14 and 15 to 'how many teachers the following four statements applied to': (a) '*The teachers in my school make it clear how we should behave*'; (b) '*The teachers in my school take action when see anyone breaking school*

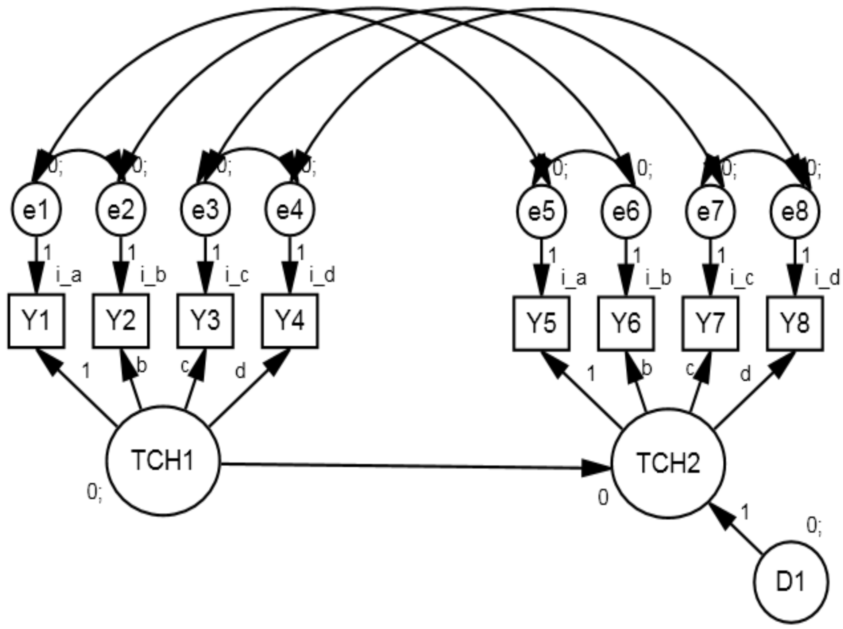

Figure 4.7: The autoregressive model for TCH (Model 5) with metric, scalar and theta invariance constraints in place.
Legend: Y1, Y5 = *r_W1yys15YP*, *r_W2yys15YP*, LSYPE waves 1-2), Y2, Y6 = *W1yys16YP*, *W2yys16YP*, LSYPE waves 1-2), Y3, Y7 = *r_W1yys18YP, r_W2yys18YP*, LSYPE waves 1-2), Y4, Y8 = *W1yys19YP*, *W2yys19YP*, LSYPE wave 1-2).

rules'; (c) '*I like my teachers*'; (d) '*My teachers can keep order in class*' (see Table 4.1 or Figure 4.7 for variable labels). All variables were ordered-categorical items with five categories coded 1 = 'All of my teachers' to 5 = 'none of my teachers'. Thus, pupils' responses tapped their ideas about the characteristics of their teachers on discipline issues taken as a group. All eight items were recoded so that a high value indicated greater proportions of teachers being effective in enforcing discipline. For the reasons explained above, all eight items were treated as continuous variables. Fuller description of these variables can be found in chapter 5.

Model 6 Young people's educational expectations for university study (YPEX)

Model 6 (young people's educational expectations for university study, YPEX) examines changes in young people's educational expectations regarding their future university option between ages 14 to 16. It is a key variable in model 7 both as a dependent variable and the target developmental outcome in this study. Figure 4.8 illustrates the autoregressive model for YPEX.

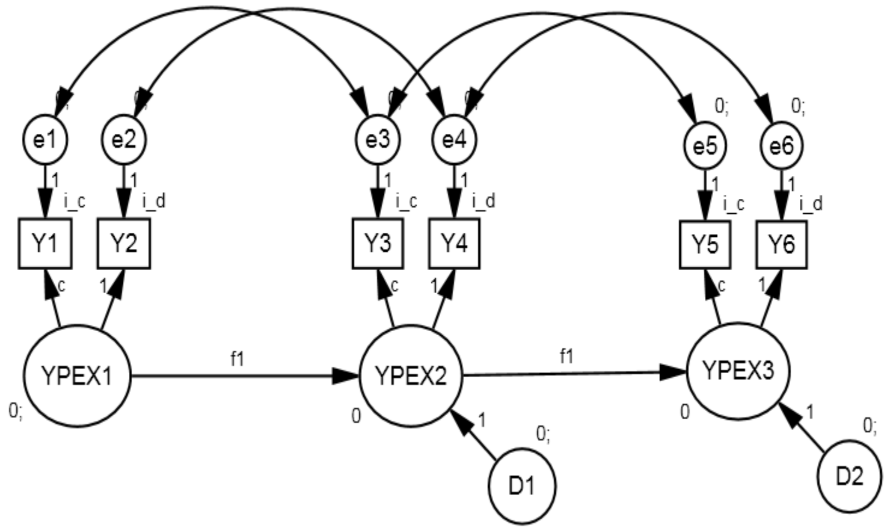

Figure 4.8: The autoregressive model for YPEX (Model 6) with metric and scalar invariance constraints in place.
Legend: Y1, Y3, Y5 _*W1heposs9YP*, *r_W2heposs9YP* and *r_W3heposs9YP*, LSYPE waves 1-3), Y2, Y4, Y6 = *r_W1hlikeYP*, *r_W2hlikeYP* and *r_W3hlikeYP*, LSYPE waves 1-3).

The latent construct YPEX captures two dimensions regarding young people's expectations about their higher education option at ages 14, 15 and 16: (a) their self-reported likelihood to apply to university after 16 and (b) their self-reported likelihood that they will be accepted to university if they apply. Their responses therefore were much more likely to reflect their realistic expectations rather than idealistic aspirations. The actual questions young people were asked at LSYPE waves 1-3 were: (a) '*How likely do you think is it that you will ever apply to go to university to do a degree?*'; (b) '*How likely do you think is it that if you apply to go to university you will get in?*' All six items were ordered-categorical variables with four categories ranging from 1 = 'very likely' to 4 = 'not at all likely'. Question (b) was nested within question (a) in that pupils who answered 'not at all likely' in question (a) were not asked question (b). Thus, question (b) coded those pupils as missing values. Further, question (b) included a 'don't know' category which the LSYPE treated as missing (-1). For question (b) this could be considered a fifth category representing the 'undecided'. Yet, including this item in the 4-point scale would be problematic. While all other variables in models 1-6 ranged from a low to a high value, with high representing the most 'positive' response or trait, inserting a middle category in question (b) would create a 5-point variable with two high points, one positive and one negative with the middle point representing zero (-2, -1, 0, +1, +2). Because this variable would be coded as 'bipolar' (having two diametrically-opposed endpoints) rather than a single range, it would attenuate the cross-sectional and longitudinal intercorrelations between questions (a) and (b). Theoretically, a bipolar variable would also be difficult to interpret. A high score in the positive dimension would signify a low score on the negative and vice versa. But the value of the middle point would be theoretically indeterminate (see Masten, 2001 on a similar discussion about resilience). As a result, I retained the 4-point structure in both questions (a) and (b) recoding all six items in model 6 so that a high value represented higher likelihoods. All six variables in YPEX are also treated as continuous.

4.3 Model 7: combining models 1-6 to assess the role of multiple mediators on pupils' expectations

Model 7 is a *multiple mediator longitudinal autoregressive model* combining models 1-6 described above. It is illustrated in Figure 4.9 and summarised in Table 4.2 below.

Typically in this tradition of multiple-occasion, multiple mediator autoregressive latent SEM, the hypothesised predictor is specified as the top horizontal line of occasions (model 1), while the outcome as the bottom horizontal line of occasions (model 6). Mediators (models 2-5) occupy the middle space and their occasions extend over the available waves of data (see, Cole and Maxwell, 2003; Maxwell and Cole, 2007; Maxwell, Cole and Mitchell, 2011). Rightmost occasions of mediators are never the primary outcomes of interest. Rather, they are important only in testing assumptions about longitudinal and structural equivalence, such as the equivalence of feedback paths f3 and f32, (see lower part of Figure 4.9). Further, because rightmost occasions represent endogenous latent constructs, they cannot be linked by factor covariances. Covariances can be specified only among their disturbance terms (see for example, Hakanen, Schaufeli and Ahola, 2008). I specified these covariances only if there was strong indication of improvement of model fit based on the Lagrange modifier (see, below) or in the case of strong theoretical reasons. Thus, all oblique paths denote longitudinal relations to be tested for significance, longitudinal and cross-group equivalence (invariance). All horizontal paths denote time dependencies between occasions. By combining models 1-6, model 7 allows exploration of multiple routes of influence to adolescents' educational expectations. For simplicity, I present only the structural part of the model here, given that the measurement parts of all of the building blocks of model 7 were already shown and discussed in section 4.2.

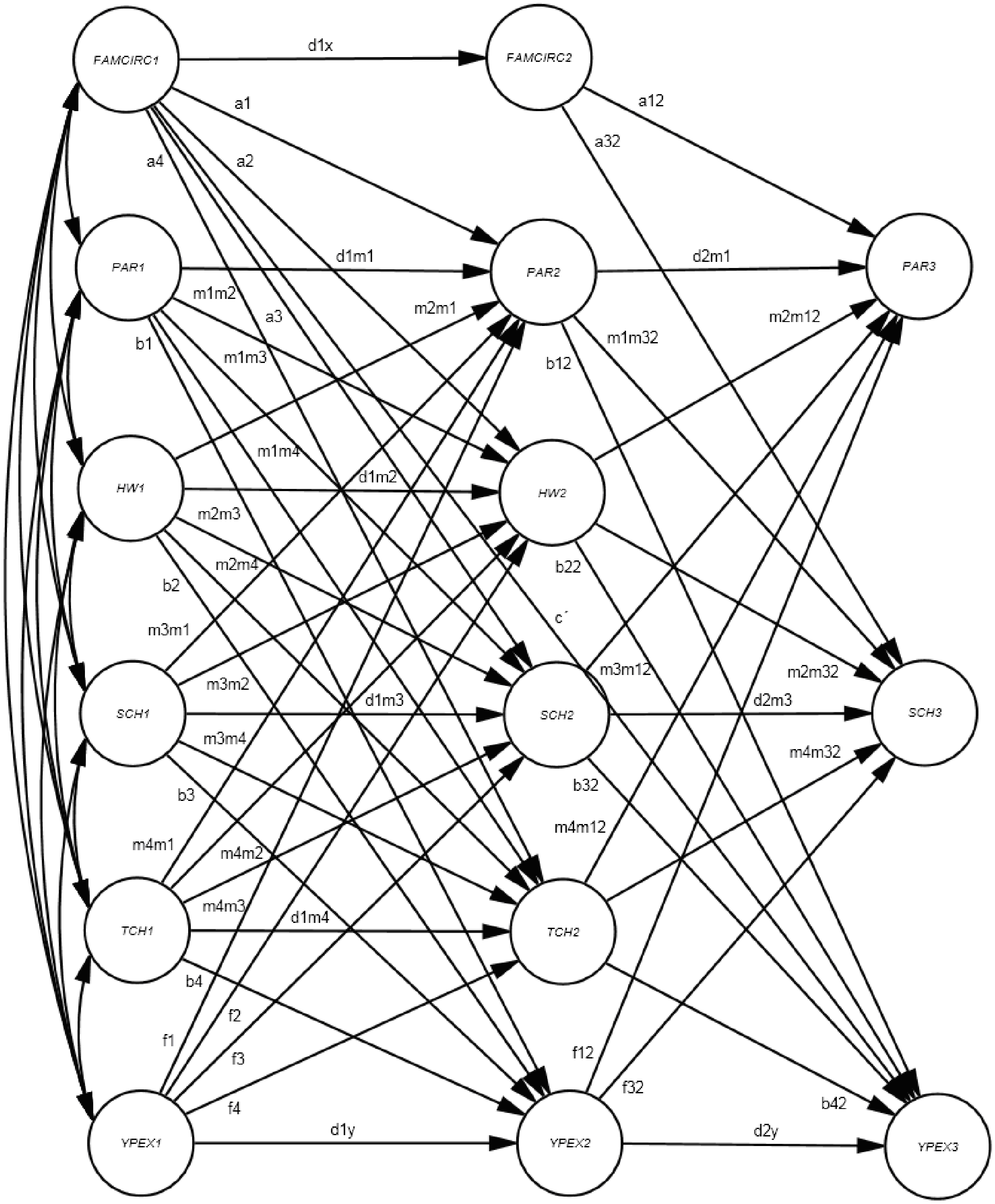

Figure 4.9: The final model 7 (showing only the structural model and hypothesised structural relations)

Table 4.2 Type, name and description of each structural path in model 7

Structural paths		type of structural effect[1]	name in model	description
from	to			
FAMCIRC1	FAMCIRC2	time dependence	d1x	shows how much occasion 2 of FAMCIRC depends on occasion 1
FAMCIRC1	PAR2	*a* effect	a1	shows influence of the predictor at age 14 on mediator 1 at age 15
FAMCIRC1	HW2	*a* effect	a2	shows influence of the predictor at age 14 on mediator 2 at age 15
FAMCIRC1	SCH2	*a* effect	a3	shows influence of the predictor at age 14 on mediator 3 at age 15
FAMCIRC1	TCH2	*a* effect	a4	shows influence of the predictor at age 14 on mediator 4 at age 15
FAMCIRC2	PAR3	*a* effect, 2nd time lag	a12	shows influence of the predictor at age 15 on mediator 1 at age 16
FAMCIRC2	SCH3	*a* effect, 2nd time lag	a32	shows influence of the predictor at age 15 on mediator 3 at age 16
PAR1	PAR2	time dependence	d1m1	shows how much occasion 2 of PAR (15) depends on occasion 1 (14)
PAR2	PAR3	time dependence	d2m1	shows how much occasion 3 of PAR (16) depends on occasion 2 (15)
PAR1	HW2	cross-lag	m1m2	shows influence of PAR1 at age 14 on HW2 at age 15
PAR1	SCH2	cross-lag	m1m3	shows influence of PAR1 at age 14 on SCH2 at age 15
PAR1	TCH2	cross-lag	m1m4	shows influence of PAR1 at age 14 on TCH2 at age 15
PAR2	SCH3	cross-lag	m1m32	shows influence of PAR2 at age 15 on SCH3 at age 16
PAR1	YPEX2	*b* effect	b1	Shows influence of PAR1 at age 15 on YPEX2 at age 15
PAR2	YPEX3	*b* effect, 2nd time lag	b12	Shows influence of PAR2 at age 15 on YPEX3 at age 16
HW1	PAR2	cross-lag	m2m1	shows influence of HW1 at age 14 on PAR2 at age 15
HW1	HW2	time dependence	d1m2	shows how much occasion 2 of HW (15) depends on occasion 1 (14)
HW1	SCH2	cross-lag	m2m3	shows influence of HW1 at age 14 on SCH2 at age 15
HW1	TCH2	cross-lag	m2m4	shows influence of HW1 at age 14 on TCH2 at age 15
HW1	YPEX2	*b* effect	b2	shows influence of HW1 at age 14 on YPEX2 at age 15
HW2	PAR3	cross-lag	m2m12	shows influence of HW2 at age 15 on PAR3 at age 16
HW2	SCH3	cross-lag	m2m32	shows influence of HW2 at age 15 on PAR3 at age 16
HW2	YPEX3	*b* effect, 2nd time lag	b22	shows influence of HW2 at age 15 on YPEX3 at age 16
SCH1	PAR2	cross-lag	m3m1	shows influence of SCH1 at age 14 on PAR2 at age 15
SCH1	HW2	cross-lag	m3m2	shows influence of SCH1 at age 14 on HW2 at age 15
SCH1	SCH2	time dependence	d1m3	shows how much occasion 2 of SCH (15) depends on occasion 1 (14)
SCH2	SCH3	time dependence	d2m3	shows how much occasion 3 of SCH (16) depends on occasion 2 (15)
SCH1	TCH2	cross-lag	m3m4	shows influence of SCH1 at age 14 on TCH2 at age 15
SCH1	YPEX2	*b* effect	b3	shows influence of SCH1 at age 14 on YPEX2 at age 16
TCH1	PAR2	cross-lag	m4m1	shows influence of TCH1 at age 14 on PAR2 at age 15
TCH1	HW2	cross-lag	m4m2	shows influence of TCH1 at age 14 on HW2 at age 15
TCH1	SCH2	cross-lag	m4m3	shows influence of TCH1 at age 14 on SCH2 at age 15
TCH1	TCH2	time dependence	d1m4	shows how much occasion 2 of TCH (15) depends on occasion 1 (14)
TCH1	YPEX2	*b* effect	b4	shows influence of TCH1 at age 14 on YPEX2 at age 15
TCH2	YPEX3	*b* effect, 2nd time lag	b42	shows influence of TCH2 at age 15 on YPEX3 at age 16
TCH2	SCH3	cross-lag	m4m32	shows influence of TCH2 at age 15 on SCH3 at age 16
TCH2	PAR3	cross-lag	m4m12	shows influence of TCH2 at age 15 on PAR3 at age 16
YPEX1	PAR1	feedback	f1	shows feedback of YPEX1 at age 14 on PAR3 at age 16
YPEX1	HW2	feedback	f2	shows feedback of YPEX1 at age 14 on HW2 at age 15
YPEX1	SCH2	feedback	f3	shows feedback of YPEX1 at age 14 on SCH2 at age 15
YPEX1	TCH2	feedback	f4	shows feedback of YPEX1 at age 14 on TCH2 at age 15
YPEX2	PAR3	feedback	f12	shows feedback of YPEX2 at age 15 on PAR3 at age 16
YPEX2	SCH3	feedback	f32	shows feedback of YPEX2 at age 15 on SCH3 at age 16
YPEX1	YPEX2	time dependence	d1y	shows how much occasion 2 of YPEX (15) depends on occasion 1 (14)
YPEX2	YPEX3	time dependence	d2y	shows how much occasion 3 of YPEX (16) depends on occasion 2 (15)
FAMCIRC1	YPEX3	*c'* effect	c'	shows the direct effect of the predictor at age 14 on YPEX 3 at age 16 adjusted for all the prior occasions of all mediators at ages 14 and 15

[1]: see text (sections 4.2-4.3) for explanation of the *a*, *b* and *c´* effects.

Following Cole and Maxwell's (2003) specification, there is no direct path from the predictor at age 14 (FAMCIRC1) to the outcome at age 15 (YPEX2) or from the predictor at age 15 to the outcome at age 16. Theoretically, this path assumes no mediation (Maxwell, Cole and Mitchell, 2011). It is typically not specified, even in the case of only two-wave data (see, Little *et al.*, 2007, p. 362). The absence of this direct path is justified under the assumption that the effect of the predictor on the outcome at wave 2 or at wave 3 is mediated longitudinally by the mediator(s) on the outcome between waves 1 and 2 and between waves 2 and 3, respectively. Any residual correlation between mediators is picked up by their cross-sectional covariances at wave 1 and the covariances of their disturbance terms at wave 2 and 3 if the Lagrange modifier suggested that that covariance should be specified. I have checked the plausibility of this assumption and found out that this direct path was positive but of very small magnitude and insignificant in most cases.

The specification of model 7 was guided by ecological systems theory. The model explicitly tests hypotheses regarding the potential relationships between the hypothesized aspects of the home (parent-child conflict and pupils' engagement with homework) and school (pupils' feelings about school and assessments about teachers' effectiveness) microsystems. The hypothesised home- and school-related processes at age 15 may potentially exert three types of mediation of background influences at pupils' age 14 on their educational expectations at age 16. They may mediate (a) the influence of parental social position; (b) their own earlier influences; and (c) the feedback of pupils' earlier expectations. All three types of mediation imply the presence of direct and indirect effects, both of which are formally defined below. Both types of effects comprise potential longitudinal relationships (*structural effects*) and are explicitly tested in Model 7.

Model 7 further permits testing the hypothesis that each of these relations is moderated by maternal ethnicity. This is achieved by fitting the same model across the white, Indian, Pakistani, Bangladeshi and Black Caribbean groups of mothers and young people in multigroup analysis, under the proviso of course that tests of cross-group factorial invariance will support such comparisons. The advantages and measurement assumptions associated with model 7 are discussed below. I deal first with the assumptions in testing for mediation effects followed by the assumptions in testing for moderation effects.

4.4. Assessing the case for the presence of mediation and moderation

Measurement assumptions in testing for mediation effects

Mediation lies at the heart of investigating any relationship between two variables. Typically, researchers probe this association for a third variable that explains this relationship, i.e., a variable which is affected by the antecedent variable and which then affects the outcome. Thus, mediation is one way of explaining a causal mechanism by which the antecedent variable affects the outcome (MacKinnon, Fairchild and Fritz, 2007).

However, although conceptually mediation is easily defined, in practice it is much harder to show. According to Baron and Kenny's (1986) *causal steps* approach, mediation is demonstrated in the decrease of a previously established association between and an X and a Y variable when a third variable M is statistically controlled for. This is interpreted as showing that X exerts an *indirect* influence on Y via M. According to this approach, four conditions are required for mediation to be shown. First, a *direct* effect of X on Y (symbolised by c) must be of considerable magnitude and statistically significant[5]. Second, X must also directly affect the potential mediator M significantly (symbolised by a), either positively or negatively. Third, the mediator M must also directly affect the outcome (symbolised by b) either positively or negatively (although the expected direction of both a and b effects must be theoretically supported). Mediation is demonstrated if the relationship between X and Y becomes insignificant when adjusted for M (symbolised by c'). Thus, the fourth condition is that $c > c'$ (Kenny, 2013). This situation suggests complete mediation of the effect of X on Y via M and the presence of a significant indirect effect of the predictor on the outcome. However, if the indirect effect is small but remains statistically significant, it suggests that mediation of the effect of X on Y via M was incomplete and that therefore mediation is partial. Partial rather complete mediation is considered much more realistic in the social sciences (MacKinnon *et al.*, 2002). Mathematically, such an indirect effect is the product of a and b, ab (Alwin and Hauser, 1975). Since ab is conceptually equivalent to the difference of c' from c, the fundamental equation for mediation (under the assumptions of the OLS estimation, see MacKinnon, Warsi and Dwyer, 1995) is:

$$M = ab = c - c' \qquad (4.16)$$

The other three conditions for mediation are expressed in the following three equations which produce estimates for a, b, c and c':

$$Y = i_1 + cX + e_1 \qquad (4.17)$$

$$M = i_2 + aX + e_2 \text{ and} \qquad (4.18)$$

$$Y = i_3 + c'X + bM + e_3 \qquad (4.19)$$

[5] If a mediator is absent, then this direct effect also represents the *total* effect of X on Y. With a mediator specified, the total effect of X on Y is the sum of the direct effect of X on Y and the indirect effect of X on Y via the mediator.

This approach implies that if either *a*, *b* or *c* are weak or insignificant before testing for mediation, further tests for mediation become unnecessary (Baron and Kenny, 1986, p 1177). The same is the case if the $c > c'$ inequality does not hold after testing for mediation.

These assumptions however were seriously questioned in more recent methodological work on mediation. The prerequisite of this approach that X and Y should be significantly associated apriori severely reduces its power to detect mediation. There are many cases in social sciences where mediation exists but a significant relation of X to Y is not obtained (MacKinnon, Fairchild and Fritz, 2007). Edwards and Lambert-Schurer (2007) showed that the presence of a significant total effect (direct plus indirect) of the predictor on the outcome is neither a sufficient nor necessary condition to test for mediation. Hayes (2009) showed that mediation could exist even if *c* in equation 4.17 was insignificant before testing for mediation. This could happen if both *a* and *b* effects were significant but of opposite signs.

Further, complete mediation which is implied by the above causal steps approach is rare in social sciences. Thus, c' could remain statistically significant even after adjusting for M. This is a plausible outcome when psychological behaviours with many probable causes are tested (Judd and Kenny, 1981). This more realistic possibility of *partial* mediation by M was recognised early on (Baron and Kenny, 1986, p 1176). But this recognition begged the question of just how much reduction in *c* would be considered ‘adequate’ for showing mediation. Thus, the *effect size* and significance of the indirect effect implied in the process of mediation was not clear. The Baron and Kenny (1986) approach was the least powerful in identifying if such an effect existed (Hayes, 2009; MacKinnon *et al.*, 2002). The indirect effect was largely *inferred* from the steps reflected by equations 4.17 - 4.19 but it was not quantified (Hayes, 2009; Preacher and Kelley, 2011). A first measure of the indirect effect size can be given by the proportion of mediated effect, which is calculated using the partial correlations *a* and *b* which are acceptable effect size measures. The proportion mediated is given by (MacKinnon, 2008):

$$M = \left(\frac{c'}{c}\right) = \frac{ab}{(ab + c)} \qquad (4.20)$$

while the most widely used formula to calculate the standard error (SE) of the *ab* is (Sobel, 1982):

$$SE_{ab} = \sqrt{b^2 sa^2 + a^2 sb^2} \qquad (4.21)$$

where *s* stands for the standard error of *a* and *b*.

However, there are problems with the assumptions of both equations 4.20 and 4.21. The actual values of the proportion of the effect mediated are usually very small (MacKinnon, Fairchild and Fritz, 2007), can be greater than one or have a negative sign (Hayes, 2009). MacKinnon (1995) reported that the proportion is unstable for sample sizes < 500 and calculation of confidence intervals was uninformative because they were excessively wide (Preacher and Kelley, 2011). The latter authors suggested alternative measures for effect size, none of which included the above proportion. Similarly, Sobel's (1982) formula for the standard error of the *ab* effect assumes that such an effect is normally distributed, which is almost never the case (Little *et al.*, 2007). Further, when multiple mediators enter the model, the distribution of the *total indirect effect* (i.e., the sum of all indirect effects) is unknown. More importantly, the SE for the total indirect effect is not the simple sum of the SE for each separate indirect effect (Cole and Maxwell, 2003). Therefore Sobel's (1982) formula cannot be used in this instance. In fact, there is no known formula for the SE of the total indirect effect (Cole and Maxwell, 2003, p 572; Maxwell, 2013a). In such cases of indirect effects from multiple mediators, only the standardized total indirect effect suggests an acceptable estimate of the effect size of the indirect effect (Preacher and Kelley, 2011). In SEM, the hypotheses that a=0, or b=0 or ab=0 can be tested directly by means of standard nested model testing (using the chi-square difference test). However, these are partial tests of individual indirect effects. They are not tests of the total indirect effect which reflects the sum of all indirect effects (see, Cole and Maxwell, 2003, p. 572).

An interesting recent approach to estimate the significance of *specific* indirect effects (components of the total indirect effect) involved *phantom* latent variables in a latent variable SEM (Macho and Ledermann, 2011). Phantom variables add extra sets of causal paths involving indirect effects that are constrained to equality to existing causal routes of interest in the SEM. The software is thus 'tricked' into estimating a specific indirect as a total indirect effect which then can be bootstrapped. The problem with this approach is that it cannot estimate standardised specific indirect effects. The second problem is that typically, specific indirect effects have very small effect sizes to be of *practical* significance (Preacher and Kelley, 2011). Much more interesting is the significance of their algebraic sum because it represents effect sizes of total indirect influences. Macho and Lederman's (2011) method will be used in the present analysis provided that a specific indirect effect is of considerable effect size to justify the added modelling and bootstrapping required. In interpreting indirect effects, I have primarily relied on the bootstrapped significance for the total indirect effect.

Bootstrapping (Bollen and Long, 1993; Efron, 1982; Shrout and Bolger, 2002) is the recommended method of attaching significance to the indirect effect which will be applied in the analysis that follows. Bootstrapping requires no assumptions regarding the distribution of the indirect effect (Hayes, 2009). Bias-corrected bootstrapped SE for the *a* and *b* effect can be easily provided and in most cases are preferable to the asymptotic ones (Moustaki, 2013a). Thus, the total indirect effect can be assessed on the basis of the bootstrapped *a* and *b* estimates and compared to the ML-based estimate. Bias-corrected SE have been found to perform very well in terms of Type I error rates and statistical power (MacKinnon, Lockwood and Williams, 2004).

However, the most important limitation of both single and multiple mediation models, regardless of whether they quantify the indirect effect or not, is ignoring central assumptions of mediation such as that of *temporal asymmetry* or temporal separation. Measurement of variables involved in causal processes must be separated by enough time to permit the causal effect to unfold (Little *et al.*, 2007, p. 361). Fundamentally, the cause must precede the outcome in time (Holland, 1986; Sobel, 1990). Thus, cross-sectional mediation models which measure the X, Y and M variables at the same time frame are inherently limited in their ability to address the assumptions of *stability*, *stationarity* and *equilibrium* that are required when measurement of longitudinal processes is attempted. Stability refers to a condition when the phenomenon under observation stabilises its levels over time (see also Kenny, 1979; Kenny and Harackiewicz, 1979). Stationarity implies that the causal structure responsible for an effect on the outcome at time t remains the same at time t+1 (Kenny, 1979), p. 232). Equilibrium refers to a condition when the causal system exhibits temporal stability of patterns of covariance and variance (Dwyer, 1983). Cross-sectional mediation models cannot address the above assumptions concerning longitudinal causal processes.

Gollob and Reichardt (1987; 1985) have shown that estimates of mediational processes based on cross-sectional designs are biased and potentially misleading. They discussed how specific time lags could be used to study a causal process over time. However, Cole and Maxwell (2003) showed that simply allowing a time lag between the predictor, the mediator and the outcome was not enough to produce unbiased estimates of the *a* and *b* effects. They argued that one of the most common ‘third variable' confounds were prior levels of the dependent (endogenous) variables as well as the exogenous (independent variables). Thus, regression

> 'cannot be used to infer causation if there are unmeasured and uncontrolled exogenous variables that correlate with the predictor variable and cause the dependent variable. In most longitudinal designs, prior levels of the dependent variable (at time t-1) represent such a variable. Without controlling for such potential confounds, we will obtain spuriously inflated estimates of the causal path of interest in mediational models. M_{t-1} must be controlled when predicting M_t, and Y_{t-1} must be controlled when predicting Y_t' (Cole and Maxwell, 2003, pp. 560-1).

More importantly, Cole and Maxwell (2003) demonstrated mathematically that under the scenario of complete mediation, the cross-sectional designs would produce seriously biased estimates of the *a* and *b* effects. In extreme cases, those estimates would indicate mediation when there was none or showing no mediation when there was substantial longitudinal mediation (West, 2011, p. 813). Cole and Maxwell (2003) also showed that three waves of data were needed as a minimum to allow time for the effect of the predictor on the mediator and the effect of the mediator on the outcome to unfold over time. Three waves of data were also necessary to test the stationarity assumption.

In this connection, the length of the time lag is critical (Reichhardt, 2011). Gollob and Reichardt (1987) demonstrated that if the time lag between the predictor and the mediator and between the mediator and the outcome are not similarly spaced (having the first time lag defined as one time unit, 1I, and the second as two time units, 2I, for example), the mediational effects will almost always be biased. Cole and Maxwell (2003) confirmed this mathematically as well. They also showed that in that case, the total indirect effect will also be biased. Of course, when dealing with secondary analysis of panel data, any pre-defined time-lag is arbitrary. Ideally, the optimal time lag should be determined after specific pilot research *before* the data are collected (Cole and Maxwell, 2003; MacKinnon, 2008). The same is true for the LSYPE. Data were collected at yearly sweeps defining yearly time lags between ages 14-16. But it remains unknown whether the yearly time lags that the LSYPE panel data were structured on, represented the optimum time lags for all the factors to unfold their effects over time. Model 7 can test whether two yearly time lags are statistically equivalent (stationarity). But testing the stationarity assumption explicitly does not indicate the optimality of the specific time lag.

Later methodological developments that built on the Cole and Maxwell's(2003) insights used autoregressive models with simulated data. Maxwell and Cole (2007) confirmed that cross-sectional approaches to mediation generated substantially biased estimates of longitudinal processes even under ideal conditions of complete mediation. More recent work by Maxwell, Cole and Mitchell (2011) showed that cross-sectional estimates of a longitudinal mediation process would seriously under- or over-estimate the magnitude of the indirect effect even under conditions of various degrees of partial mediation.

Model 7 makes full use of the Cole and Maxwell's (2003), Maxwell and Cole's, (1977) and Maxwell, Cole and Mitchell's (2011) insights and recommendations. Two occasions of the predictor, three occasions of the outcome and at least two occasions for each of the mediators are modelled over three waves of panel data. Cross-sectional associations (factor covariances) are hypothesised at baseline (time t or age 14) only. Thus, prior occasions of the predictor, the mediators and the outcome are explicitly modelled (shown prospectively in Model 7 as t, t+1 and t+2). This effectively controls for a centrally important confound (Cole and Maxwell, 2003). Not shown in Figure 4.8 but included in the model, error covariances were specified not only for autocorrelated error structures, but also across errors of indicators and disturbances of theoretically-linked latent constructs. Following Cole and Maxwell's (2003) recommendations, these specifications in the measurement models address method and trait variance (Cole and Maxwell, 2003, p. 569). Correlated residuals may indicate influences from common but omitted variables (Cole and Maxwell, 2003).

Model 7 also makes the assumptions of stability, stationarity and equilibrium. All these three assumptions can be actually tested directly in MACS analysis. Analysis of latent means and intercepts across autoregressive SEM with repeated measures for example, can indicate whether change from one occasion to the next was substantial, thus, indicating stability. Equilibrium requires stability in the complete causal structure responsible for the outcome. This assumption can directly be tested by testing the equivalence of the variances of latent constructs across time (see Figure 4.9). It amounts in fact to a test of longitudinal factorial variance invariance. However, although these assumptions involved in causal modelling are explicitly tested in model 7, I make no causal inferences from correlational data (Baron and Kenny, 1986; West, 2011). Statistically significant structural paths in models 1-6 and 7 only suggest that a relationship was 'observed to be consistent with what we would expect to see if a causal path leading from A to B to O were in force' (Kraemer *et al.*, 2001, p. 852).

Measurement assumptions in testing for moderation effects

While analyses of mediation are concerned with 'how' X affects Y, moderation analyses concern the 'when' or 'for whom' (Frazier, Tix and Barron, 2004, p. 116). In a mediation model including X, M and Y where X affects M which then affects Y, a moderator Z is any variable which changes the *direction* or *strength* of the relations between X and M and/or M and Y (Holmbeck, 1997). Naturally therefore, moderators are of substantive interest in the social sciences. They offer information on when or in which environments the intervention is more likely to be effective (Kraemer *et al.*, 2002). In non-experimental mediation research, moderator effects are important because they indicate the level or the category of the variable at which the hypothesized *a* and *b* effects increase or weaken (Frazier, Tix and Barron, 2004). The theoretical perspectives reviewed in chapter 2, explicitly or implicitly treated ethnic group and social class as moderators of adolescent expectations. This study tests this question explicitly by asking whether maternal ethnicity moderates the hypothesised mediational, cross-lagged and feedback mechanisms potentially impacting on young people's educational expectations.

Moderators are a central component of ecological systems theory, one of the few theories to give the concept of moderation explicit and central theoretical significance. Bronfenbrenner's (1992) well-known formula of development (D) already included an interaction term denoting the central link between personal characteristics (P) and environment (E) (Bronfenbrenner, 2005, p.108):

$$D = f\,(PE) \qquad (4.22)$$

In more formal terms, moderation of the relation between X and Y by a moderator (Mo) typically is expressed (Jaccard and Turrisi, 2003) as:

$$Y = i + c_1X + c_2Mo + c_3XMo + e_y \qquad (4.23)$$

Factoring out X, equation 4.23 becomes:

$$Y = i + (c_1 + c_3\,Mo)X + c_2Mo + e_y \qquad (4.24)$$

which suggests that the effect of X on Y is a function of Mo, called *conditional* effect of X on Y (Hayes, 2012, p. 4). Thus, c_1 estimates the effect of X on Y when Mo = 0 and c_3 estimates how much the effect of X on Y changes as Mo changes by one unit (ibid). The regression models 4.23 and 4.24 can be extended to include multiple moderators (see Hayes, 2012), p. 5).

To measure moderation in a mediation model, equations 4.18 and 4.19 are extended to include the moderator Mo:

$$M = i_M + a_1X + a_2Mo + a_3XMo + e_M \text{ and} \qquad (4.25)$$

$$Y = i_Y + c_1'X + c_2'Mo + c_3'XMo + b_1Mo + e_Y \quad (4.26)$$

Factoring out X from 4.25 and 4.26

$$M = i_M + (a_1 + a_3Mo)X + a_2Mo + e_M \text{ and} \quad (4.27)$$

$$Y = i_Y + (c_1' + c_3'Mo)X + c_2'Mo + b_1Mo + e_Y \quad (4.28)$$

easily shows that both the effect of X on the mediator (M) and the effect of X on Y adjusted for the mediator are no longer single numbers but are conditional on the level or category of the moderator. As the result, the indirect effect of X on Y is

$$M = (a_1 + a_3Mo)X\, b_1Mo \quad (4.29)$$

and equation 4.16 for the indirect effect can be re-written, substituting elements from equations 4.24 and 4.28 as:

$$M = (a_1 + a_3Mo)b_1Mo = (c_1 + c_3Mo) – (c_1' + c_3'Mo) \quad (4.30)$$

which is also a function of the moderator (Mo). Equation 4.28 expresses *moderated mediation*, i.e., when mediation of the effect of X on Y via M is moderated by Mo (see also Frazier, Tix and Barron, 2004; Muller, Judd and Yzerbyt, 2005; Wu and Zumbo, 2008). Equation 4.30 expresses the *moderated indirect effect*. Edwards and Lambert-Schurer (2007) and Hayes (2009) discuss many combinations for multiple mediator-moderator models. Kraemer *et al* (2008) also discuss the so-called MacArthur approach which does not prespecify which factor in the linear equation is a moderator or a mediator. They propose a data-driven method that defines moderators and mediators after the data are tested. In the case of multiple mediators, equation 4.30 can be extended to reflect the *total indirect effect*. MacKinnon *et al* (2002) recommend a number of methods with the highest statistical power for testing the indirect effect. Preacher *et al* (2007) also provide standard errors (SE) for conditional indirect effects. None of these methods however provides SE for the total indirect effect.

However, despite their conceptual clarity and computational ease (requiring no specialised SEM software) mediator-moderator regression models with observed variables suffer from at least four major limitations. The first is that all error is clustered in a single error term. Thus they make the implicit assumption that all variables are measured without error (Jaccard and Wan, 1995). The second is that all these models are cross-sectional, thus allowing no time to function between the predictor, the mediator and the outcome (Gollob and Reichardt, 1987). Yet, these models are treated as causal (Edwards and Lambert-Schurer, 2007). Third, when the moderator is a discrete categorical variable (e.g., gender or ethnicity), Aguinis (1995) demonstrated that the power to detect a moderation effect depends on the difference in the sample sizes of the subgroups of the moderator.

If ethnicity is measured by several ethnic groups of unequal sample sizes, then the power to detect moderation effects is severely reduced in multiple regression models (Aguinis, 1995, p. 1148). All of these problems are quite serious. In this analysis, they are addressed by developing the mediation model within a CFA/SEM framework and allowing for more than one occasion of the predictor, mediator(s) and outcome, as discussed for model 7. I discuss the bias from sample size discrepancy in multigroup analysis and how I handled it in this thesis in chapter 5.

The fourth limitation however has to do with the interpretation of the effect of the moderator on the model parameters. It is expected that interaction terms should be specified in a regression model after a good theoretical reason. However, regression models that include two-, three- or four-way interaction terms are unlikely to be always guided by theory (Jaccard and Wan, 1995). More importantly, many of these interaction terms will be statistically insignificant simply as a function of sampling variability (Aguinis, 1995). Further, data-driven approaches to mediation and moderation like those advocated by the MacArthur approach (Kraemer *et al.*, 2008), are entirely atheoretical. Moreover, when the model includes more than mediation effects (i.e., feedback and cross-lagged effects) as is the case with model 7, the above regression models are limited in addressing them simultaneously.

Instead of interaction terms, the present analysis applies a multigroup approach to test for moderation by maternal ethnicity. This approach has been advocated early on (Baron and Kenny, 1986; Jaccard and Wan, 1995) particularly when SEM methodologies can be applied (Little *et al.*, 2007; Muller, Judd and Yzerbyt, 2005). The advantages of this approach are multi-fold: First, each parameter of the measurement and structural model can be tested for moderation. Tests for moderation in a CFA framework have more statistical power because they are typically based on a greater number of fit indices. By contrast, moderated multiple regression models have less statistical power, particularly if there is sample inconsistency in the moderator categories (Aguinis, 1995; Aguinis, Petersen and Pierce, 1999). Second, moderation in a CFA framework can be studied on every structural relation. Thus, it becomes easy to see which relations out of a complex web of hypothesized relations are moderated and which are not. Asymptotic estimates can be bootstrapped for greater confidence in their interpretation. Third, every *a*, *b*, *c*′ and *c* effect can be compared across groups after cross-group measurement invariance has been established. Thus, obtained cross-group differences in structural estimates can be more reliably attributed to group membership characteristics (i.e., maternal ethnicity). Fourth and most importantly, the potentially moderated *a*, *b*, *c*′ and the *ab* indirect effect are adjusted for measurement error, prior occasions and method and trait variance.

4.5 Conclusions

This chapter presented the statistical models that will be estimated to address the research questions of this thesis that were set out in chapter 1. Longitudinal change in parental social class, parent-child conflict, pupils' engagement with homework, feelings about school, assessments about teachers' effectiveness, and educational expectations, is modelled in six stand-alone multiple occasion autoregressive models. Models 1-6 are first estimated separately as an integral part of the analysis of this thesis and tested for longitudinal and cross-group measurement invariance. These models are later combined into a final autoregressive panel model assuming the roles of the predictor, the mediators and the outcome. The final autoregressive model will test for multiple routes of mediation involving these factors (MacKinnon, 2013).

This chapter has thoroughly discussed the fundamental assumptions of the CFA framework and argued that, guided by ecological systems theory, such a measurement methodology is well suited to address the research questions and test explicitly many of the hypotheses they imply in a longitudinal context. In particular, longitudinal autoregressive SEM are well suited to study these longitudinal processes at the individual level. The various advantages and limitations of these models have been carefully noted above.

Model 7 is a complex multiple mediator latent variable autoregressive SEM which enables testing hypotheses about many effects simultaneously (MacKinnon, 2013). Multiple mediator models are better approximations of reality. In every longitudinal ecological process, it is likely that more than one mediators are at work at the same time (Maxwell, 2013b; 2013c; Moustaki, 2013b). The specification of model 7 addresses important methodological measurement issues, including explicit tests of cross-group and longitudinal measurement and structural factorial invariance. It is therefore capable of addressing more reliably the question of whether maternal ethnicity moderates any of the hypothesized structural relations.

However, model 7 is also a complex model. It involves 44 manifest indicators which will be estimated on moderate-sized samples (see chapter 5). This may reduce the statistical power for some estimates. Further, the time-window of only 2 years might not be enough for all phenomena to optimally unfold over time. Yet we should not lose sight of two factors that counterbalance these two limitations. First, while the available time lag is only two years, these are extremely important formative years in the lives of young people marking an important life transition at age 16. Second, although model 7 could be developed step-wise, testing one mediator at a time, this approach would be completely incongruent with ecological theory that suggests that multiple rather than single mediation is the rule in real life. Being explorative, this method would also be at odds with the confirmatory nature of the present analysis. Further, setting an arbitrary order for the step-wise inclusion of mediators in a series of nested models under model 7 could again beg the question on the criteria used for the order of the step-wise inclusion. Instead, including all potential mediators at a single step resolves that issue and allows simultaneous estimation of complex effects among the potential mediators, which could not be done during a step-wise inclusion (Maxwell, 2013c). Thus, although model 7 is complex, model complexity was unavoidable if complex social processes were to be modelled as realistically as possible. The results follow in chapters 6 and 7 after a fuller description of the LSYPE data source and the manifest variables specified as indicators of the models are presented in chapter 5.

Chapter 5: Setting up the data, managing sub-groups and the description of key variables in the analysis

Introduction

The purpose of this chapter is fourfold: (a) to present the data source; (b) to explain how the data were organised before the analysis; (c) to offer a fuller description of key LSYPE variables that were used as indicators in models 1-7 by contrasting their distributions across the white, Indian, Pakistani, Bangladeshi and Black Caribbean groups; and in doing so (d) assess whether the LSYPE data support the paradox of high expectations of minority pupils from low SES parental backgrounds that was highlighted in the literature review. I present the data source in section 5.1, followed by the treatment of the LSYPE for the needs of the analysis in section 5.2. All the 44 indicator variables used in the analysis are fully described and the extent to which the LSYPE supports the above paradox is discussed in section 5.3. Along with chapter 4, this chapter completes the presentation of the models and the data in preparation for the results chapters 6 and 7.

5.1 The Longitudinal Study of Young People in England (LSYPE) dataset

The LSYPE is a multipurpose, ongoing large-scale panel study of young people in England commissioned by the Department of Children, Schools and Families (DCSF). The LSYPE has completed seven yearly waves since 2004, and it currently managed by the Centre for Longitudinal Studies, (CLS), Institute of Education, University of London (http://www.cls.ioe.ac.uk/). It includes rich information on parental socioeconomic status, family background and the home environment, parental and young people’s attitudes about education and work and pupils’ post 16 plans (for a description see also, Anders, 2012).

The LSYPE followed a cohort of **15,770** young people who were in year 9 in maintained and independent schools and pupil referral units in England on February 2004. Pupils who were born in the time window between 1st September 1989 and 31st August 1990 were eligible for inclusion. There was therefore some age variability in the data as the pupils were between 13.5 – 14.5 years old when sampled. Table 5.1 suggests that both young people’s median and mean age were 14 at wave 1. This age variability was of less importance to the present study as the main criterion for including pupils in the analysis was pupil's *year* in secondary education. Accordingly, this analysis included pupils from year 9 (wave 1), 10 (wave 2) and 11 (wave 3).

Table 5.1: Age distribution of Young Person (YP) at Wave 1

YP's Age (in years)	N	%
0-12	17	0.0
13	2234	13.9
14	13684	86.0
15+	46	0.0
Total*	15981	100.0

Source: LSYPE Index (Longitudinal) File, W1-W4
* Total includes all recorded cases, before cleaning.
Data are unweighted to show unadjusted frequencies

LSYPE sampling

The LSYPE is a complex, two-stage random probability, proportional to size (PPS), sampling design with disproportionate stratification which targeted Year 9 young people at maintained schools, independent schools and pupil referral units (PRU) in England in February 2004 (NatCen, 2009, p. 6). Schools were the primary sampling units (PSU), stratified by the three groups. Different sampling strategies were applied to the lists of pupils from maintained schools, independent schools and pupil referral units (see (NatCen, 2009).

For maintained schools, pupils were sampled from the Pupil Level Annual School Census (PLASC). For independent schools and PRUs, pupils were sampled from the School Level Annual School Census (SLASC). This sample frame included 892 maintained and independent schools of which 647 participated with the study. During the first sampling stage, maintained schools were stratified into deprived/non-deprived and deprived schools were oversampled by a factor of 1.5 (NatCen, 2009, p. 6). During the second stage, pupils from the major UK minorities (Indian, Pakistani, Bangladeshi, Black Caribbean, Black African and of mixed ethnicity) as recorded in PLASC were oversampled to achieve a preset target of n=1000 per minority group. The concentration of pupils belonging to each minority ethnic group in the school was also taken into account as well as the school-level deprivation stratum. This ensured equal selection probabilities for each pupil within each minority ethnic group. An average of 33 pupils from each participating school was selected this way (NatCen, 2009, p. 8). Independent schools were selected by percentage of pupils achieving 5 or more A-C GCSE grades in 2003. PRUs were sampled with probability proportional to the number of pupils aged 13 at that institution (NatCen, 2009, pp. 6-8). Table 5.2 shows the distribution of young persons' self-reported ethnic group at waves 1-3 by gender. The table suggests that there were enough cases of young people in each ethnic minority to support multivariate analysis. However, as already discussed in the concluding section of chapter 4, making inferences regarding parameter estimates in my final model, model 7, should be done with caution because this model is complex as it includes 44 manifest variables.

Table 5.2: Young Person's self-reported ethnic group (grouped) by gender, Waves 1-3.

	Wave1			Wave2			Wave3		
YP' ethnic group	Male	Female	Total	Male	Female	Total	Male	Female	Total
White	5343	4992	10335	4488	4427	8915	4149	4059	8208
%	**51.7**	**48.3**	**100.0**	**50.3**	**49.7**	**100.0**	**50.5**	**49.5**	**100.0**
Mixed	383	416	799	377	324	701	333	326	659
%	**47.9**	**52.1**	**100.0**	**53.8**	**46.2**	**100.0**	**50.5**	**49.5**	**100.0**
Indian	529	484	1013	433	417	850	401	388	789
%	**52.2**	**47.8**	**100.0**	**50.9**	**49.1**	**100.0**	**50.8**	**49.2**	**100.0**
Pakistani	468	472	940	400	402	802	369	381	750
%	**49.8**	**50.2**	**100.0**	**49.9**	**50.1**	**100.0**	**49.2**	**50.8**	**100.0**
Bangladeshi	322	401	723	322	301	623	292	272	564
%	**44.5**	**55.5**	**100.0**	**51.7**	**48.3**	**100.0**	**51.8**	**48.2**	**100.0**
Black Caribbean	287	289	576	254	252	506	233	235	468
%	**49.8**	**50.2**	**100.0**	**50.2**	**49.8**	**100.0**	**49.8**	**50.2**	**100.0**
Black African	296	317	613	260	272	532	248	244	492
%	**48.3**	**51.7**	**100.0**	**48.9**	**51.1**	**100.0**	**50.4**	**49.6**	**100.0**
Other	219	199	418	195	172	367	175	170	345
%	**52.4**	**47.6**	**100.0**	**53.1**	**46.9**	**100.0**	**50.7**	**49.3**	**100.0**
Total	**7847**	**7570**	**15417**	**6729**	**6567**	**13296**	**6200**	**6075**	**12275**
%	**50.9**	**49.1**	**100.0**	**50.6**	**49.4**	**100.0**	**50.5**	**49.5**	**100.0**

Source: LSYPE Young Person Files (Longitudinal), Waves 1-3
Note: Data are unweighted to show unadjusted percentages and frequencies. Totals in the last row exclude missing cases.

LSYPE response rate

There was a very good response rate between LSYPE waves 1-3 – see Table 5.3[6]. Analysis of non-response suggested that the highest proportions of non-response came from inner-London maintained schools in the deprived stratum while the lowest proportions from schools outside London in the non-deprived stratum (ibid, p. 39). Factors that determined pupil-level non-response

Table 5.3: Overall response by LSYPE Wave 1-3

Sample	Issued	Households reached (%)*	Fieldwork period	Full Interviews	Partial Interviews
Final	21,447	-		-	-
Wave 1	15,770	**15,770** (100.0)	30/3 – 18/10/2004	13,914	1,856
Wave 2	15,678	**13,539** (86.0)	18/4 – 18/09/2005	11,952	1,587
Wave 3	13,525	**12,439** (90.0)	21/4 – 28/09/2006	12,148	291

Source: NatCen, 2009*Percentages in parentheses refer to percent household reached based on achieved sample base from previous previous wave. Note: Data are unweighted to show unadjusted frequencies. Full interviews: YP, MP and SP interviewed; Partial interviews: not all members of the household interviewed

at Waves 1-4 were Government Office Region (GOR), ethnicity, achieved level 1 (5 GCSEs at A* to G); achieved level 2 (5 GCSEs at A* to C) qualifications. Black African and Caribbean pupils with less than level 2 qualifications; pupils with a single parent; pupils whose parents claimed jobseeker's allowance (JSA); pupils planning on leaving education at age 16; pupils who had ever tried cannabis; had free school meals (FSM); had special educational needs; and were suspended, were less likely to respond (ibid, p. 47). The above information was used to derive Wave-specific non-response (NR) weights. LSYPE waves 1-3 were spaced in approximately equal yearly intervals. Wave-specific visits involving the same households were carried out by the same interviewer originally assigned to them, who followed the same schedule using the same interpreter where necessary. Therefore for all practical reasons, repeated individual responses between waves 1 to 3 in this study can be assumed to be equally spaced in yearly intervals, thus satisfying modelling assumptions requiring equidistant waves, as discussed in section 4.3 chapter 4.

[6] At wave 3, the fieldwork extended beyond the end of the school year. It is therefore possible that a number of pupils who had opted out of school earlier that year were interviewed. Pupils are typically sent exam results no sooner than early September at year 11. So, the decision to opt out based on final grades should be finalised around that time. In any case, these pupils were included in the analysis. The reason is that the analysis was concerned with pupils' reported *likelihoods* to apply to university and to be admitted if they applied at age 16. Arguably, even if a pupil had decided to opt out prior to being interviewed, he or she would still give a valid response ('not at all likely') to the two expectations questions at age 16. None of the two questions required pupils to specify how far into the future they were expected to apply to university. Pupils could eventually decide to re-enter the educational system and resit GCSEs following their decision to opt out at age 16. There was no reason to exclude them from the analysis, (wrongly) assuming that they would *never* apply to university. In fact, about 13% of those reporting 'not at all likely' in both questions at age 16, actually applied to university two years later (Anders and Micklewright, 2013).

Instrument content and LSYPE interviews

Data were collected from the young person (YP), the main parent (MP) and the second parent (SP). This study used information obtained by (a) *The young person interview* (YP's attitudes to current school and teachers, homework habits, educational expectations). (b) *The main parent interview* (MP's attitudes to parent-child conflict); (c) *The individual parent interview* (parents' NS-SEC, education and income); *the household section interview* (level of household-level deprivation and material circumstances). Most main parents in all Waves were mothers (about 87%) while most second parents were fathers. Unfortunately, the LSYPE asked only the main parent (mostly mothers) about attitudes and other information relating to young people's future plans in each household. As a result it was not possible to compare fathers and mothers on any variable relating to YP clustered under the same household.

5.2 Treatment of the LSYPE dataset for the needs of the analysis

My analysis focuses on the three types of potential mediation exerted via parent-child conflict, pupils' engagement with homework, feelings about school and assessments about teachers effectiveness to young people's educational expectations from ages 14 (year 9) to 16 (year 11), as explained in chapters 1-4. One of my major interests is to assess the extent to which the above relations are moderated by maternal ethnicity. The analysis required therefore repeated measures contained in LSYPE waves 1-3 for the white, Indian, Pakistani, Bangladeshi and Black Caribbean groups in the LSYPE. The categories 'mixed' and 'other' in both mothers and young people were excluded as ethnicity was indeterminate. Black African mothers and young people were also excluded because of particularly high levels of item missingness and wave 1-4 non-response that created problems in their covariance matrices (see below).

The working LSYPE wave 1-3 longitudinal file was derived by following the SPSS syntax recommended by LSYPE (NatCen, 2009, pp. 26; 65-66). After the required consistency tests were conducted, a subset of the LSYPE wave 1-3 mothers-only longitudinal file was derived by filtering out all fathers as only a small proportion of them were 'main parents' (MP). Another reason was that 'second' parents' (SP) interviews were not conducted at wave 3 (NatCen, 2009). The derived file included **10,915** mothers as well as the young people clustered under the same household identified by the *surveyid* variable. The modelling assumptions discussed in chapter 4 required that the repeated measures included in the analysis represented responses from the same persons only (identified as 'main parents' and 'young persons' in LSYPE). As a result, a subset of the derived file was created that contained only fully-productive mothers (i.e., mothers and young people who had consistently participated in all 3 LSYPE waves). This produced the master working file containing **10,633** mothers and the young people structure clustered under the same household survey identification code (see SPSS syntax, Appendix 2). A further subset of this file was created which contained a total of only 109 variables for LSYPE waves 1-3, including the 44 variables required for the analysis and shown in Table 4.1 in chapter 4. The extra variables were required for various preliminary tests during the indicator selection stage. A subset of these extra variables also served as predictors for the data imputation procedure (see below). This wave1-3 longitudinal file was stratified by five pre-selected mothers' ethnic groups. Table 5.4 shows the initial distribution or these pre-selected or trimmed samples.

Table 5.4 Sample sizes of mothers' groups

Groups	N
White	**7578**
Indian	**751**
Pakistani	**642**
Bangladeshi	**484**
Black Caribbean	**324**

Source: LSYPE waves 1-3 longitudinal File

There was great discrepancy among the sample sizes of the white and the minority ethnic groups. When the analysis includes manifest (observed) variables, as is typically the case in multiple regression models, larger samples are welcome because estimates are more precise, i.e., their standard errors are smaller. However, as discussed in chapter 4, when the moderator is a discrete categorical variable (e.g., gender or ethnicity), (Aguinis, 1995) demonstrated that the power to detect a moderation effect depends on the difference in the sample sizes of the subgroups of the moderator. If ethnicity is measured by several ethnic groups of unequal sample sizes, then the power to detect moderation effects is severely reduced in multiple regression models (Aguinis, 1995, p. 1148).

An analogous but more serious issue emerges when groups of widely discrepant sample sizes (i.e., ethnicity groups) are included in the same multigroup analysis involving latent variable SEM. In the latter case, any cross-group comparison requires as a minimum the equivalence of the different sample covariances $\mathbf{S}_1, \mathbf{S}_2, \ldots, \mathbf{S}_n$ (configural invariance) in addition to the equivalence of the matrices of the indicator loadings (metric invariance), (Little, 1997; Vandenberg and Lance, 2000). These minimum levels of cross-group invariance must be established before any comparisons of structural estimates commences. Therefore detection of moderator effects in multigroup analysis involving SEM rests upon the correct execution and interpretation of invariance tests. However, when widely discrepant sample sizes are included in the same multigroup analysis, severe bias results in the multigroup chi-square, the primary index of overall model fit and chi-square difference tests. The chi-square value of the largest group contributes considerably more to the test of the configural invariance than the other groups in the analysis, even though the model specifications are identical (i.e., the covariance matrices in each group have the same number of elements in the off-diagonal) (Brown, 2006, p. 279). More importantly, modification indices, standard errors, power to detect parameter estimates as significantly different from zero and error variances will be differentially impacted by the unbalanced group sizes (Kaplan and George, 1995). Therefore, Type I error rates[7] will be inflated because the null hypothesis that groups have equivalent structures will be rejected more often (Maxwell, 2013d; Moustaki, 2013c).

More recent simulation studies (Chen, 2007; 2008) have shown that in cases of cross-group invariance tests with widely unbalanced group sizes, as is the case in the present study, fit indices, in addition to the chi-square, (CFI, RMSEA, RMSR, $\hat{\gamma}$) were severely biased if the sample size ratio between the reference and the comparison group was ≥ 4/1. Therefore, the risks of obtaining severely biased estimates resulting from cross-group invariance tests if the unbalanced sample structure shown in Table 5.4 was retained were serious. It was decided to reduce the initial sample of the white group in order to balance the group sample sizes and thus minimize bias from that source as much as possible. Unfortunately, there are no specific guidelines in the methodological literature as to which ratio (apart from the ideal 1:1) between the reference and comparison group sample sizes is optimal to minimize such bias (Byrne and Stewart, 2006). Therefore, I considered the 4/1 ratio used in the simulation studies by Chen (2007; 2008), as the lower bound of permissible sample size discrepancy.

Since the smallest sample size was 324, the sample size of the white mothers was reduced to 1000 cases by drawing a random sample out of the original 7,578 cases using the pertinent SPSS

[7] Unbalanced group sizes may also cause excessive Type II error rates. This is due to the fact that the largest group will dominate the comparison decreasing the power to detect differences between the large and the small groups.

command (SAMPLE, see syntax, Appendix 2). Since this was a 13.2% random sample of the original representative sample, it should not severely affect the magnitudes of measurement or structural estimates other than their standard errors. In order to check on the empirical validity of sub-sampling from the white ethnic group, some preliminary analytical checks were carried out in advance of the modeling. Models 1-6 were estimated on the complete sample of white mothers (n=7578) and then re-estimated on the 1000 case-based variance covariance matrix (see below) and their parameter estimates compared. Full details of these checks are contained in Appendix 1. What follows is a brief resume of these preparations.

By and large, differences in the size of factor loadings were trivial (changes in most cases were restricted to the second decimal). Loadings of indicators like gross family income with greater proportions of missing values in the full sample had slightly different magnitudes in the smaller sample where all missing values had been imputed (see below). Out of the 44 indicators used in models 1-6, 4 indicators in addition to the 2 indicators for income at LSYPE waves 1 and 2 showed slightly different loadings when the smaller sample was used. These were the items reflecting '*how bad was the relation with the young person'* at LSYPE wave 2, in model 2 (parent-child conflict); *frequency of homework assigned* at LSYPE wave 1 in model 3 (pupils' engagement with homework); '*I like being at school*' and '*I'm bored at lessons*' at wave 1, in model 4 (pupils' feelings about school). There were no apparent differences in the intercepts of any model. In all cases, standard errors were unsurprisingly lower when the full sample was used. Cross-group invariance tests under the full sample (with missing values) in the white group may therefore have been more likely to show that the loadings of these 6 items were cross-group non-invariant. Table A1.1 (Appendix 1) presents the full comparisons. Yet, the overwhelming majority of indicator loadings (86%) and all of the intercepts (100%) remained unaffected when the sample was reduced to 1000 cases. These results were consistent with simulation studies which showed that model parameters were generally unaffected by smaller sample sizes (Finch, West and MacKinnon, 1997).

Structural estimates also had trivial changes (within rounding error of the second decimal). The structural path representing change between ages 15 to 16 in parent-child conflict was slightly larger (indicating less change) when the full sample was used. Similarly, the structural path representing change between ages 14 to 15 in feelings about school was slightly larger when the smaller sample was used (see Appendix 1). Although model fit was very good to excellent when models were estimated on either sample, the chi-square values were inflated in the full sample, typically as a result of the larger sample size (Saris and Satorra, 1993). As a result, some indices were less optimal (the RMSEA in particular, see below) when the full sample was used although all remained well within the margin of acceptability.

As a result of the above comparisons it was established that neither the loadings nor the structural paths of models 1-6 changed so as to suggest that the relation of the indicators to their latent construct or the relations between latent factors was different when models 1-6 were estimated on samples of different sizes in the white group. This argues in favour of the representativeness of the 1000-case random sample. Both the measurement and structural estimates of models 1-6 remained quite consistent between the full and the smaller sample of the white group and were not biased systematically in a positive or negative direction by the random selection. The reduction of the sample of the white group may not completely eclipse bias from sample discrepancy in subsequent multigroup comparisons. However, it will minimize it considerably by reducing the original sample size ratio from a maximum of 23.4 to 3.1 and a minimum of 10.1 to 1.3. Thus, while the reduction of the sample of the white group did not alter the estimates for models 1-6, using the smaller sample will control better for excessive Type I error rates in the cross-group invariance tests that follow. Controlling for Type I error also guards against bogus moderator effects (Chen, 2008).

Weighting the data

To control for individual and school-level non-response, the raw data would ideally have been weighted by the longitudinal weight provided by the LSYPE. This weight combined the design weight (which was a combination of separate weights for maintained and independent schools) and the combined non-response weight. Although only fully-productive mothers and young people from waves 1-3 were used in the analysis, it was still the case that these data had to be weighted to insure their representativeness in the population by controlling for individual-level and school-level non-response (NatCen, 2009, p. 41). Successful weighting of the data used in the analysis was achieved, despite the fact that AMOS Graphics 20 (Arbuckle, 2011) ignored all weighting when weighted *raw* data were used as input. The problem was effectively bypassed when covariance matrices weighted by the longitudinal weight were used as input. I explain this procedure further below.

Clustering

The analysis does not take into account the cluster variable for the purposes of deriving robust standard errors because this was technically impossible under SPSS and a latent variable design under AMOS. The reasons for this were the following. The LSYPE dataset included a cluster variable (*SampPSU*). This variable could be used to derive robust standard errors by means of the complex sample plan module in SPSS. This SPSS module (CSPLAN ANALYSIS) produces a complex sample plan file which informs the subsequent analysis of the sample design. The LSYPE provided the necessary syntax (NatCen, 2009, p. 53). However, the complex samples plan in SPSS can be subsequently applied only on a limited number of analyses that involve exclusively manifest variables (general linear model, logistic, ordinal and Cox regression). The CSPLAN file can be activated from within these procedures (IBM, 2011). Unfortunately, the CSPLAN cannot be applied to any factor analytic procedures that involve latent variables. Certain SEM programs like MPlus (Muthén and Muthén, 2010) provide for clustered data under a multi-level SEM design, in contrast to AMOS Graphics 20. However, I already raised the issue of complicating the analysis by moving the models into a multi-level SEM framework in chapter 4. Such complication can be revealed particularly in cases when direct and indirect effects at the individual level need to be estimated. I discuss this point further below.

I discussed the increased complexity involved in any attempt to estimate model 7 under a multi-level SEM framework in section 4.1, chapter 4. It is possible that the repeated observations clustered under each individual or scores clustered within each school are not independent. However, the degree to which this potential non-independence of scores will affect the standard errors of the estimates of model 7 has yet to be assessed. For example, only an average of 33 year-9 pupils were randomly selected from each school roll in 647 schools (NatCen, 2009, p. 8). So, it is possible that pupils were spread over their school population quite widely. Further, inner-city maintained schools had a 44% non-response rate and independent schools 43% non-response rate (ibid). This stresses the fact that non-response, while considerable, was not particularly associated with type of school. Thus, controlling for non-response addresses the issue of bias in parameter estimates. This is arguably a much more important issue than bias in standard errors resulting from the possibility that pupils' scores could be non-independent within schools. Of course, controlling for between-cluster variation in any of the relations estimated in model 7 remains a legitimate hypothesis that can be pursued in a future study. But estimating simultaneously *all* longitudinal relations that are explicitly tested in model 7 under a multi-level SEM would be daunting. It would also defy my purpose of estimating direct and indirect effects in these relations at the individual level, as a level 2 indirect effect has yet to be conceptually defined and understood. Formally therefore, the analysis did not derive robust standard errors. Informally however, I employ other methods, such as the bootstrapped percentile method (Bollen and Stine, 1993) and the Bonferonni adjustment (see chapter 6) in multiple comparisons to achieve more realistic Type I error rates.

Missingness, data imputation and derivation of covariance matrices as input

All missing values in the white group (n=1000), Indian (n=751), Pakistani (n=642), Bangladeshi (n=484) and Black Caribbean (n=324) groups were imputed. The longitudinal weight provided by the LSYPE was incorporated into the imputation procedure. Following the imputation of missing values, weighted covariance matrices were produced for each ethnicity group, which were used as input for subsequent analyses. This procedure is explained in more detail below.

Analysis of missingness and imputation procedure

Before imputation, the pattern of missingness in each group was studied using the Missing Case Analysis in SPSS 20. Four patterns of missingness were generally evident in the data, none of which were missing completely at random (MCAR). It was assumed that all patterns of missingness were missing at random (MAR) (Schafer and Graham, 2002). This is typically the pattern of missingness more likely to be observed in applied data sets and is referred to as *ignorable* (see, Allison, 2003; Little and Rubin, 2002). Most variables had a minimal percentage of missing values and small deviations from normality based on their skewness and kurtosis (see Table 5.23, chapter 5). However, the income variables across all groups in the analysis had > 40% missing cases, which for the Pakistani and Bangladeshi groups reached 70-85%. Interestingly, all variables on parent-child conflict (see below) had high proportions of missing values among the Bangladeshi (56.4%) and Pakistani (43%). This suggests that in some Muslim families parent-child conflict may have been interpreted as sensitive information not to be disclosed.

Separate multiple imputations of the missing values of each of the five ethnicity datasets containing the 109 variables (as described above) were conducted using the MCMC algorithm available in SPSS 20. All imputations used the same longitudinal weight provided by the LSYPE. Five separate imputations were performed with each imputation addressing the particular patterns of missingness in the white, Indian, Pakistani, Bangladeshi, and Black Caribbean groups of mothers. Thus, maternal ethnicity was the primary factor controlling the imputation. Only some but not all of the 109 variables were used as predictors for missing values in the imputation procedure for each of the five groups. These included all the variables in the measurement parts of models 1-6 (44) which were specified to be used as both predictors and dependent variables during the imputation. A number of additional variables were also included as predictors, notably father's and mother's educational level and employment status at LSYPE waves 1-3. Before the imputation, the minimum and maximum values of each variable to be imputed were constrained to match the true range of the raw variables. This ensured that the imputed values did not exceed the recommended range. Problems with any variables, particularly those in the smaller sized groups were identified and handled during the preliminary runs of the imputation. If values could not be imputed for any reason, or the imputation resulted in widely discrepant means and standard deviations compared to those in the original dataset, the variables were dropped from the analysis. The procedure created 10 imputed datasets for each ethnic group that had been weighted by the LSYPE longitudinal weight. Every missing value in each dataset was replaced by an imputed value that differed slightly across the ten datasets. The means, standard deviations (SD) and the maximum and minimum values for every imputed variable in the imputed datasets for each ethnic group was directly compared to those of the original data. Divergences from the original distributions were minimal and all imputed values fell within their proper ranges. The software produced an extra dataset for each ethnic group that included the pooled values of the ten imputed datasets, including the vectors of their pooled means and SDs.

The next step involved the creation of a variance-covariance matrix based on the values included in the pooled dataset. Some authors recommend constructing such a covariance matrix by hand in an external program, such as Microsoft Excel and feed this matrix as input to AMOS (Blunch, 2010, p. 87). However, this is an inherently error-prone procedure if carried out by hand, particularly for a 44x44 matrix. In this analysis, this was achieved by means of the CONVERTM = ROWTYPE_ SPSS command (see Appendix 2) which automatically created a new SPSS data file containing a symmetric variance-covariance matrix that could be read by AMOS as input. The pooled means averages from each ethnic group were subsequently added to each matrix as a MEAN vector. Five such data files were created each including one covariance matrix with its N vector (sample size) specified as per Table 4.4 for the white (n = 1000), Indian (n=751), Pakistani (n=642), Bangladeshi (n=484) and Black Caribbean (n=324). The five weighted *augmented variance-covariance matrices* (i.e., covariance matrices with an added vector of means and weighted by the LSYPE longitudinal weight) for each of the above ethnicity groups were saved and used as input in the multigroup analysis. Due to their length, they can be provided on request from the author.

There were several important advantages in using these weighted augmented variance-covariance matrices as input instead of raw data. First, the wave 1-3 data needed for the analysis were weighted by the longitudinal weight and could be handled by AMOS Graphics without a problem. Second, because the covariances provided input for complete data, AMOS could generate modification indices which are the main tool to identify problems in the measurement model and conduct invariance tests (Byrne, 2004; Byrne and Stewart, 2006). Third, it could generate bootstrapped estimates for models 1-7 (see chapter 4). Fourth, it could use alternative estimators in addition to ML (generalised least squares, scale-free least squares, and unweighted least squares) to compare parameter estimates in case of severe divergences from multivariate normality. None of the above capabilities were available under full information maximum likelihood (FIML) (typically the estimator used by AMOS when unweighted raw data with missing values are supplied as input).

Inputting covariance matrices is standard procedure in multigroup analysis (see for example, Bandura *et al.*, 1996; Kim, Cramond and Bandalos, 2006; Labouvie and Ruetsch, 1995; Meredith, 1993; Pentz and Chou, 1994; Schaie *et al.*, 1998; Tansy and Miller, 1997). Even when the model is complex and multigroup analysis involved five groups, the software processes the data much faster. It is also the recommended method (Arbuckle, 2009) if the multi-group analysis includes nested model comparisons in the same analysis (as is the case with longitudinal and cross-group invariance tests). Each covariance matrix included the matrices for all the occasions of all the models for each group. This eliminated the need for separate occasion-specific matrices to test for longitudinal invariance.

However, there are also disadvantages in using augmented covariance matrices. Because a covariance matrix includes summary data, creating one from pooled imputation samples will yield correct point estimates but incorrect standard errors. This is because there is no correction for uncertainty, so standard errors will be too small. In this thesis however, this limitation is counterbalanced by the Bonferroni adjustment.

5.3 Description of key variables in the analysis

The models required a total of 44 observed variables that served as indicators of the latent constructs, as presented in chapter 4. In this section I will describe all indicator variables and show whether the LSYPE data support the paradox of high adolescent educational expectations from lower SES minority homes discussed in chapter 2. I will also discuss ethnic differences in parent-child conflict, pupils' engagement with homework, feelings about school and assessments of teachers' effectiveness, the subsequent analysis of which will determine whether they may help explain this paradox. All tables report valid unweighted percentages before the imputation to enable comparison of the original unweighted LSYPE frequencies across waves 1-3. I provide means and standard deviations as well as the indices of skewness and kurtosis for all variables at the end of the section. However, all statistical models were estimated on the basis of augmented covariance matrices which had been weighted by the LSYPE longitudinal weight. Point-estimates are therefore adjusted by that weight.

Most minority fathers and mothers are concentrated in lower-status routine and semi-routine occupations. Table 5.5 shows the NS-SEC for fathers' and mother's occupations by minority ethnic group. Notable exceptions are the Black Caribbean and Indian groups who are overrepresented in managerial occupations in contrast to the Pakistani and Bangladeshi groups who are overrepresented in semi-routine and routine occupations and in the 'never worked' category. This picture hardly changes between waves 1 and 2, as expected. However the data about Black Caribbean fathers must

Table 5.5 NS-SEC for father's and mother's occupations by ethnic group at LSYPE waves 1-2

	Father's NS-SEC wave 1					Father's NS-SEC wave 2					Mother's NS-SEC wave 1					Mother's NS-SEC wave 2				
NS-SEC	W	I	P	B	BC	W	I	P	B	BC	W	I	P	B	BC	W	I	P	B	BC
1.Never worked/long-term unemp/d	1.4	4.5	10.8	20.8	3.0	1.5	4.7	10.2	23.4	3.0	3.4	16.3	71.3	84.9	7.8	3.2	16.3	71.3	84.9	7.8
2. Routine occupations	10.6	15.2	18.2	22.1	9.0	11.7	16.8	24.3	25.1	11.3	10.8	16.3	9.0	5.2	8.5	10.9	16.3	9.0	5.2	8.5
3. Semi-routine occupations	7.9	13.3	12.6	18.9	10.4	7.9	14.7	10.2	16.4	10.5	22.7	19.0	6.9	3.4	17.0	22.7	19.0	6.9	3.4	17.0
4. Lower supervisory and technical	15.3	13.1	7.1	13.9	20.9	16.7	12.9	11.1	13.4	18.8	7.3	7.0	1.5	.7	5.9	8.4	7.0	1.5	.7	5.9
5. Small employers and own account	15.8	20.3	32.5	16.1	11.9	11.8	13.3	21.1	9.7	9.0	6.6	8.6	1.4	.9	2.9	4.9	8.6	1.4	.9	2.9
6. Intermediate occupations	4.0	4.8	3.5	.6	4.5	4.1	4.4	3.6	1.3	6.8	17.0	14.2	3.6	2.5	18.6	16.2	14.2	3.6	2.5	18.6
7. Lower managerial and profess'l	26.1	17.8	10.0	6.3	28.4	27.9	22.5	12.7	9.0	29.3	27.2	16.3	5.5	2.0	35.3	28.9	16.3	5.5	2.0	35.3
8. Higher managerial and profess'l	18.9	11.0	5.4	1.3	11.9	18.5	10.8	6.8	1.7	11.3	4.9	2.4	.9	.5	3.9	4.8	2.4	.9	.5	3.9
Total	7578	751	642	484	324	7578	751	642	484	324	7578	751	642	484	324	7578	751	642	484	324
Missing	28.6	22.8	28.0	34.5	58.6	29.7	23.7	31.3	38.2	59.0	3.2	5.2	9.5	8.5	5.6	3.7	5.2	9.5	8.5	5.6

Note: NS-SEC: National Statistics Socioeconomic Classification; W=white; I=Indian; P=Pakistani; B=Bangladeshi; BC=Black Caribbean

be treated with caution as about 60% had missing values on this variable before imputation. Table 5.6 shows family level material circumstances (deprivation) and is consistent with the data of Table 5.5.

Table 5.6: Family-level material circumstances (deprivation) by ethnic group at LSYPE wave 1-2

	Wave 1					Wave 2				
Deprivation level	White	Indian	Pak	Bang	BC	White	Indian	Pak	Bang	BC
1.00 (high deprivation)	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2.00	.0	.1	.2	.0	.0	.0	.0	.0	.0	.0
3.00	.2	.1	.8	.4	.6	.1	.0	.6	.6	.0
4.00	1.8	.8	1.6	.9	2.5	1.7	.3	.8	.6	1.9
5.00	3.5	3.5	8.5	12.6	3.8	3.5	3.0	5.6	9.2	5.6
6.00	6.1	8.6	17.5	29.7	14.7	5.2	6.5	19.3	23.1	10.3
7.00	18.3	25.8	33.9	34.5	28.2	22.2	35.0	36.0	44.1	30.6
8.00 (low deprivation)	70.2	61.0	37.5	21.9	50.2	67.3	55.3	37.7	22.3	51.6
Total	7578	751	642	484	324	7578	751	642	484	324
Missing	0.5	1.3	3.1	4.8	1.5	0.4	1.3	3.0	3.5	1.2

Note: Pak=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

Bangladeshi (42.3%) and Pakistani (26%) pupils have greater proportions in categories 5 and 6 as compared to their Black Caribbean (18.5%), Indian (12.1%) and white (9.6%) counterparts. By contrast, Bangladeshi and Pakistani groups have much lower proportions in the top category (signifying best material circumstances and least deprivation) than their white, Indian and Black Caribbean counterparts. The ethnic differential in the income distribution confirms the disadvantage of South Asian minorities. Table 5.7 shows that almost 60% of the Pakistani and 80% of the Bangladeshi families earn less than £15,500 per year at LSYPE wave 1, as compared to only 24% of the white, 35% of the Indian and 40% of the Black Caribbean families. This distribution hardly changed a year later.

Table 5.7 Income distributions of gross household income by ethnic group. at waves 1 and 2

	Wave 1					Wave 2				
Bands for HH income	White	Indian	Pak	Bang	BC	White	Indian	Pak	Bang	BC
<= £5200	6.1	6.6	17.7	31.3	12.1	4.4	5.7	17.1	28.4	8.2
£5200.01 to £10400	9.1	15.0	21.7	31.3	14.9	7.5	9.5	18.5	33.7	12.6
£10400.01 to £15.600	8.7	13.8	18.9	16.3	12.8	9.3	13.4	19.4	13.7	12.1
£15600.01 to £20800	10.0	12.5	14.3	7.5	12.8	8.1	9.5	14.4	7.4	9.9
£20800.01 to £33800	25.8	27.2	14.9	7.5	25.5	23.9	26.5	18.9	8.4	20.9
£33800.01 to £41000	10.6	10.0	5.1	1.3	7.1	12.4	14.2	4.1	4.2	8.8
£41000.01 to £55000	13.8	9.1	2.3	1.3	5.0	16.8	12.6	4.1	2.1	15.9
over £55000	15.9	5.9	5.1	3.8	9.9	17.8	8.5	3.6	2.1	11.5
Total	7578	751	642	484	324	7578	751	642	484	324
Missing	46.9	57.4	72.7	83.5	56.5	34.5	48.3	65.4	80.4	43.8

Note: HH=household; Pak=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

The lower-class profiles of South-Asian groups, particularly those of Pakistani and Bangladeshi groups are further exacerbated by the overwhelming proportions of mothers in these groups without formal qualifications. Table 5.8 shows that about half of Indian, three quarters of Pakistani and four fifths of Bangladeshi mothers were without qualifications in 2004, at LSYPE wave 1. In contrast, Black Caribbean mothers were very similar to their white counterparts.

Table 5.8 Level of qualification of mothers at LSYPE wave 1

Level of qualification	White	Indian	Pak	Bang	BC
1. No qualification	14.7	43.5	76.5	87.0	11.9
2. Other qualifications	1.7	1.8	0.8	1.1	0.6
3. Qualifications at level 1 or below	10.2	8.1	2.9	2.2	9.7
4. GCSE grades A-C or equivalent	32.5	21.1	8.3	5.9	28.8
5. GCE A level or equivalent	14.7	9.4	4.4	1.5	15.0
6. Higher education below degree level	13.9	7.7	3.6	1.5	21.6
7. Degree or equivalent	12.3	8.5	3.6	0.9	12.2
Total	7578	751	642	484	324
Missing	8.9	8.7	19.0	8.0	5.4

Note: Pak=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

Yet, while the South Asian groups were much more disadvantaged than their white and Black Caribbean counterparts, young people from South Asian groups had consistently much higher educational expectations. Tables 5.9 and 5.10 show pupil-reported likelihoods of expecting to apply to university and of being successful if apply. The original questions were '*How likely do you think it is that you will ever apply to go to university to do a degree?*' (*heposs9YP*) and '*How likely do you think it is that if you do apply to go to university you will get in?*' (*hlikeYP*). The first question included five options: 'very likely'; 'fairly likely'; 'not very likely'; 'not at all likely' and 'don't know' which was originally coded as missing (-1). The question was reverse-coded so that a high value represented the 'very likely' option. The second question was nested in the first in that only those who responded as 'very likely', 'fairly likely' and 'not very likely' were asked the second question. Thus, those pupils who chose the 'not at all likely' and the 'don't know' categories in the first question were treated as missing values in the second question. The second question included the same five options as question one and was also reverse-coded so that 'very likely' had the highest value. I have already discussed the reason why I did not use the 'don't know' category as a middle-point category denoting the 'undecided' in section 4.2, chapter 4. More than one third of Indian, Pakistani, Bangladeshi and slightly less of Black Caribbean young people expected to go to university and considered successful application for university study 'very likely' as compared to one fifth of their white counterparts. Although the proportions of white pupils who regarded a successful university application very likely increased in year 16 so did the proportions of all the other minority groups so the gaps in educational expectations remained. This evidence shows that the LSYPE data support the paradox shown by other studies reviewed in chapter 2.

Table 5.9: Pupil-reported likelihood to apply to university (heposs9YP) at LSYPE waves 1-3

	Wave 1					Wave 2					Wave 3				
Level of likelihood	W	I	P	B	BC	W	I	P	B	BC	W	I	P	B	BC
1.00 Not at all likely	12.0	2.2	3.2	4.1	4.1	15.4	3.0	3.6	5.1	.4	19.9	3.3	6.2	4.6	1.5
2.00	18.6	4.6	8.6	11.4	11.4	20.6	5.7	9.1	9.8	6.3	18.5	3.7	6.4	9.2	5.5
3.00	36.7	34.5	40.2	41.9	41.9	32.9	29.7	36.5	38.9	68.6	25.9	23.7	36.2	36.7	60.4
4.00 Very likely	32.7	58.8	48.1	42.6	42.6	31.1	61.6	50.7	46.1	24.7	35.7	69.3	51.2	49.6	32.7
Total	7578	751	642	484	324	7578	751	642	484	324	7578	751	642	484	324
Missing	4.9	3.5	7.3	9.3	9.3	4.9	2.3	6.1	7.6	16.4	4.5	2.3	4.5	5.4	15.1

Note: W=white; I=Indian; P=Pakistani; B=Bangladeshi; BC=Black Caribbean

Table 5.10: Pupil-reported likelihood of being accepted if applied (hlikeYP), by ethnic group at LSYPE waves 1-3

	Wave 1					Wave 2					Wave 3				
Level of likelihood	W	I	P	B	BC	W	I	P	B	BC	W	I	P	B	BC
1.00 Not at all likely	1.7	.6	.9	.5	.4	2.1	.9	1.1	.8	.4	1.9	.1	.2	.5	1.5
2.00	15.2	4.6	5.7	9.2	9.2	16.7	3.8	7.7	8.0	6.3	13.1	3.4	4.5	7.8	5.5
3.00	64.2	60.7	58.7	59.2	61.0	60.3	57.9	59.0	56.5	68.6	57.9	53.6	56.1	58.3	60.4
4.00 Very likely	19.0	34.0	34.6	31.1	29.4	20.9	37.4	32.2	34.8	24.7	27.1	42.9	39.2	33.5	32.7
Total	7578	751	642	484	324	7578	751	642	484	324	7578	751	642	484	324
Missing	21.8	10.8	15.4	19.0	16.0	25.0	9.9	14.5	17.4	16.4	28.1	9.3	17.3	14.9	15.1

Note: W=white; I=Indian; P=Pakistani; B=Bangladeshi; BC=Black Caribbean

Mother-reported parent-child conflict appears to be much less in Muslim families. Table 5.11 shows that in contrast to the white, the Indian and the Black Caribbean groups, almost one third of Bangladeshi and Pakistani mothers reported that they ‘never’ argued with the young person at LSYPE wave 1.

Table 5.11: Mother-reported frequency of arguing with young person (parqual) by ethnic group at LSYPE waves 1-3

	Wave 1					Wave 2					Wave 3				
Frequency of arguing	White	Indian	Pak	Bang	BC	White	Indian	Pak	Bang	BC	White	Indian	Pak	Bang	BC
1,00 Most days	12.7	11.3	12.6	8.5	11.8	12.6	11.4	10.9	8.0	9.6	9.8	11.6	8.4	8.6	11.0
2,00 More than once a week	25.4	18.3	16.4	11.8	25.9	21.4	18.1	13.5	8.6	25.5	19.2	12.9	14.5	7.1	19.6
3,00 Less than once a week	27.8	25.3	21.9	13.7	23.3	27.6	22.0	21.8	17.7	24.8	27.5	26.1	24.6	16.2	29.6
4,00 Hardly ever	31.4	37.1	32.5	35.5	34.4	34.7	39.5	33.8	39.4	35.8	39.2	39.4	33.7	43.7	33.6
5,00 Or never	2.8	8.0	16.7	30.3	4.6	3.7	9.0	20.1	26.3	4.3	4.2	9.9	18.7	24.4	6.3
Total	7578	751	642	484	324	7578	751	642	484	324	7578	751	642	484	324
Missing	2.7	16.4	43.0	56.4	5.9	2.2	16.0	38.6	63.8	6.8	2.0	14.2	36.8	59.3	7.1

Note: Pak=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

Table 5.12 does not show significant ethnic differences, although again Bangladeshi mothers reported the highest proportions of getting on very well with the young person. Although caution is

Table 5.12: Mother-reported frequency of how well she gets on with young person (kiddif) by ethnic group at LSYPE waves 1-3

	Wave 1					Wave 2					Wave 3				
How well mother & YP get on	White	Indian	Pak	Bang	BC	White	Indian	Pak	Bang	BC	White	Indian	Pak	Bang	BC
1.00 Very badly	.1	.5	.5	2.4	.0	.3	.3	.3	.6	.0	.4	.2	.7	1.0	.3
2.00 Badly	.8	.8	.3	2.4	.3	1.0	.8	1.0	2.3	2.3	1.1	1.2	1.0	2.5	1.7
3.00 Well	24.5	24.0	29.7	18.0	25.0	27.2	27.0	32.2	17.6	28.9	26.0	28.6	27.5	23.1	26.4
4.00 Very well	74.6	74.7	69.5	77.3	74.7	71.5	71.9	66.5	79.5	68.8	72.5	70.0	70.7	73.4	71.6
Total	7578	751	642	484	324	7578	751	642	484	324	7578	751	642	484	324
Missing	2.5	15.7	42.8	56.4	4.9	2.0	15.7	38.6	63.6	6.2	1.9	12.9	37.2	58.9	6.5

Note: YP=young person; Pak=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

needed because in both of these groups there were high proportions of missing values before the imputation, it is evident that parent-child conflicts were reported by Pakistani and Bangladeshi mothers as being much less frequent than in the other groups. The high proportion of missing values among the Bangladeshi and Pakistani mothers as regards frequency of parent-child conflict may be indicative of their different interpretations in considering this type of information sensitive.

Engagement with homework is shown by the frequency of weekday evenings spent on homework by the young person (Table 5.13) and frequency of homework assignment per term week (Table 5.14). Indian, Pakistani, and Bangladeshi pupils reported generally higher proportions of spending every weekday evening in doing homework at ages 14 and 15 as compared to their white and Black

Table 5.13 Young person-reported number of evenings per week spent on homework (hwndayYP) at LSYPE waves 1-2

	Wave 1					Wave 2				
No of Evenings	White	Indian	Pakis	Bang	BC	White	Indian	Pakis	Bang	BC
.00	2.5	1.1	2.0	.9	2.1	3.0	1.0	1.0	.9	1.7
1.00	13.6	7.1	10.3	10.6	9.6	16.3	7.7	11.3	10.2	13.0
2.00	21.4	15.4	20.9	19.8	14.7	23.9	14.3	17.2	19.6	22.3
3.00	28.3	29.1	29.3	30.2	40.1	26.6	29.9	32.3	29.1	30.7
4.00	15.6	18.7	16.2	15.1	12.0	13.5	17.6	17.0	16.8	16.0
5.00	18.5	28.6	21.3	23.4	21.6	16.6	29.5	21.1	23.4	16.3
Total	7578	751	642	484	324	7578	751	642	484	324
Missing	9.6	4.7	4.8	8.3	9.9	11.9	2.5	5.0	6.4	7.4

Note: Pakis=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

Table 5.14: Young person-reported frequency of how often he/she was given homework per week at term time (hwdoYP) at LSYPE waves 1-2

	Wave 1					Wave 2				
Frequency of homework assigned per week	White	Indian	Pakis	Bang	BC	White	Indian	Pakis	Bang	BC
1.00 never assigned any homework/once a week	1.2	.9	.3	.2	1.3	2.7	.5	1.4	1.7	1.6
2.00	3.2	.9	2.8	2.5	3.5	4.3	.7	1.7	.8	3.1
3.00	5.9	4.7	5.4	6.3	7.5	8.4	5.1	7.4	5.8	9.7
4.00	20.7	16.4	23.6	19.8	13.8	23.1	15.4	21.3	24.2	24.0
5.00 Five days /Most days assigned homework	69.0	77.0	67.9	71.1	73.9	61.5	78.3	68.2	67.4	61.7
Total	7578	751	642	484	324	7578	751	642	484	324
Missing	1.1	.4	1.6	1.0	1.9	1.1	.5	.5	1.0	.9

Note: Pakis=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

Caribbean peers. The same South Asian groups reported the highest frequencies of homework assignments at age 15. In contrast, white and Black Caribbean pupils appeared to spend generally fewer evenings doing homework. Further, these pupils tended to report the lowest proportions of homework assignments for 5 evenings per week. These proportions dropped further at age 15 while they increased for their Indian and Pakistani peers.

As regards pupils' feelings about school, Tables 5.15-5.18 show pupils' agreement with two positively-worded statements '*I'm happy when I am at school*'(*yys1YP*); '*on the whole I like being at school'* (*yys6YP*); and two negatively-worded statements '*Most of the time I don't want to go to school*'(*yys4YP*); '*I am bored at lessons*'(*yys9YP*). Both the positively and the negatively-worded statements show that much greater proportions of Pakistani, Bangladeshi and Indian pupils maintained positive feelings toward school as compared to their white and Black Caribbean peers.

Table 5.15: Pupils' agreement with ''*I'm happy when I am at school'* (yys1YP) by ethnic group at LSYPE waves 1-3

	Wave 1					Wave 2					Wave 3				
Level of agreement	White	Indian	Pakis	Bang	BC	White	Indian	Pakis	Bang	BC	White	Indian	Pakis	Bang	BC
1.00 Completely disagree	2.5	1.0	1.0	.7	3.3	3.5	1.0	1.1	2.2	2.0	4.2	1.0	1.3	1.5	2.2
2.00 Disagree	9.2	3.3	5.9	4.7	8.2	10.9	5.9	5.4	6.1	12.8	10.4	3.7	3.3	3.7	11.8
3.00 Agree	61.3	57.1	47.4	53.7	59.5	63.2	62.0	60.3	56.0	65.8	61.0	55.9	57.6	54.1	60.8
4.00 Completely agree	27.0	38.6	45.8	41.0	28.9	22.3	31.1	33.2	35.7	19.4	24.4	39.5	37.9	40.7	25.2
Total	7578	751	642	484	324	7578	751	642	484	324	100.0	751	642	484	324
Missing	4.4	2.8	4.7	6.8	6.2	4.8	3.6	4.7	5.6	6.2	3.8	2.5	4.2	4.1	3.1

Note: Pakis=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

Table 5.16: Pupils' agreement with '*on the whole I like being at school*' (yys6YP) by ethnic group at LSYPE waves 1-3

	Wave 1					Wave 2					Wave 3				
Level of agreement	White	Indian	Pakis	Bang	BC	White	Indian	Pakis	Bang	BC	White	Indian	Pakis	Bang	BC
1.00 Completely disagree	2.8	.3	1.3	.4	2.0	3.4	1.4	1.3	3.1	3.0	3.9	1.4	2.3	.6	3.8
2.00 Disagree	10.7	5.3	4.9	5.1	10.2	12.9	4.7	5.7	8.9	12.2	11.7	3.1	3.2	4.7	10.8
3.00 Agree	61.5	57.9	53.7	54.7	60.3	63.0	63.3	64.1	58.8	65.7	59.8	56.4	55.1	57.8	59.2
4.00 Completely agree	25.1	36.4	40.1	39.7	27.5	20.7	30.6	28.9	29.2	19.1	24.5	39.1	39.4	36.8	26.1
Total	7578	751	642	484	324	7578	751	642	484	324	7578	751	642	484	324
Missing	3.7	2.8	5.1	7.4	5.9	4.6	3.5	4.0	5.2	6.5	3.4	2.3	3.9	3.9	3.1

Note: Pakis=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

Table 5.17: Pupils' agreement with '*Most of the time I don't want to go to school*' (yys4YP) by ethnic group at LSYPE waves 1-3

	Wave 1					Wave 2					Wave 3				
Level of agreement	White	Indian	Pakis	Bang	BC	White	Indian	Pakis	Bang	BC	White	Indian	Pakis	Bang	BC
1.00 Strongly agree	7.0	2.8	4.9	2.9	5.7	6.8	3.1	4.3	4.9	5.9	7.2	3.7	2.8	4.6	6.9
2.00 Agree	24.3	16.5	18.9	22.6	23.0	24.8	16.7	21.3	23.4	29.8	21.2	13.6	17.5	19.6	29.7
3.00 Disagree	46.5	48.0	47.4	44.1	45.7	45.8	45.9	45.4	43.8	41.6	47.2	45.2	45.1	44.8	45.1
4.00 Strongly disagree	22.2	32.7	28.8	30.3	25.7	22.6	34.4	29.0	27.9	22.6	24.5	37.5	34.5	31.1	18.3
Total	7578	751	100.0	484	324	7578	100.0	642	484	324	7578	751	642	484	324
Missing	4.4	4.0	7.0	8.7	7.4	4.7	5.1	6.4	7.4	5.9	3.6	3.9	5.8	5.0	5.6

Note: Pakis=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

Table 5.18: Pupils' agreement with '*I'm bored at lessons'* (yys9YP) by ethnic group at LSYPE waves 1-3

	Wave 1					Wave 2					Wave 3				
Level of agreement	White	Indian	Pakis	Bang	BC	White	Indian	Pakis	Bang	BC	White	Indian	Pakis	Bang	BC
1.00 Strongly agree	9.1	3.3	4.6	5.9	7.5	10.1	3.7	2.9	4.9	5.2	9.7	3.0	3.8	6.2	4.3
2.00 Agree	34.6	25.3	22.7	27.9	32.4	37.9	29.4	28.3	32.7	37.5	37.0	24.5	23.4	28.0	37.1
3.00 Disagree	48.3	57.8	54.7	52.9	47.4	46.2	57.2	55.3	50.1	49.8	47.8	59.6	56.4	54.8	52.0
4.00 Strongly disagree	8.0	13.6	18.0	13.3	12.6	5.8	9.7	13.5	12.3	7.6	5.5	13.0	16.4	11.0	6.6
Total	7578	100.0	642	484	324	7578	751	642	484	324	7578	751	642	484	324
Missing	7.1	6.9	4.6	11.8	9.6	7.6	9.1	9.8	11.0	10.2	5.2	5.5	6.7	9.9	6.8

Note: Pakis=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

Interestingly, there appears to be a drop in this feeling across all groups at age 15 and an increase at age 16. However, the gaps in feelings about school between the white and the other minority groups increased between ages 14 to 16 mainly because white and Black Caribbean pupils showed a further drop in their feelings about school at age 16. Regarding pupils' assessments of teachers' effectiveness in maintaining discipline, Tables 5.19-5.22 show pupils' assessments regarding how many of their teachers the following four statements applied '*The teachers in my school make it clear how we should behave*' (*yys15YP*); *The teachers in my school take action when they see anyone breaking school rules*' (*yys16*); '*I like my teachers*' (*yys18*); '*My teachers can keep order in class*' (*yys19*). In general, Indian, Pakistani and Bangladeshi pupils reported greater proportions of their teachers fitting the higher levels of teachers' efficiency in maintaining discipline implied by the four statements and the greatest proportions of liking 'all of their teachers' (Table 5.21). Pupils' assessments with regard to this statement did not appear to change much between ages 14 to 15.

Table 5.19: Pupils' responses to how many of their teachers the statement '*The teachers in my school make it clear how we should behave*' (yys15YP) applies by ethnic group at LSYPE waves 1-2.

	r_W1yys15YP (wave 1)					r_W1yys15YP (wave 2)				
Statement applies to	White	Indian	Pak	Bang	BC	White	Indian	Pak	Bang	BC
1.00 None of my teachers	.2	.1	.2	.0	.0	.6	.4	1.0	.6	.0
2.00	2.5	2.2	1.5	1.8	1.6	2.1	1.1	1.9	1.1	1.9
3.00	15.3	11.4	10.7	11.4	14.6	15.7	13.5	10.2	13.4	17.0
4.00	46.9	43.3	34.7	41.6	38.2	47.7	43.1	40.3	40.6	39.7
5.00 All of my teachers	35.1	42.9	53.0	45.3	45.5	33.9	42.0	46.7	44.3	41.3
Total	7578	751	642	484	324	7578	751	642	484	324
Missing	2.2	2.0	3.6	5.6	3.1	2.3	2.0	1.9	4.3	2.2

Note:Pak=Pakistani Bang=Bangladeshi; BC=Black Caribbean

Table 5.20: Pupils' responses to how many of their teachers the statement '*The teachers in my school take action when they see anyone breaking school rules*' (yys16) applies by ethnic group at LSYPE waves 1-2.

	Wave 1					Wave 2				
Statement applies to	White	Indian	Pak	Bang	BC	White	Indian	Pak	Bang	BC
1.00 None of my teachers	.4	.1	.5	.0	.0	.5	.4	1.0	.4	.0
2.00	3.5	2.4	2.3	2.6	3.2	3.4	2.6	2.7	1.3	3.8
3.00	16.0	13.5	14.6	16.4	19.4	18.8	18.2	15.0	13.4	24.3
4.00	45.8	42.4	38.2	41.8	42.0	47.8	45.6	39.7	44.2	41.3
5.00 All of my teachers	34.4	41.5	44.4	39.2	35.4	29.5	33.2	41.6	40.7	30.6
Total	7578	751	642	484	324	7578	751	642	484	324
Missing	2.2	2.1	3.9	5.6	3.1	2.3	1.9	2.6	4.1	2.2

Note: Pak=Pakistani Bang=Bangladeshi; BC=Black Caribbean

Table 5.21: Pupils' responses to how many of their teachers the statement '*I like my teachers*' (yys18) applies by ethnic group at LSYPE waves 1-2.

	Wave 1					Wave 2				
Statement applies to	White	Indian	Pak	Bang	BC	White	Indian	Pak	Bang	BC
1.00 None of my teachers	1.6	1.0	1.8	2.8	3.8	1.7	1.5	2.4	3.2	3.2
2.00	10.1	6.5	5.5	9.6	14.7	9.9	6.1	6.6	7.1	16.8
3.00	43.3	47.2	42.8	38.2	52.1	42.1	45.4	42.1	47.2	49.1
4.00	40.6	38.5	38.8	41.7	27.2	41.7	40.1	38.5	34.1	26.9
5.00 All of my teachers	4.4	6.8	11.1	7.6	2.2	4.6	6.8	10.4	8.4	4.1
Total	7578	751	642	484	324	7578	751	642	484	324
Missing	2.2	2.1	3.3	5.4	3.4	2.4	2.1	3.0	4.1	2.5

Note: Pak=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

Table 5.22: Pupils' responses to how many of their teachers the statement '*My teachers can keep order in class*' (yys19) applies by ethnic group at LSYPE waves 1-2.

	Wave 1					Wave 2				
Statement applies to	White	Indian	Pak	Bang	BC	White	Indian	Pak	Bang	BC
1.00 None of my teachers	.9	.5	.5	.9	1.6	1.3	.8	1.8	.7	1.3
2.00	8.5	4.3	5.4	6.8	7.3	8.0	5.7	5.0	4.1	10.7
3.00	35.7	37.5	32.5	33.0	42.5	37.1	39.2	35.6	41.4	46.7
4.00	47.9	46.9	46.9	46.6	42.2	47.1	45.4	44.1	45.1	37.2
5.00 All of my teachers	7.0	10.7	14.8	12.7	6.4	6.4	8.9	13.5	8.7	4.1
Total	7578	751	642	484	324	7578	751	642	484	324
Missing	2.2	2.0	4.0	5.6	3.4	2.3	2.4	3.0	4.8	2.2

Note: Pak=Pakistani; Bang=Bangladeshi; BC=Black Caribbean

Table 5.23 reports the means (M), standard deviations (SD), skewness (Sk) and kurtosis (Kur) for all indicators described above. In the overwhelming proportion of cases, there were no severe deviations from normality. More specifically, skew did not exceed the recommended value of ±3.00 indicating extreme skew (Curran, West and Finch, 1997). Although there is less consensus regarding kurtosis, there is general agreement that a kurtosis index of between ±8.0 and ±20.0 indicates extreme kurtosis (DeCarlo, 1997). Thus, a 'rule of thumb' regarding kurtosis suggests that absolute values of > ±10.00 indicate extreme kurtosis (Kline, 2005, p. 50). Values of skew slightly exceeding ±3.00 and of kurtosis exceeding ±10.0 occurred only in the case of Bangladeshi mothers' NS-SEC classification. As explained above, Bangladeshi mothers belonged to families with the greatest disadvantage (over one third earning less than £5200 per year). This disadvantage was exacerbated by the fact that 85% of Bangladeshi mothers either never worked or were long-term

Table 5.23: Means, standard deviations, skewness and kurtosis for all indicator variables entering models 1-6 by ethnic groups at LSYPE waves 1-3

Variable name	White				Indian				Pakistani				Bangladeshi				Black Caribbean			
	M	SD	Sk	Kur	M	SD	Sk	Kur	M	SD	Sk	Kur	M	SD	Sk	Kur	M	SD	Sk	Kur
Father's NS-SEC w1	5.44	2.05	-.35	-1.13	4.70	2.10	.02	-1.15	4.09	2.01	.13	-.91	3.15	1.78	.67	-.24	5.16	2.04	-.22	-1.15
Father's NS-SEC w2	5.41	2.10	-.35	-1.20	4.70	2.19	.02	-1.34	4.04	2.14	.29	-1.08	3.09	1.92	.85	-.19	5.13	2.09	-.25	-1.23
Mother's NS-SEC w1	4.87	2.04	-.20	-1.37	3.94	2.19	.18	-1.35	1.90	1.79	2.05	2.96	1.45	1.32	3.28	10.05	5.04	2.17	-.51	-1.21
Mother's NS-SEC w2	4.89	2.05	-.20	-1.40	3.96	2.23	.21	-1.36	1.95	1.88	1.96	2.45	1.43	1.30	3.36	10.71	5.12	2.17	-.57	-1.14
HH deprivation w1	7.50	.91	-2.16	4.51	7.41	.88	-1.84	4.07	6.94	1.09	-1.08	1.12	6.62	1.01	-.37	-.26	7.17	1.04	-1.42	1.92
HH deprivation w2	7.49	.89	-2.15	4.76	7.42	.76	-1.42	2.08	7.02	.98	-1.00	1.11	6.76	.96	-.73	.69	7.24	.97	-1.35	1.35
HH gross income w1	5.06	2.07	-.28	-.84	4.34	1.91	.05	-.80	3.37	1.91	.70	-.14	2.56	1.74	1.51	2.13	4.15	2.09	.21	-.81
HH gross income w2	5.33	2.02	-.41	-.75	4.77	1.94	-.18	-.79	3.46	1.86	.53	-.36	2.65	1.74	1.25	.98	4.70	2.17	-.10	-1.12
Likely accepd at uni w1	3.00	.640	-.39	.67	3.28	.57	-.29	.49	3.27	.60	-.46	.69	3.20	.61	-.29	.07	3.19	.60	-.21	.04
Likely accepd at uni w2	3.00	.67	-.40	.36	3.31	.58	-.48	.82	3.22	.62	-.47	.63	3.25	.62	-.43	.24	3.17	.54	-.041	.72
Likely accepd at uni w3	3.10	.68	-.48	.37	3.39	.56	-.26	-.51	3.34	.57	-.24	-.33	3.24	.60	-.32	.08	3.24	.61	-.58	1.24
Likely go to uni w1	2.89	.99	-.53	-.76	3.49	.68	-1.43	2.14	3.33	.76	-1.07	.86	3.23	.80	-.91	.38	3.24	.81	-.88	.21
Likely go to uni w2	2.79	1.04	-.39	-1.03	3.49	.73	-1.54	2.13	3.34	.79	-1.13	.82	3.25	.83	-1.05	.57	3.12	.87	-.91	.26
Likely go to uni w3	2.77	1.13	-.36	-1.28	3.59	.71	-1.96	3.75	3.32	.84	-1.28	1.12	3.31	.82	-1.13	.76	3.27	.83	-1.12	.77
Evenings do HW, w1	2.96	1.37	-.05	-.87	3.43	1.29	-.36	-.73	3.11	1.34	-.12	-.82	3.18	1.32	-.10	-.94	3.15	1.29	-.17	-.52
Evenings do HW, w2	2.81	1.38	.07	-.89	3.44	1.32	-.36	-.75	3.16	1.30	-.14	-.83	3.20	1.32	-.13	-.93	2.95	1.30	-.00	-.78
Frequency HW set, w1	4.52	.84	-2.06	4.18	4.67	.69	-2.67	8.31	4.55	.75	-1.91	3.64	4.59	.73	-1.95	3.57	4.55	.87	-2.12	4.03
Frequency HW set, w2	4.36	.98	-1.71	2.42	4.70	.64	-2.57	7.71	4.53	.81	-2.06	4.55	4.54	.78	-2.24	6.03	4.41	.90	-1.68	2.59
Frequency argueing w1	2.86	1.07	-.19	-.96	3.12	1.14	-.37	-.78	3.24	1.26	-.34	-.93	3.67	1.25	-.76	-.46	2.94	1.12	-.19	-1.00
Frequency argueing w2	2.95	1.10	-.31	-.90	3.16	1.16	-.41	-.81	3.38	1.25	-.47	-.76	3.67	1.18	-.831	-.08	2.99	1.08	-.24	-.92
Frequency argueing w3	3.09	1.06	-.45	-.70	3.23	1.15	-.52	-.57	3.40	1.18	-.43	-.66	3.68	1.17	-.93	.14	3.05	1.10	-.30	-.74
How get on with YP w1	3.73	.46	-1.45	1.34	3.72	.49	-1.82	4.00	3.68	.50	-1.47	2.80	3.70	.63	-2.49	6.67	3.74	.44	-1.23	-.16
How get on with YP w2	3.69	.49	-1.49	2.28	3.70	.49	-1.48	2.24	3.64	.51	-1.13	.89	3.76	.51	-2.34	6.15	3.66	.51	-1.19	.36
How get on with YP w3	3.70	.50	-1.62	2.88	3.68	.49	-1.27	1.00	3.68	.53	-1.72	3.78	3.68	.57	-2.00	4.60	3.69	.51	-1.55	2.39
Happy at school w1	3.12	.66	-.66	1.12	3.33	.58	-.52	.96	3.37	.64	-.76	.57	3.35	.60	-.51	.39	3.14	.69	-.78	1.27
Happy at school w2	3.04	.68	-.70	1.18	3.23	.59	-.40	.87	3.25	.60	-.49	.99	3.25	.66	-.78	1.25	3.02	.63	-.49	1.08
Happy at school w3	3.05	.71	-.76	1.08	3.33	.59	-.56	.87	3.32	.60	-.63	1.34	3.34	.62	-.77	1.37	3.08	.67	-.55	.79
Not like go school w1	2.83	.84	-.37	-.43	3.10	.76	-.55	-.13	3.00	.82	-.53	-.20	3.01	.80	-.37	-.57	2.91	.84	-.41	-.42
Not like go school w2	2.84	.84	-.36	-.47	3.11	.78	-.58	-.17	2.99	.82	-.45	-.39	2.94	.84	-.39	-.51	2.80	.85	-.20	-.67
Not like go school w3	2.89	.85	-.47	-.34	3.16	.79	-.75	.13	3.11	.78	-.55	-.27	3.02	.83	-.52	-.32	2.75	.83	-.21	-.51
Like being at school w1	3.08	.67	-.64	1.01	3.30	.57	-.24	-.12	3.32	.63	-.70	.98	3.33	.59	-.40	.07	3.13	.66	-.56	.85
Like being at school w2	3.01	.68	-.63	.99	3.23	.59	-.52	1.46	3.20	.59	-.47	1.33	3.14	.69	-.74	1.10	3.00	.65	-.64	1.30
Like being at school w3	3.04	.71	-.71	.87	3.33	.60	-.68	1.38	3.31	.64	-.92	1.86	3.30	.58	-.39	.44	3.07	.71	-.73	.95
Bored in lessons w1	2.55	.76	-.24	-.31	2.81	.69	-.31	.11	2.86	.75	-.40	.010	2.73	.76	-.32	-.11	2.65	.79	-.19	-.35
Bored in lessons w2	2.47	.75	-.22	-.36	2.72	.68	-.29	.10	2.79	.70	-.19	-.094	2.69	.74	-.15	-.25	2.59	.70	-.14	-.16
Bored in lessons w3	2.49	.74	-.27	-.33	2.83	.68	-.33	.23	2.85	.72	-.36	.080	2.71	.74	-.37	-.00	2.61	.67	-.17	-.10
Teach: how behave w1	4.14	.77	-.67	.21	4.26	.75	-.86	.53	4.38	.74	-1.07	.76	4.30	.73	-.81	.16	4.27	.76	-.73	-.26
Teach: how behave w2	4.12	.78	-.75	.71	4.25	.75	-.83	.68	4.29	.80	-1.25	2.04	4.26	.77	-.97	1.10	4.20	.78	-.61	-.43
Teach: eff/ve disc w1	4.10	.81	-.73	.33	4.22	.78	-.80	.26	4.23	.81	-.92	.59	4.17	.79	-.63	-.26	4.09	.81	-.53	-.43
Teach: eff/ve disc w2	4.02	.81	-.64	.33	4.08	.80	-.64	.22	4.18	.85	-.99	.94	4.23	.75	-.83	.77	3.98	.83	-.36	-.66
I like my teachers w1	3.35	.78	-.39	.26	3.43	.75	-.09	.32	3.52	.82	-.23	.37	3.41	.87	-.48	.31	3.09	.80	-.35	.36
I like my teachers w2	3.37	.79	-.42	.28	3.44	.77	-.26	.55	3.47	.85	-.32	.41	3.37	.86	-.30	.55	3.12	.84	-.13	.12
Teach keep order w1	3.51	.78	-.43	.20	3.62	.75	-.18	.15	3.70	.80	-.26	-.04	3.63	.82	-.35	.11	3.44	.78	-.37	.49
Teach keep order w2	3.49	.78	-.47	.37	3.55	.76	-.25	.27	3.6	.84	-.41	.45	3.57	.73	-.14	.29	3.32	.76	-.24	.18

Note: To facilitate reading the table, I have included variable names in condensed form. For the actual wording of each variable and variable labels, please refer to Table 4.1, chapter 4, in the text as well as in the title of Tables 5.5-5.22; M=mean; SD=standard deviation; Sk=skew; Kur=kurtosis. YP=young person; HW=homework; w1-3=LSYPE waves 1-3; HH=household.

unemployed (see Table 5.5). So, both the extreme skew and kurtosis associated with this variable in the Bangladeshi group were substantively justified. However, although certainly non-normal, this variable is reported in Table 5.23 as exhibiting extreme skew and kurtosis before multiple imputation was performed on the data. It is therefore expected that these indexes will improve after imputation. In sum, Table 5.23 suggests that deviations from normality did occur but they were not extreme in most of the cases. Using the maximum likelihood estimator that assumed multivariate normality was therefore tolerated by the data.

5.4 Conclusions

This chapter presented the Longitudinal Study of Young People in England (LSYPE) which provides the data source for the repeated measures longitudinal models that were presented in chapter 4. I have described how the LSYPE wave 1 to 3 data were organised and provided basic information on the derivation of the samples representing the white, Indian, Pakistani, Bangladeshi and Black Caribbean mothers. Particular detail was given to the analysis of missingness, the imputation procedure and the derivation of covariance matrices that will be used as input in the multigroup analyses. It was also shown that statistically, the maximum likelihood estimator could be used because in general, the data did not exhibit severe deviations from normality. The description of indicator variables suggested that in descriptive analyses, the LSYPE data fully supported the paradox of high expectations of minority pupils from disadvantaged parental backgrounds discussed in chapter 2. In general terms, Indian, Pakistani and Bangladeshi pupils appeared to have higher expectations, much less parent-child conflict, greater engagement with homework, more positive feelings about their school and reported that greater proportions of their teachers were effective in maintaining discipline and order than their white and Black Caribbean peers. In general terms, Modood’s argument (Modood, 2003) that parenting style in Muslim families stresses obedience, higher supervision and control over homework and respect for school and teachers seems to gain support. However, conclusions relating to ethnic differences based on only the manifest data should be considered tentative, pending confirmation by more sophisticated measures and tests of significance. Further, the extent to which these factors impact on young people’s educational expectations remains to be seen. Both tasks are taken up in chapters 6 and 7.

Chapter 6: Results for research questions 1 and 2: Assessing moderated longitudinal change in models 1-6

Introduction

In this chapter I discuss the findings of the analysis addressing the following two research questions (RQ) as outlined in chapters 1 and 4:

(1) *Do parental social position, parent-child conflict, engagement with homework, feelings about school, assessment of teachers' effectiveness and adolescent expectations change between ages 14 and 16?*

(2) *Is this change different across the white, Indian, Pakistani, Bangladeshi and Black Caribbean pupils? In other words, are these trajectories of change moderated by maternal ethnicity?*

As already explained in chapter 1, research questions 1 and 2 are part of the preliminary analysis. This analysis is required to establish that the measurement parts of models 1-6 are longitudinally and cross-group invariant and thus comparable over time or across ethnicity groups prior to subsequent analysis. In the framework of this preliminary analysis, research question 1 regarding longitudinal change in a latent construct between times t, t+1 and t+2 is conditional on whether the required level of longitudinal invariance is supported by the data. Research question 2 is similarly conditional on whether cross-group invariance is supported by the data. My research does not have a substantive interest in social mobility reflected by longitudinal change in parental social position (model 1) although there is substantive interest in the longitudinal change of all other models (models 2-6, see chapter 4). Rather, my interest lies in whether the autoregressive latent variable structural equation model (SEM) 1, representing the predictor; SEM 2-5 representing the mediators and SEM 6 representing the outcome in the final mediation SEM 7 (i.e., models 1-7, see chapter 4) exhibit the necessary psychometric properties required to proceed to the next analytic stage. Subsequent analysis addressing RQ3 and 4 in chapter 7 is therefore conditional on the results of the preliminary analysis reported here.

The null hypothesis of no significant difference is systematically tested in all measurement invariance tests. Failure to reject the null hypothesis of measurement invariance over time and across groups in models 1-6 is a *desired* precondition. It suggests that the latent construct exhibits the required levels of invariance, which renders it comparable over time and across groups. It also means that whatever change is observed in the latent construct structural parameters can safely be attributed to the latent construct itself, as representing 'true change' (Chan, 1998). It is therefore required before the comparison of factor coefficients, factor means and factor intercepts (also referred to as latent means and intercepts), which are critical to understanding longitudinal change in latent constructs over time and across groups, can proceed. I explain why in section 6.3 below.

In short, a precondition of addressing research questions 1 and 2 is that adequate levels of longitudinal and cross group measurement invariance in models 1-6 were supported by the data. If adequate levels of *measurement* invariance are established, significant cross-group differences in factor coefficients, factor means and factor intercepts can be interpreted as implying moderation by maternal ethnicity. Thus, rejecting or failing to reject the null hypothesis of cross-group *structural* invariance in factor coefficients, factor means and factor intercepts of models 1-6 is of substantive interest. Such a finding would be consistent with what we would expect to see if moderation of these parameters by maternal ethnic group membership was in force. In turn, cross-group structural invariance suggests lack of such moderation.

Based on the review of literature in chapter 4, the following specific hypotheses can be formulated:

i. *parental social position is not expected to change over ages 14 to 15 in any ethnic minority.*
ii. *parent-child conflict is likely to change between ages 14 to 16. It is expected to be significantly lower in South Asian families as compared to white and Black Caribbean families.*
iii. *homework engagement is expected to change over ages 14 to 15 conforming to the growing demands for school work. It is expected to be significantly higher in the Indian, Pakistani and Bangladeshi pupils as compared to their white and Black Caribbean peers, reflecting South Asian pupils' generally higher academic performances.*
iv. *positive feelings about school are expected to change over time and be stronger among South Asian pupils as compared to their white and Black Caribbean peers.*
v. *pupils' assessments about teachers' effectiveness are also expected to change over time and to be generally higher among South Asian pupils and lower among their white and Black Caribbean peers.*
vi. *expectations are expected to change over time. South Asian pupils are expected to have much higher expectations about university study as compared to their white and Black Caribbean peers.*

This preliminary analysis sets the necessary interpretation framework for the analysis in chapter 7. Conditional on achieving the desired level of invariance, models 1-6 will provide important information on cross-group differences in factor means and intercepts which will help interpret any cross-group differences in factor coefficients describing structural relations in model 7, chapter 7. In section 6.1, I discuss the need for measurement invariance/equivalence (MI/E) tests in this thesis in more detail and the fit indices typically used in such tests. Section 6.2 contains the estimation of models 1-6 (see chapter 4) and all invariance tests conducted. In section 6.3, I discuss the cross-group comparisons of latent means and intercepts for models 1-6. In section 6.4, I discuss the findings as they relate to the research questions and specific hypotheses above. Thus, while the analysis that follows is preliminary, I draw on its results considerably as they are of substantive importance and integral to the interpretation of the results of the main analysis in chapter 7. I will bring together the results of both analyses in chapter 7 and relate them to the review of literature in chapter 2. Section 6.5 concludes.

6.1 The need for longitudinal and cross-group measurement invariance/equivalence tests

Measurement invariance/equivalence (MI/E) expresses the degree to which comparisons between latent constructs are possible by assessing whether latent constructs remain equivalent over time or across groups of different membership (Bagozzi and Yi, 1988; Dimitrov, 2010). Invariance tests are inherently therefore tests of the potential effect of a *moderator*, either *time* (in longitudinal invariance) or *group membership k* (in cross-group invariance) (Palich, Horn and Griffeth, 1995; Riordan and Vandenberg, 1994), as defined by ethnicity in past research (Ang, Huan and Braman, 2007; Ang *et al.*, 2009; Glanville and Wildhagen, 2007; Hoe and Brekke, 2009; Karcher and Sass, 2010; Sulik *et al.*, 2010; Tyson, 2004; Wicherts, Dolan and Hessen, 2005). Unless an acceptable degree of longitudinal or cross-group construct equivalence is established, any comparisons among constructs are misleading. Without appropriate MI/E tests, it is impossible to know whether the observed change over time was due to true development; moderation by group membership; or because the construct was perceived or interpreted differently. Acceptable levels of MI/E permit longitudinal and cross-group comparisons of structural estimates including latent means and intercepts (Widaman, Ferrer and Conger, 2010). For the purposes of the present analysis which is carried out within a CFA framework as explained in chapter 4, invariance tests establish whether all latent constructs share particular psychometric properties necessary to their comparison. Thus, invariance tests reported in this chapter will determine whether mediation analysis in chapter 7 is meaningful.

Typically, MI/E tests follow a prescribed sequence during which successively more restrictive constraints are placed on the measurement model (Bagozzi and Edwards, 1998; Bollen, 1989a; Marsh, Scalas and Nagengast, 2010; Steenkamp and Baumgartner, 1998; Vandenberg and Lance, 2000; Widaman, Ferrer and Conger, 2010). These tests typically start with a test of *configural* factorial invariance. This is a test of the null hypothesis that all unconstrained covariance structures are equivalent (H_o: $\mathbf{\Sigma}_k = \mathbf{\Sigma}$) for *k* groups. Typically, covariance structures of *k* groups are tested simultaneously in a single augmented covariance matrix. A small or non-significant overall model chi-square signifies failure to reject the null hypothesis and establishes the unrestricted *baseline* model within which all subsequent sequentially-constricted models are nested. A test of *metric factorial invariance* is the logical sequential step. This is a test of the hypothesis that the regression slopes linking the indicators to the latent construct are invariant longitudinally or across groups (H_o: $\boldsymbol{\lambda}_k = \boldsymbol{\lambda}$) for *k* groups or occasions. If overall model fit is acceptable and the difference in the chi-square ($\Delta\chi^2$) between the baseline and the metric-constricted model insignificant (based on the difference in the degrees of freedom (*df*) between the two models), metric invariance is established. Once this level of invariance is established, comparisons of structural estimates, i.e., relations between factors, can be compared across groups (Byrne, Shavelson and Muthén, 1989; Steenkamp and Baumgartner, 1998; Vandenberg and Lance, 2000; Wolfle, 1985). Partial metric invariance is also acceptable and is discussed in Appendix 3. Once full or partial metric invariance is established, the next step involves a test of *scalar invariance*. This is a test of the hypothesis that the intercepts of like indicators over time or across groups are statistically equivalent (H_o: $\boldsymbol{\tau}_k = \boldsymbol{\tau}$) for *k* groups or occasions. Scalar invariance is argued to represent a 'strong' form of factorial invariance (Meredith, 1993). When scalar invariance is established like indicators exhibit not only the same relation to their latent construct but also share the same origin. This allows direct comparison of both manifest and latent means and intercepts over time and across groups because group differences are interpreted as stemming only from the different latent means across *k* occasions or groups (Little, 1997, p. 56; Millsap and Kwok, 2004, p.101). *Partial scalar factorial invariance* (Millsap and Kwok, 2004; Vandenberg and Lance, 2000) is also acceptable but rules are less clear (Byrne, Shavelson and Muthén, 1989; Steenkamp and Baumgartner, 1998; Vandenberg and Lance, 2000). Millsap and Kwok's (2004, p 108) sensitivity tests suggest that a 20% to 25% noninvariance in indicator intercepts is tolerable to allow a comparison of latent means and intercepts. This norm was adopted in the analysis that follows. There are more restrictive tests of invariance beyond scalar level which are discussed in more detail in Appendix 3. They were not adopted in the present thesis because they are overly restrictive and are not required for comparison of latent means and intercepts. What follows is a selection of fit indices considered generally appropriate to expert practice in the relevant literature for invariance tests. For a systematic review of fit indices adopted in this thesis, see Tanaka (1993) and Browne and Cudeck (1993).

Model fit, chi-square difference tests and alternative fit indices

The chi-square difference test is crucial in invariance tests. The chi-square value and the associated *p* value can be interpreted unambiguously because its distribution is known (Arbuckle, 2009). However, because chi-square depends on sample size, it may also lead to the rejection of the null hypothesis too often, thus increasing Type I error rates or 'false positives' (i.e., showing significant differences while in reality there are none). In SEM, a nonsignificant chi-square is desired to indicate no difference between model and data and thus, good fit to data (Bentler and Bonett, 1980, p. 591). However, with large sample sizes the test will show that the data are significantly different even though the difference is 'so very slight as to be negligible or unimportant on other criteria (Gulliksen and Tukey, 1958, p. 95-96). To adjust for this possibility, methodologists have advised that the chi-square should be interpreted in conjunction with other fit indices (Arbuckle, 2011; Bollen, 1989b; Bollen and Long, 1993; Hu and Bentler, 1993; Widaman, Ferrer and Conger, 2010). Tanaka (1993, p. 32) proposed a set of alternative fit indices indicating when *not* to reject the null hypothesis solely on the basis of a significant model chi-square or the chi-square difference value. A description of several indices to complement the use of measures based upon chi-square follows. There is a plethora of additional fit indices like goodness of fit index (GFI); adjusted goodness of fit index (AGFI); parsimony goodness of fit (PGFI); root mean square residual (RMSR) that are available in AMOS Graphics 20 under unweighted least squares (ULS) but not under maximum likelihood (ML) estimation. Still others like gamma hat ($\hat{\gamma}$) or the Satorra-Bentler (Satorra and Bentler, 1994; 2001) scaled chi-square ($SB\chi^2$) are not available. However AMOS provides a thorough means of assessing invariance.

The *normed fit index* (NFI) (Bentler and Bonett, 1980) or *delta 1* (Bollen, 1989b) expresses the distance of the model chi-square from the perfectly-fitting saturated model (a model that includes all possible paths and thus, zero degrees of freedom, (Arbuckle, 2009; 2011). Values ≥ 0.90 indicate good fit and ≥ 0.95 very good fit (Bollen, 1989a). NFI is sample-dependent (Tanaka, 1993, p. 32). The *Relative fit index* (RFI) or *rho 1* (Bollen, 1986) represents an adjustment for sample-dependency and typically produces lower values than the NFI. It ranges from 0 – 1 with values ≥ 0.90 indicating good fit and ≥ 0.95 very good fit (Arbuckle, 2011). The *incremental fit index* (IFI) (Bollen, 1989b) also referred to as *delta 2* (Bollen, 1989b; 1990) adjusts for sample size dependency of NFI but also controls for the degrees of freedom available to evaluate the target model (Tanaka, 1993, p. 36). The *Tucker-Lewis coefficient* (TLI), also known as *rho 2* (Bollen, 1989b) or *non-normed fit index*

(NNFI) compares the fit of the target model to that of the null model. Its advantage is that it is not sample-dependent (Tanaka, 1993, p. 32). It penalises more complex models because it controls for the degrees of freedom of both the target and the null model. Typically it ranges from 0-1 but in very-well fitting models it can slightly exceed 1.00. (5) The *comparative fit index* (CFI) (Bentler, 1990) adjusts for both sample size and the noncentrality parameter, taking into consideration the non-normality of the chi-square distribution (Marsh, Balla and McDonald, 1988). CFI is identical to the *relative noncentrality index* (RNI) (McDonald and Marsh, 1990) but it is normed so that it has a range of 0-1. Values ≥ 0.90 indicate good fit and ≥ 0.95 very good fit (Vandenberg and Lance, 2000). Finally, *Root mean square* (RMS) (Steiger and Lind, 1980) or *root mean square error of approximation* (RMSEA) (Browne and Cudeck, 1993) is also a noncentrality-based index but also adjusts for model complexity and sample size. It is particularly sensitive to misspecified factor loadings (Hu and Bentler, 1998; Hu and Bentler, 1999) so it is good to use for metric invariance tests. It expresses the error of the target model to approximate the true model in the population (Jöreskog and Sörbom, 1996, p. 124). RMSEA produces a 90% two-tailed confidence interval with a lower bound of 0.0 and an upper bound of $+\infty$. RMSEA values ≤ 0.05 indicate close fit while values ≤ 0.08 indicate a reasonable error of approximation (Browne and Cudeck, 1993). The PCLOSE is also reported in connection to the RMSEA. It expresses a *p* value for testing the hypothesis that the true value of the RMSEA is ≤ 0.05. It ranges from 0 to 1.00.

However, the distributions of the above indices are unknown (Arbuckle, 2009). Therefore, differences in values of any index will also have unknown distributions. Cheung and Rensvold (1999) studied the behaviour of TLI, RMSEA and CFI under varying conditions of measurement invariance, sample size discrepancy in multigroup solutions and model specification. They concluded that all three indices were superior to chi-square in terms of Type I error rates. They suggested that a change in CFI of -0.01 or less indicated that the null hypothesis of invariance should not be rejected. Other studies reported that a change in TLI of ≤ 0.02 (McGaw and Jöreskog, 1971) or ≤ 0.05 (Little, 1997) was negligible and the invariance hypothesis should not be rejected. More recent simulation studies have confirmed that CFI and RMSEA were robust to varying sample sizes, under multiple conditions of factorial invariance (Cheung and Rensvold, 2002). A CFI change (ΔCFI) of ≤ 0.01 and a RMSEA change (ΔRMSEA) of ≤ 0.016 (see, Cheung and Rensvold, 2002, Table 4, p. 245) were reasonable indications that the hypothesis of invariance should not be rejected even if $\Delta\chi^2$ was significant. If noninvariance cannot be supported by theory or previous research, then greater reliance on the alternative fit indices is recommended (Raykov, 2004; Widaman, Ferrer and Conger, 2010).

Some researchers used the scaled chi-square ($SB\chi^2$) (Satorra and Bentler, 1994; 2001) and the Satorra-Bentler difference test ($\Delta SB\chi^2$) instead of the usual $\Delta\chi^2$. The $SB\chi^2$ corrects for the approximate chi-square under conditions of severe non-normality of the indicators. This correction was not incorporated in the present study because AMOS Graphics 20 did not provide it. Additional statistical reasons made its use unnecessary, however. None of the cut-off points for the above alternative indices (ΔCFI; ΔRMSEA) were intended to supplement the $SB\chi^2$ but only the $\Delta\chi^2$. Also, the $SB\chi^2$ is *not* chi-square distributed (Satorra, 2000) and is affected by sample size (Dimitrov, 2010, p 126). Finally, the $SB\chi^2$ does not affect the magnitude of structural estimates but only provides adjusted standard errors (Byrne, 2010, p.127). In this analysis, bootstrapping was performed as an extra precaution against the possibility that there were divergences from the assumptions of ML estimation. Bootstrapping (based on 1000 bootstrapped samples) derived standard errors that could be compared to the asymptotic ML SE produced as a default by the analysis. Bootstrapping was particularly useful in cases where there were no standard errors for specific indirect effects (see chapter 7). Simulation studies have also shown that bootstrapping performed better than the $SB\chi^2$ if the underlying assumptions of ML estimation and SE were violated (Fouladi, 1998; Hancock and Nevitt, 1999; Nevitt and Hancock, 2001). Bootstrapping was performed in all models. Bootstrapped standard errors for models 1-6 are reported only if the ML-based significance in their measurement and structural parts was in doubt.

6.2 Results regarding the goodness of fit to data of models 1-6.

Table 6.1 reports the model fit for models 1-6 with configural, metric and scalar longitudinal invariance constraints in place. The table reports the chi-square value (χ^2), degrees of freedom (df), significance (p) and the discrepancy/df ratio ($\hat{C}/d$) as well as normed fit index (NFI); relative fit index (RFI); incremental fit index (IFI); Tucker-Lewis index (TLI); comparative fit index (CFI); the root mean square error of determination (RMSEA); its lower (LO) and upper (HI) bounds and the probability that the RMSEA is ≤ 0.05 in the population (PCLOSE). As a yardstick, I also report the cut-off points above which very good to excellent fit is indicated at the bottom of Table 6.1 and the sample sizes next to each ethnicity group.

All the models achieved very good to excellent overall model fit based on the commonly accepted standards reported in the note of table 6.1. This suggests that longitudinal metric and (at least

Table 6.1: Overall fit of the final models 1-6 with achieved configural, metric and scalar longitudinal invariance

Model 1: FAMCIRC (Parental social position and associated family-level material circumstances at pupils' ages 14-15)													
Group & sample size	**χ^2**	**df**	**p**	**$\hat{C}$/d**	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**	**RMSEA**	**LO**	**HI**	**PCLOSE**
White (n=1000)	53.3	18	0.0	2.9	0.990	0.984	0.993	0.989	0.993	0.044	0.03	0.06	0.733
Indian (n=751)	17.9	20	ns	0.89	0.996	0.994	1.000	1.001	1.000	0.000	0.00	0.02	1.000
Pakistani (n=642)	49.3	19	0.0	2.59	0.985	0.978	0.991	0.987	0.991	0.050	0.03	0.067	0.474
Bangladeshi (n=487)	54.2	19	0.0	2.77	0.976	0.966	0.984	0.978	0.984	0.061	0.04	0.08	0.141
BCaribbean (n=324)	31.7	19	0.0	1.67	0.982	0.973	0.993	0.989	0.993	0.045	0.013	0.07	0.574
Model 2: PAR (Parent-child conflict at pupils' ages 14-15-16)													
Group & sample size	**χ^2**	**df**	**p**	**$\hat{C}$/d**	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**	**RMSEA**	**LO**	**HI**	**PCLOSE**
White (n=1000)	21.1	9	0.01	2.22	0.986	0.978	0.992	0.988	0.992	0.035	0.015	0.05	0.888
Indian (n=751)	14.1	9	ns	1.49	0.982	0.974	0.994	0.991	0.994	0.026	0.00	0.05	0.942
Pakistani (n=642)	16.4	7	0.02	2.11	0.978	0.958	0.989	0.979	0.987	0.046	0.01	0.069	0.653
Bangladeshi (n=487)	24.8	9	0.0	2.76	0.927	0.876	0.951	0.917	0.950	0.060	0.033	0.089	0.241
BCaribbean (n=324)	18.11	10	0.05	1.81	0.956	0.934	0.980	0.967	0.979	0.050	0.00	0.086	0.449
Model 3: HW (Pupils' engagement with homework at ages 14-15)													
Group & sample size	**χ^2**	**df**	**p**	**$\hat{C}$/d**	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**	**RMSEA**	**LO**	**HI**	**PCLOSE**
White (n=1000)	2.8	2	ns	1.43	0.997	0.992	0.999	0.998	0.999	0.021	0.00	0.07	0.792
Indian (n=751)	1.6	3	ns	0.56	0.997	0.994	1.002	1.004	1.000	0.000	0.00	0.04	0.953
Pakistani (n=642)	2.5	3	ns	0.45	0.994	0.989	1.001	1.002	1.000	0.000	0.00	0.06	0.873
Bangladeshi (n=487)	2.1	3	ns	0.53	0.992	0.984	1.003	1.006	1.000	0.000	0.00	0.06	0.857
BCaribbean (n=324)	5.5	4	ns	1.38	0.978	0.966	0.994	0.990	0.994	0.035	0.00	0.09	0.576
Model 4: SCH (Pupils' feeling about school – school affect at ages 14-15-16)													
Group & sample size	**χ^2**	**df**	**p**	**$\hat{C}$/d**	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**	**RMSEA**	**LO**	**HI**	**PCLOSE**
White (n=1000)	118.9	48	0.0	2.47	0.974	0.964	0.984	0.978	0.984	0.038	0.03	0.04	0.986
Indian (n=751)	101.8	50	0.0	2.03	0.963	0.951	0.981	0.978	0.981	0.037	0.02	0.04	0.981
Pakistani (n=642)	98.5	48	0.0	2.01	0.948	0.930	0.973	0.963	0.972	0.041	0.02	0.05	0.931
Bangladeshi (n=487)	78.5	50	0.0	1.57	0.939	0.921	0.977	0.969	0.977	0.034	0.02	0.04	0.967
BCaribbean (n=324)	79.2	55	0.0	1.44	0.942	0.931	0.982	0.978	0.981	0.037	0.01	0.05	0.887
Model 5: TCH (Pupils' assessments of teachers' collective effectiveness in enforcing and maintaining discipline at ages 14-15)													
Group & sample size	**χ^2**	**df**	**p**	**$\hat{C}$/d**	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**	**RMSEA**	**LO**	**HI**	**PCLOSE**
White (n=1000)	33.2	18	0.0	1.847	0.982	0.973	0.992	0.987	0.992	0.029	0.012	0.044	0.990
Indian (n=751)	36.6	18	0.0	2.037	0.976	0.962	0.987	0.980	0.987	0.037	0.019	0.054	0.883
Pakistani (n=642)	38.5	18	0.0	2.142	0.971	0.955	0.984	0.976	0.984	0.042	0.024	0.061	0.737
Bangladeshi (n=487)	38.2	20	0.0	1.911	0.961	0.945	0.981	0.973	0.981	0.043	0.022	0.064	0.673
BCaribbean (n=324)	39.5	20	0.0	1.976	0.951	0.932	0.975	0.965	0.975	0.055	0.029	0.080	0.343
Model 6: YPEX (Pupils' educational expectations at ages 14-15-16)													
Group & sample size	**χ^2**	**df**	**p**	**$\hat{C}$/d**	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**	**RMSEA**	**LO**	**HI**	**PCLOSE**
White (n=1000)	15.9	10	ns	1.586	0.996	0.993	0.998	0.998	0.998	0.024	0.000	0.046	0.979
Indian (n=751)	6.0	9	ns	0.661	0.997	0.994	1.002	1.003	1.000	0.000	0.000	0.030	1.000
Pakistani (n=642)	14.6	9	ns	1.621	0.989	0.982	0.996	0.993	0.996	0.031	0.000	0.059	0.850
Bangladeshi (n=487)	13.5	12	ns	1.123	0.987	0.984	0.999	0.998	0.999	0.016	0.000	0.05	0.947
BCaribbean (n=324)	20.3	10	0.0	2.031	0.969	0.954	0.984	0.976	0.984	0.056	0.019	0.092	0.338

Note: **χ^2 =chi-square; df=degrees of freedom; p=significance; *C*/d=ratio of discrepancy to df (<2.00); NFI=normed fit index (>0.95); RFI=relative fit index (>0.95); IFI=incremental fit index (>0.95); TLI=Tucker-Lewis index (>0.95); CFI=comparative fit index (>0.95); RMSEA=Root mean square error or approximation (<0.05); LO=lower bound of the RMSEA (0.0); HI=upper bound of the RMSEA (<.0.05); PCLOSE=probability that the RMSEA is ≤ 0.05 in the population (1.000).**

partial) scalar invariance was achieved. In most cases the model chi-square was small in relation to its degrees of freedom ($\hat{C}$/d) and the good fit was confirmed by all fit indices. CFI ranged from 0.95-1.004 while the RMSEA was in most cases well below 0.05. Model 3 (pupils' engagement with homework, labelled HW) was not tested for longitudinal invariance in any group because scalar invariance was achieved from the start. For model 3, the model chi-square remained nonsignificant when the augmented covariance matrix (including all occasions) was constrained to loading and intercept longitudinal invariance. This indicated that model 3 remained longitudinally invariant under configural, metric and scalar invariance constraints. For the rest of the models longitudinal invariance was confirmed and is shown in Tables 6.3a-c (see below). The measurement parts of models 1-6 are presented in Table 6.2. I report the unstandardized (**b**) and standardized (**β**) coefficients and their standard errors (SE). All measurement models were longitudinally consistent, i.e., the loadings of like indicators across occasions were all very significant and had standardized estimates of roughly equal magnitudes. Some of the intercepts in models 1-6 exhibited differential item functioning (DIF). Appendix 4 provides a full commentary on the evidence for DIF.

Table 6.2: Estimated measurement parts of models 1-6 by maternal ethnicity with configural, metric and scalar longitudinal invariance achieved

	White			Indian			Pakistani			Bangladeshi			BCaribbean		
Model 1: FAMCIRC (parental social class and associated family-level deprivation at pupils' ages 14-15)															
	b	**SE**	**β**	**b**	**SE**	**β**	**b**	**SE**	**β**	**b**	**SE**	**β**	**b**	**SE**	**β**
λ_{11} father's NS-SEC w1	1.000		0.637	1.000		0.608	1.000		0.606	1.000		0.418	1.000		0.455
λ_{21} mother's NS-SEC w1	1.008	0.074	0.580	1.062	0.084	0.614	0.705	0.096	0.420	1.419	0.258	0.788	0.868	0.136	0.515
λ_{31} deprivation score w1	0.317	0.026	0.449	0.256	0.025	0.376	0.282	0.037	0.349	0.311	0.065	0.249	0.327	0.055	0.407
λ_{41} gr. family income w1	1.000	0.070	0.679	1.170	0.089	0.769	1.019	0.123	0.556	1.102	0.171	0.358	1.527	0.250	0.820
λ_{12} father's NS-SEC w2	1.000		0.639	1.000		0.602	1.000		0.614	1.000		0.397	1.000		0.423
λ_{22} mother's NS-SEC w2	1.008	0.074	0.586	1.062	0.084	0.610	0.705	0.096	0.425	1.419	0.258	0.814	0.868	0.136	0.492
λ_{32} deprivation score w2	0.317	0.026	0.436	0.256	0.025	0.432	0.282	0.037	0.413	0.311	0.065	0.265	0.327	0.055	0.422
λ_{42} gr. family income w2	1.000	0.070	0.663	1.170	0.089	0.767	1.019	0.123	0.611	1.102	0.171	0.395	1.527	0.250	0.850
Model 2: PAR (parent-child conflict at pupils' ages 14-16)															
λ_{11} freq. of arguing with YP w1	1.000		0.823	1.000		0.730	1.000		0.739	1.000		0.997	1.000		0.288
λ_{21} how bad relation is with YP w1	0.196	0.017	0.374	0.204	0.020	0.339	0.199	0.022	0.362	0.111	0.021	0.216	0.755	0.111	0.545
λ_{12} freq. of arguing with YP w2	1.000		0.808	1.000		0.759	1.000		0.837	1.000		0.854	1.000		0.404
λ_{22} how bad relation is with YP w2	0.196	0.017	0.324	0.204	0.020	0.358	0.199	0.022	0.385	0.111	0.021	0.198	0.755	0.111	0.630
λ_{13} freq. of arguing with YP w3	1.000		0.922	1.000		0.752	1.000		0.866	1.000		0.997	1.000		0.404
λ_{33} how bad relation is with YP w3	0.196	0.017	0.370	0.204	0.020	0.356	0.199	0.022	0.393	0.169	0.020	0.344	0.755	0.111	0.676
Model 3: HW (pupils' engagement with homework at ages 14-15)															
λ_{11} evenings spent on homework w1	1.000		0.872	1.000		0.802	1.000		0.878	1.000		0.800	1.000		0.997
λ_{21} freq. of homework assigned w1	0.433	0.025	0.596	0.298	0.023	0.545	0.298	0.028	0.528	0.272	0.038	0.490	0.242	0.019	0.478
λ_{12} evenings spent on homework w2	1.000		0.836	1.000		0.808	1.000		0.838	1.000		0.803	1.000		0.997
λ_{22} freq. of homework assigned w2	0.433	0.025	0.612	0.298	0.023	0.567	0.298	0.028	0.509	0.272	0.038	0.453	0.242	0.019	0.446
Model 4: SCH (pupils' feelings or affect about school at ages 14-16)															
λ_{11} *I'm happy when I am at school* w1	1.000		0.590	1.000		0.535	1.000		0.545	1.000		0.528	1.000		0.589
λ_{21} *I do not want to go to school* w1	1.346	0.061	0.627	1.694	0.097	0.681	1.183	0.105	0.478	1.380	0.141	0.530	1.438	0.109	0.694
λ_{31} *I like being at school* w1	1.065	0.054	0.556	1.198	0.077	0.542	1.074	0.093	0.484	1.068	0.111	0.430	.981	0.087	0.515
λ_{41} *I'm bored at lessons* w1	1.127	0.036	0.672	1.139	0.052	0.619	1.099	0.061	0.610	1.119	0.081	0.608	1.079	0.058	0.681
λ_{12} *I'm happy when I am at school* w2	1.000		0.604	1.000		0.495	1.000		0.516	1.000		0.473	1.000		0.593
λ_{22} *I do not want to go to school* w2	1.346	0.061	0.638	1.694	0.097	0.657	1.183	0.105	0.466	1.380	0.141	0.510	1.438	0.109	0.629
λ_{32} *I like being at school* w2	1.065	0.054	0.578	1.198	0.077	0.540	1.074	0.093	0.501	1.068	0.111	0.460	0.981	0.087	0.518
λ_{42} *I'm bored at lessons* w2	1.127	0.036	0.673	1.139	0.052	0.577	1.099	0.061	0.580	1.119	0.081	0.510	1.079	0.058	0.602
λ_{13} *I'm happy when I am at school* w3	1.000		0.651	1.000		0.574	1.000		0.596	1.000		0.552	1.000		0.619
λ_{23} *I do not want to go to school* w3	1.346	0.061	0.711	1.694	0.097	0.734	1.183	0.105	0.564	1.380	0.141	0.527	1.438	0.109	0.731
λ_{33} *I like being at school* w3	1.065	0.054	0.634	1.198	0.077	0.609	1.074	0.093	0.529	1.068	0.111	0.489	0.981	0.087	0.610
λ_{43} *I'm bored at lessons* w3	1.127	0.036	0.708	1.139	0.052	0.636	1.099	0.061	0.599	1.119	0.081	0.641	1.079	0.058	0.639
Model 5: TCH (pupils' assessments of teachers' collective effectiveness at ages 14-15)															
λ_{11} *teach make clear how we should behave* w1	1.000		0.607	1.000		0.577	1.000		0.528	1.000		0.536	1.000		0.673
λ_{21} *teachers take action when rules broken* w1	1.026	0.058	0.592	0.990	0.059	0.539	1.206	0.085	0.543	1.049	0.099	0.523	1.070	0.075	0.699
λ_{31} *I like my teachers* w1	0.759	0.067	0.445	0.981	0.081	0.557	0.923	0.104	0.444	1.340	0.145	0.605	0.738	0.094	0.478
λ_{41} *teachers can keep order in class* w1	1.032	0.078	0.620	1.282	0.092	0.725	1.442	0.126	0.692	1.544	0.147	0.748	0.937	0.092	0.619
λ_{12} *teach make it clear how we should behave* w2	1.000		0.608	1.000		0.567	1.000		0.563	1.000		0.431	1.000		0.673
λ_{22} *teachers take action when rules broken* w2	1.026	0.058	0.596	0.990	0.059	0.526	1.206	0.085	0.616	1.049	0.099	0.460	1.070	0.075	0.681
λ_{32} *I like my teachers* w2	0.759	0.067	0.460	0.981	0.081	0.550	0.923	0.104	0.500	1.340	0.145	0.492	0.738	0.094	0.483
λ_{42} *teachers can keep order in class* w2	1.032	0.078	0.603	1.282	0.092	0.711	1.442	0.126	0.725	1.544	0.147	0.680	0.937	0.092	0.672
Model 6: YPEX (pupils' educational expectations at ages 14 – 16)															
λ_{11} *How likely to apply to university* w1	0.603	0.015	0.743	0.673	0.028	0.634	0.661	0.032	0.682	0.698	0.034	0.689	0.626	0.040	0.649
λ_{21} *How likely to get in university if apply* w1	1.000		0.903	1.000		0.850	1.000		0.869	1.000		0.864	1.000		0.828
λ_{12} *How likely to apply to university* w2	0.603	0.015	0.756	0.673	0.028	0.677	0.661	0.032	0.678	0.698	0.034	0.695	0.626	0.040	0.700
λ_{22} *How likely to get in university if apply* w2	1.000		0.923	1.000		0.871	1.000		0.844	1.000		0.875	1.000		0.823
λ_{13} *How likely to apply to university* w3	0.603	0.015	0.781	0.673	0.028	0.693	0.661	0.032	0.739	0.698	0.034	0.703	0.626	0.040	0.660
λ_{33} *How likely to get in university if apply* w3	1.000		0.924	1.000		0.918	1.000		0.880	1.000		0.878	1.000		0.888

Note: b=unstandardized loading; β=standardized loading; SE=standard error. 1.000 under (b) refers to loadings which were fixed to unity for identification purposes. The same indicator in each occasion in each model was fixed to unity as a requirement of configural, metric and scalar longitudinal and cross-group invariance

Tables 6.3a-c present the tests for longitudinal invariance for models 1-6 except for model 3 for which they were not necessary as explained above. Freely-estimated items are noted as 'free'. Full

Table 6.3a: Tests for longitudinal invariance for models 1-2

Model 1: FAMCIRC (parental social class and associated family material circumstances)										
	χ^2	df	p	$\Delta\chi^2$	df	p	CFI	ΔCFI	RMSEA	ΔRMSEA
White (n=1000)										
baseline	35.5	12	0.0	-	-	-	0.995	-	0.045	-
metric	45.3	15	0.0	9.8	3	ns	0.994	-0.001	0.045	0.00
scalar	85.4	19	0.0	40.1	3	0.0	0.987	-0.007	0.059	0.014
p.scalar (i_dW2 free)	53.3	18	0.0	8.0	3	ns	0.993	-0.001	0.044	-0.001
Indian (n=751)										
baseline	14.4	14	ns	-	-	-	1.000	-	0.006	-
metric	16.9	17	ns	2.5	3	ns	1.000	0.000	0.000	-0.001
scalar	43.5	21	0.0	26.6	4	0.0	0.995	-0.005	0.038	0.038
p.scalar (i_dW2 free)	19.9	20	ns	3.0	1	ns	1.000	0.000	0.024	0.024
Pakistani (n=642)										
baseline	25.3	13	0.02	-	-	-	0.996	-	0.038	-
metric	36.1	16	0.03	10.8	3	0.04	0.994	-0.002	0.044	0.006
scalar	49.3	19	0.00	13.2	3	0.00	0.991	-0.003	0.050	0.006
Bangladeshi (n=487)										
baseline	43.0	14	0.00	-	-	-	0.988	-	0.65	-
metric	51.0	17	0.00	8.0	3	ns	0.986	-0.002	0.064	-0.001
scalar	67.6	20	0.00	16.6	3	0.00	0.980	-0.006	0.070	0.006
p.scalar (HHdepW2 free)	54.2	19	0.00	3.2	1	ns	0.985	-0.001	0.062	-0.002
Black Caribbean (n=324)										
baseline	20.1	13	ns	-	-	-	0.996	-	0.041	-
metric	25.1	16	ns	5.0	3	ns	0.994	-0.002	0.043	0.002
scalar	37.7	19	0.03	12.6	3	0.0	0.993	-0.001	0.045	0.002
Model 2: PAR (parent-child conflict)										
	χ^2	df	p	$\Delta\chi^2$	df	p	CFI	ΔCFI	RMSEA	ΔRMSEA
White (n=1000)										
baseline	0.5	4	ns	-	-	-	1.000	-	0.00	-
metric	2.8	6	ns	2.3	2	ns	1.000	0.00	0.00	0.00
scalar	43.8	10	0.0	41.0	4	0.0	0.978	-0.02	0.05	0.05
p.scalar (parqualW2 free)	21.1	9	0.0	18.3	1	0.0	0.992	-0.08	0.03	0.03
Indian (n=751)										
baseline	0.7	3	ns	-	-	-	1.000	-	0.00	-
metric	2.4	5	ns	1.7	2	ns	1.000	0.00	0.00	-
scalar	14.1	9	ns	11.7	4	0.05	0.994	-0.006	0.02	0.02
Pakistani (n=642)										
baseline	9.2	3	0.02	-	-	-	0.991	-	0.057	-
metric	13.8	5	0.01	4.6	2	ns	0.988	-0.003	0.052	0.005
scalar	46.3	3	0.0	32.5	4	0.0	0.949	-0.039	0.080	0.028
p.scalar (i_bW3 free)	27.1	8	0.0	13.3	1	0.0	0.974	-0.014	0.061	0.009
p.scalar (i_aW1 free)	16.4	7	0.02	2.6	2	ns	0.987	-0.001	0.046	0.006
Bangladeshi (n=487)										
baseline	17.7	4	0.01	-	-	-	0.957	-	0.08	-
metric	26.6	6	0.00	8.9	2	0.0	0.935	-0.022	0.08	0.00
p.metric (bW3-kiddif free)	20.3	5	0.00	2.6	1	ns	0.952	-0.006	0.08	0.00
scalar	24.8	9	0.0	4.5	3	ns	0.950	-0.002	0.06	-0.02
Black Caribbean (n=324)										
baseline	8.9	5	ns	-	-	-	0.990	-	0.049	-
metric	16.0	7	0.0	7.1	2	ns	0.977	-0.01	0.050	0.001
scalar	27.0	11	0.0	16.0	4	0.0	0.959	-0.018	0.067	0.017
p.scalar (i_bW1kiddif free)	18.1	10	0.05	2.1	3	ns	0.979	0.002	0.050	0.000

Note: **χ^2 =chi-square; df=degrees of freedom; p=significance; $\Delta\chi^2$= chi-square difference; CFI=comparative fit index (>0.95); RMSEA=Root mean square error or approximation (<0.05); ΔCFI=change in CFI (≤ -0.01); ΔRMSEA=change in RMSEA (≥ 0.016); 'p.metric' or 'p.scalar'=partial metric/partial scalar**

Table 6.3b: Tests of longitudinal invariance for models 4-5

Model 4: SCH (pupils' feelings about school – school affect										
	χ^2	df	p	$\Delta\chi^2$	df	p	CFI	ΔCFI	RMSEA	ΔRMSEA
White (n=1000)										
baseline	80.8	34	0.0	-	-	-	0.990	-	0.037	-
metric	85.6	40	0.0	4.8	6	ns	0.990	0.00	0.034	-0.003
scalar	116.5	47	0.0	30.9	7	0.00	0.985	-0.005	0.038	0.004
Indian (n=751)										
baseline	67.9	36	0.0	-	-	-	0.988	-	0.034	-
metric	73.6	42	0.0	5.7	6	ns	0.988	0.00	0.032	-0.002
scalar	101.6	49	0.0	28.0	7	0.00	0.980	-0.008	0.038	0.006
Pakistani (n=642)										
baseline	77.3	36	0.0	-	-	-	0.977	-	0.042	-
metric	80.4	42	0.0	3.1	6	ns	0.979	0.002	0.038	-0.004
scalar	116.4	49	0.0	36.0	7	0.00	0.963	-0.016	0.046	0.008
p.scalar (i_bW3yyr4YPfree)	98.5	48	0.0	18.1	6	0.0	0.972	-0.007	0.041	0.003
Bangladeshi (n=487)										
baseline	47.5	37	ns	-	-	-	0.992	-	0.024	-
metric	61.7	43	0.0	14.2	6	ns	0.985	-0.007	0.030	0.006
scalar	103.6	51	0.0	41.9	8	0.0	0.958	-0.027	0.046	0.016
p.scalar (i_dW2yyr6free)	78.5	50	0.0	16.8	7	0.05	0.977	-0.008	0.034	0.004
Black Caribbean (n=324)										
baseline	68.8	41	0.0	-	-	-	0.983	-	0.042	-
metric	71.0	47	0.0	2.2	6	ns	0.982	-0.001	0.040	-0.002
scalar	79.2	54	0.0	8.2	7	ns	0.981	-0.001	0.038	-0.002
Model 5: TCH (pupils' assessments of their teachers' collective effectiveness)										
	χ^2	df	p	$\Delta\chi^2$	df	p	CFI	ΔCFI	RMSEA	ΔRMSEA
White (n=1000)										
baseline	20.6	11	0.0	-	-	-	0.995	-	0.030	-
metric	24.4	14	0.0	3.8	3	ns	0.994	-0.001	0.027	-0.003
scalar	33.2	10	0.0	15.2	4	0.0	0.992	-0.002	0.029	0.002
Indian (n=751)										
baseline	26.6	12	0.0	-	-	-	0.990	-	0.040	-
metric	31.1	15	0.0	4.5	3	ns	0.989	-0.001	0.038	-0.002
scalar	51.8	19	0.0	20.7	4	0.0	0.978	-0.011	0.048	0.010
p.scalar (i_bW1free)	36.6	18	0.0	5.5	3	ns	0.987	-0.002	0.037	-0.001
Pakistani (n=642)										
baseline	34.5	12	0.00	-	-	-	0.983	-	0.054	-
metric	37.0	15	0.00	2.5	3	ns	0.983	0.00	0.048	-0.006
scalar	38.6	18	0.00	1.6	3	ns	0.984	0.001	0.042	-0.006
Bangladeshi (n=487)										
baseline	22.0	13	0.05	-	-	-	0.990	-	0.038	-
metric	28.7	16	0.02	6.7	3	ns	0.987	-0.003	0.041	0.003
scalar	38.6	18	0.0	9.9	2	0.05	0.984	-0.003	0.042	0.001
Black Caribbean (n=324)										
baseline	24.2	13	0.02	-	-	-	0.986	-	0.052	-
metric	28.0	16	0.03	3.8	3	ns	0.985	-0.001	0.048	-0.004
scalar	38.2	20	0.00	9.8	4	0.05	0.981	-0.004	0.043	-0.005

Note: **χ^2 =chi-square; df=degrees of freedom; p=significance; $\Delta\chi^2$= chi-square difference; CFI=comparative fit index (>0.95); RMSEA=Root mean square error or approximation (<0.05); ΔCFI=change in CFI (≤ -0.01); ΔRMSEA=change in RMSEA (≥ 0.016); 'p.metric' or 'p.scalar'=partial metric/partial scalar**

Table 6.3c: Tests for longitudinal invariance for model 6

Model 6 YPEX (pupils' educational expectations)										
	χ^2	df	p	$\Delta\chi^2$	df	p	CFI	ΔCFI	RMSEA	ΔRMSEA
White (n=1000)										
baseline	7.6	4	ns	-	-	-	0.999	-	0.030	-
metric	7.6	6	ns	0.0	2	ns	1.000	0.001	0.017	-0.013
scalar	15.9	10	ns	8.3	4	ns	0.998	-0.002	0.024	0.007
Indian (n=751)										
baseline	3.8	3	ns	-	-	-	1.000	-	0.018	-
metric	3.9	5	ns	0.1	2	ns	1.000	0.00	0.000	-0.018
scalar	6.0	9	ns	2.1	4	ns	1.000	0.00	0.000	0.000
Pakistani (n=642)										
baseline	1.7	3	ns	-	-	-	1.000	-	0.000	-
metric	3.9	5	ns	2.2	2	ns	1.000	0.00	0.000	0.000
scalar	14.6	9	ns	10.7	4	0.05	0.996	-0.004	0.031	0.031
Bangladeshi (n=487)										
baseline	5.7	6	ns	-	-	-	1.000	-	0.000	-
metric	6.8	8	ns	1.1	2	ns	1.000	0.00	0.000	0.000
scalar	13.5	12	ns	6.7	4	ns	0.999	-0.001	0.016	0.016
Black Caribbean (n=324)										
baseline	10.8	5	ns	-	-	-	0.991	-	0.060	-
metric	13.3	7	ns	2.5	2	ns	0.990	-0.001	0.053	-0.007
scalar	20.3	10	0.0	7.0	3	0.05	0.984	-0.006	0.056	0.003

Note: **χ^2 =chi-square; df=degrees of freedom; p=significance; $\Delta\chi^2$= chi-square difference; CFI=comparative fit index (>0.95); RMSEA=Root mean square error or approximation (<0.05); ΔCFI=change in CFI (≤ -0.01); ΔRMSEA=change in RMSEA (≥ 0.016); 'p.metric' or 'p.scalar'=partial metric/partial scalar**

metric and scalar longitudinal invariance was established in most of the cases. If the chi-square difference tests between the baseline and the metric-constrained model or between the metric-constrained and the scalar-constrained model were nonsignificant and did not result in a *reduction* of CFI (ΔCFI ≤ -0.01) or an *increase* of RMSEA (ΔRMSEA ≥ 0.016) (Cheung and Rensvold, 2002), the null hypothesis was not rejected. If the CFI increased or the RMSEA decreased they were ignored because they signified *improvement* rather than deterioration of model fit (Dimitrov, 2010). There was only a single case of partial metric longitudinal invariance. It was found in model 2 (parent-child conflict) in the Bangladeshi group, where the loading of item '*how bad relations are with YP w3*' (β = 0.344, Table 6.2) was stronger in wave 3 in contrast to those of waves 1 (β = 0.216) and 2 (β = 0.198). Partial scalar invariance was more frequent. However, the noninvariant intercepts never exceeded 20% of the total number of intercepts (Millsap and Kwok, 2004). I now discuss cases of non-invariance in each model.

For model 1 (parental social position), the intercepts of income at wave 2 were not longitudinally invariant in the white and Indian groups, while the intercept of deprivation score was longitudinally noninvariant in the Bangladeshi group. Lack of scalar invariance in these items suggests that the question on income was perceived and responded to differently by the same LSYPE respondents between waves 1 and 2.

Model 2 (parent-child conflict) established full metric longitudinal invariance across all groups (except the Bangladeshi where partial metric invariance was established) and partial scalar invariance in the items on *frequency of arguing* in the white (wave 2) and Pakistani (wave 1). The item intercepts of *how bad parent-child relations were* with the pupil were noninvariant in the Pakistani (wave 3) and Black Caribbean (wave 1). This suggests that mothers' interpretation of frequency of arguments, and ratings of quality of parent-child relations differed between ages 14-16 but were statistically noninvariant only at age 15 in the white, age 16 in the Pakistani and age 14 in the Black Caribbean homes. Lack of invariance in age-specific intercepts in the parent-child conflict measure may imply different home-based processes affecting perceptions of such conflict over time more profoundly in some groups than in others.

Model 4 (pupils' feelings about school) exhibited both full metric and scalar longitudinal invariance in most groups. Only 1 out of 8 intercepts per group were longitudinally noninvariant. The intercepts of item '*most of the time I do not want to go to school* w3' at age 16 in the Pakistani group and item '*on the whole I like being at school w2*' at age 15 in the Bangladeshi group were longitudinally noninvariant.

Model 5 (pupils' assessments of teachers' effectiveness) also exhibited full metric and scalar longitudinal invariance across most groups. The only exception was the intercept of item '*the teachers in my school take action when anyone breaks school rules w1*' at age 14 in the Indian group. This differential item functioning may indicate changing perceptions of Indian pupils between ages 14 to 15.

Model 6 (pupils' educational expectations) exhibited full metric and full scalar invariance in all groups. This suggests that the latent construct measuring educational expectations was similar across all occasions in all groups. With configural, full metric and at least partial scalar (>80% in all cases) longitudinal invariance achieved, the structural parameters, latent means and latent intercepts can be compared over time but not across groups, without further tests of cross-group scalar invariance. These assessments will follow after I examine the estimated structural components of the models in

Table 6.4 which contains **b** (ML unstandardized) followed by its standard error and **β** (ML standardized) estimates for all models 1-6 for each ethnicity groups. Estimates of higher magnitude in the time-dependence structural paths (p_{21}, p_{32}) suggest *less* change (or greater stability) from one occasion to the next. Lower magnitudes suggest *higher* change (or less stability) from one occasion to the next because each occasion depends less on its prior measurement. I briefly discuss the implications of the findings reported in Table 6.4 below.

Table 6.4: Structural parts of models 1-6 by ethnic group

Structural paths	White			Indian			Pakistani			Bangladeshi			Black Caribbean		
	b	SE	β	b	SE	β	b	SE	β	b	SE	β	b	SE	β
Model 1: FAMCIRC (parental social class and associated family material circumstances)															
p_{21}	1.002	0.020	0.992	0.987	0.018	0.973	1.059	0.032	0.998	1.024	0.023	0.999	0.963	0.036	1.000
Model 2: PAR (parent-child conflict)															
p_{21}	0.810	0.035	0.828	0.875	0.055	0.822	0.711	0.060	0.647	0.247	0.040	0.314	1.371	0.170	0.997
p_{32}	0.810	0.035	0.737	0.875	0.055	0.887	0.711	0.060	0.666	0.563	0.163	0.453	1.035	0.111	0.997
Model 3: HW (pupils' engagement with homework)															
p_{21}	0.772	0.045	0.728	0.730	0.059	0.750	0.654	0.068	0.642	0.589	0.087	0.609	0.508	0.050	0.493
Model 4: SCH (pupils' feelings or affect about school)															
p_{21}	0.887	0.026	0.847	0.701	0.044	0.716	0.768	0.043	0.782	0.840	0.052	0.823	0.687	0.062	0.743
p_{32}	0.887	0.026	0.822	0.701	0.044	0.621	0.768	0.043	0.699	0.840	0.052	0.797	0.687	0.062	0.598
Model 5: TCH (pupils' assessments of teachers' effectiveness															
p_{21}	0.771	0.051	0.759	0.671	0.048	0.682	0.761	0.068	0.691	0.565	0.052	0.702	0.787	0.082	0.761
Model 6: YPEX (pupils' educational expectations)															
p_{21}	0.881	0.019	0.814	0.778	0.029	0.704	0.553	0.050	0.540	0.705	0.035	0.670	0.754	0.076	0.726
p_{32}	0.881	0.019	0.833	0.778	0.029	0.749	0.808	0.049	0.739	0.705	0.035	0.720	0.730	0.063	0.722

Note: b=unstandardized loading; β=standardized loading; SE=standard error.

Based on the standardized estimates (**β**), parental social position at pupils' age 15 depended strongly on its prior occasion at age 14 across all groups. Unsurprisingly, parental social position hardly changed between ages 14 to 15. Parent-child conflict appeared to change over time in all groups except the Black Caribbean. Groups differed considerably in the extent parent-child conflict at age 16 depended on its previous occasions at ages 15 and 14. The greatest changes over ages 14 to 16 in parent-child conflict were observed in Bangladeshi and Pakistani families and the least in Black Caribbean, Indian and white families. Average parent-child conflict in the white, Indian and Black Caribbean families was much more stable over time than it was in the Bangladeshi and Pakistani families.

Similarly, engagement with homework appeared to be most stable between ages 14 and 15 in the Indian and white pupils but more variable in the Black Caribbean, Bangladeshi and Pakistani peers. Pupils' feelings about school from ages 14 to 16 appeared to be most stable among the white and Bangladeshi pupils and less stable among their Black Caribbean, Indian and Pakistani peers. Pupils' ideas about their teachers' effectiveness did not appear to differ much across groups and showed roughly similar levels of stability between ages 14 to 15. White, Black Caribbean and Indian pupils' educational expectations were more stable over ages 14 to 16 while Pakistani and Bangladeshi pupils' much less stable between ages 14 to 15. Stability over time suggests whether two consecutive dependence paths were equivalent. This is also a test of the stationarity assumption (Cole and Maxwell, 2003). Tests of equilibrium are tests of factorial variance invariance. Models 2, 4 and 6 were tested for longitudinal structural and factorial variance invariance and results are reported in Appendix 5. In most of the cases the models were stationary but fewer models were in equilibrium.

The evidence on longitudinal change does not tell us however about the nature of these changes. We do not know whether change from one occasion to the next represents stability at a high, medium or low level of the latent dimension. High stability in *low* expectations over time tells quite a different story from low stability in *high* expectations, for example. The same holds for parent-child conflict, pupils' engagement with homework, feelings about school and assessments about teachers' effectiveness. Examining the changes in latent means and intercepts over time helps us to understand more about the nature of the observed longitudinal change. Similarly, and once cross-group invariance is established, we can assess whether structural estimates, means and intercepts were moderated by maternal ethnicity. Tables 6.5a-b below describes the tests for cross-group invariance. 'Baseline' refers to the unrestricted model. 'Full metric' and 'partial scalar' refer to cases where full metric and partial scalar invariance was achieved while 'free' refers to freely-estimated intercepts. Explanations for all the labels of indicators can be found in Table 4.1, chapter 4, p. 76.

The same criteria for the rejection of the null hypothesis in testing for longitudinal invariance were also applied in the testing for cross-group invariance. Identification of noninvariant loadings or intercepts was guided by modification indices (MI). MIs represented the expected change in the model chi-square based on the Lagrange multiplier (Arbuckle, 2011) if a particular constraint was removed. Following Byrne, Shavelson and Muthén (1989) and Byrne (2004), the highest MI was freely estimated first. Standard procedure in cross-group invariance testing (Stacy, MacKinnon and Pentz, 1993; Tyson, 2004; Vandenberg and Lance, 2000; Wicherts, Dolan and Hessen, 2005) suggested that each occasion should be tested for metric and scalar cross-group invariance separately. Once a level of cross-group invariance was established in one occasion, the constraints placed on items that were shown to be cross-group invariant were retained when testing the level of invariance of the next occasion. When tests of metric invariance for all occasions in a model were complete, the first occasion was again tested for cross-group scalar invariance, and so on. Tables 6.5a-b report these tests. In Tables 6.5a-b, levels of cross group invariance are separated by bold horizontal lines in each group. Within tests of scalar invariance, each item that was cross-group noninvariant was freely estimated and was labelled ‘free’. Group membership of those items was identified by W=white; I=Indian; P=Pakistani, B=Bangladeshi and BC=Black Caribbean.

Free estimation of noninvariant items across groups resulted in a stepwise improvement of overall model fit. This improvement can be followed by the *positive* values of CFI difference tests (ΔCFI) and the *negative* values of the RMSEA difference tests (ΔRMSEA) suggesting increase of the model CFI and decrease of the RMSEA. When tests of scalar invariance were complete, the model that achieved the highest level of metric invariance (labelled ‘metric occasion 2 or 3’) was compared to the model that achieved the highest level of scalar invariance (labelled ‘scalar occasion 2 or 3’). The chi-square difference between the two models showed whether the more constrained model with scalar cross-group invariance constraints deteriorated the model fit achieved with only metric cross-group invariance constraints. This $\Delta\chi^2$ test appears in the last row of each model in Tables 6.5a-b. The more constrained model never deteriorated overall model fit so as to exceed the recommended cut-off points for the CFA (ΔCFA < -0.01) and the RMSEA (ΔRMSEA > 0.016) (Cheung and Rensvold, 2002). In all cases, the fit of the final multigroup solution with metric and scalar cross-group invariance constraints in place (shown in bold in Tables 6.5a-b) was excellent.

Tests of model 3 (HW) did not start with an unconstrained baseline model as there were only two occasions with two indicators per occasion. In order to manage the evaluation of model 3, I adopted a procedure suggested by Horn and McArdle (1992). They recommended starting invariance tests with the model fully constrained to ‘strict’ invariance and then gradually release constraints, testing whether the resulting improvement of fit was significant. However this procedure makes identification of noninvariant items cumbersome if the chi-square of the highly-restricted model is significant. It is also counterintuitive since the logic of invariance testing is to test for higher level of invariance only if the data permit it (Millsap, 2011), i.e., only if lower levels of invariance were achieved first. However, to identify model 3 for cross-group invariance tests, it was necessary

Table 6.5a: Tests of cross-group invariance for models 1-3

Level of invariance tested	χ2	df	p	Δχ2	df	p	CFI	ΔCFI	RMSEA	ΔRMSEA
Model 1: FAMCIRC (parental social position and associated family material circumstances)										
baseline	142.2	67	0.0	-	-	-	0.996	-	0.019	-
Full metric: occasion 1	171.5	79	0.0	29.3	12	0.0	0.995	-0.001	0.019	0.000
Full metric: occasion 2	205.5	91	0.0	34.0	12	0.0	0.993	-0.002	0.020	0.001
Scalar. occasion 1	1474.8	107	0.0	1367.8	16	0.0	0.920	-0.073	0.063	0.043
Free: W1nssecmum B	783.5	103	0.0	691.3	4	0.0	0.960	0.04	0.045	-0.018
Free: W1HHdep I										
Free: W1HHdep B	687.0	101	0.0	687.0	2	0.0	0.966	0.006	0.043	-0.002
Free: W1income B										
Free: W1nesecdad B	421.5	99	0.0	265.5	2	0.0	0.981	0.015	0.032	-0.011
Free: W1income P	328.2	98	0.0	93.3	1	0.0	0.987	0.006	0.027	-0.005
Free: W1HHdep P	273.9	97	0.0	54.3	1	0.0	0.990	0.003	0.024	-0.003
Free: W1mssecdad P	230.1	96	0.0	43.8	1	0.0	0.992	0.002	0.021	-0.003
Scalar: occasion 2	1460.7	112	0.0	1255.2	21	0.0	0.921	-0.072	0.061	0.041
Free: W2nssecmumBC	1285.9	111	0.0	174.8	1	0.0	0.931	0.010	0.058	-0.003
Free: W2income P	1080.4	109	0.0	204.6	2	0.0	0.043	0.012	0.053	-0.005
Free: W2HHdep B										
Free: W2nssecmum B	**271.3**	**105**	**0.0**	736.3	3	0.0	**0.990**	0.042	**0.022**	-0.029
Full metric occasion 2 - partial scalar occasion 2				65.8	14	0.0		-0.003		0.000
Model 2: PAR (parent-child conflict)										
baseline	26.5	17	ns	-	-	-	0.997	-	0.013	-
Full metric: occasion 1	27.4	18	ns	0.9	1	ns	0.998	0.001	0.013	0.000
Full metric: occasion 2	34.8	22	0.04	7.4	4	ns	0.997	-0.001	0.013	0.000
Full metric: occasion 3	41.9	26	0.02	7.1	4	ns	0.996	-0.001	0.014	0.001
Scalar. occasion 1	246.0	34	0.0	204.1	8	0.0	0.944	-0.052	0.044	0.031
Free: W1parqual B	117.9	33	0.0	128.1	1	0.0	0.978	0.034	0.028	-0.016
Free: W1kiddif P	76.2	32	0.0	41.7	1	0.0	0.988	0.010	0.021	-0.007
Free: W1parqual P	61.4	31	0.0	14.8	1	0.0	0.992	0.004	0.019	-0.002
Scalar. occasion 2	120.4	38	0.0	59.0	9	0.0	0.978	-0.014	0.026	0.007
Free: W2parqual P	83.3	37	0.0	37.1	1	0.0	0.988	0.010	0.020	-0.006
Free: W2kiddif P	69.8	36	0.0	13.5	1	0.0	0.991	0.003	0.017	-0.003
Scalar. occasion 3	137.5	44	0.0	67.7	8	0.0	0.975	0.016	0.025	0.009
Free: W3parqual B										
Free: W3kiddif B	**74.2**	**41**	**0.0**	20.2	1	0.0	**0.991**	0.005	**0.016**	-0.004
Full metric occasion 3- partial scalar occasion 3				33.2	15	0.0		-0.005		0.002
Model 3: HW (pupils' 'engagement with homework)										
Full scalar occasions 1&2	127.2	23	0.0	-	-	-	0.961	-	0.038	-
Free: W2hwdo W										
Free: W1hwnday W										
Free: W2hwnday W	78.7	21	0.0	48.5	2	0.0	0.978	0.017	0.029	-0.009
Free: W1hwdo I										
Free: W2hwdo I										
Free: W1hwnday I										
Free: W2hwnday I	57.9	20	0.0	20.8	1	0.0	0.986	0.008	0.024	-0.005
Free: W2hwnday BC	**46.8**	**19**	**0.0**	11.1	1	0.0	**0.989**	0.003	**0.021**	-0.003

Note: **χ^2 =chi-square; df=degrees of freedom; p=significance; $\Delta\chi^2$= chi-square difference; CFI=comparative fit index (>0.95); RMSEA=Root mean square error or approximation (<0.05); ΔCFI=change in CFI (≤ -0.01); ΔRMSEA=change in RMSEA (≥ 0.016). W=white; I=Indian; P=Pakistani, B=Bangladeshi and BC=Black Caribbean**

Table 6.5b: Tests of cross-group invariance for models 4-6

Model 4: SCH (pupils' feelings or affect about school										
Baseline	366.0	187	0.0	-	-	-	0.985	-	0.017	-
Full metric occasion 1	378.0	199	0.0	12.0	12	ns	0.984	-0.001	0.017	0.000
Full metric occasion 2	405.4	211	0.0	27.4	12	0.0	0.983	-0.001	0.017	0.000
Full metric occasion 3	413.9	223	0.0	8.5	12	ns	0.983	0.000	0.016	-0.001
Scalar: occasion 1	546.2	239	0.0	132.3	16	0.00	0.973	0.01	0.020	0.004
Free: W1yys4 I										
Free: W1yys9 P										
Free: W1yys9 I										
Free: W1yys1 BC										
Free: W1 yys6 W										
Free: W1 yys6 BC	463.4	233	0.0	82.8	6	0.00	0.980	0.007	0.018	-0.002
Scalar: occasion 2	508.7	249	0.0	45.3	3	0.00	0.977	-0.003	0.018	0.000
Free: W1yys1W	477.9	245	0.0	30.8	1	0.00	0.980	0.003	0.017	-0.001
Scalar occasion 3										
Free: W3yys4 BC										
Free: W2yys4 P										
Free: W2yys4 B	**489.7**	**258**	**0.0**	11.8	13	ns	**0.980**	0.000	**0.017**	0.000
Metric occasion 3 – scalar occasion 3				75.8	35	0.0		-0.003		0.001
Model 5: TCH (pupils' assessments about teachers' effectiveness)										
baseline	123.4	57	0.0	-	-	-	0.990	-	0.019	-
Full metric occasion 1	144.3	69	0.0	20.9	12	ns	0.988	-0.002	0.018	-0.001
Full metric occasion 2	160.6	81	0.0	16.3	12	ns	0.988	0.000	0.018	0.000
Scalar occasion 1	239.8	95	0.0	79.2	14	0.0	0.977	-0.011	0.022	0.004
Free: W1yys18 BC										
Free: W1yys19 BC	187.1	93	0.0	52.7	2	0.0	0.985	-0.003	0.018	-0.001
Scalar occasion 2	267.7	109	0.0	80.0	16	0.0	0.975	-0.010	0.021	0.003
Free W2yys16 B										
Free W2 yys 18 BC										
Free W2 yys15 BC										
Free W1yys16 P	**197.4**	**104**	**0.0**	70.3	5	0.0	**0.985**	0.010	**0.017**	-0.004
Metric occasion 2 –scalar occasion 2				36.8	23	0.0		-0.003		-0.001
Model 6: YPEX (pupils' educational expectations)										
baseline	28.3	19	ns	-	-	-	0.999	-	0.012	-
Full metric occasion 1	33.6	23	ns	5.3	4	ns	0.999	0.000	0.012	0.000
Full metric occasion 2	39.8	27	ns	6.2	4	ns	0.998	-0.001	0.012	0.000
Full metric occasion 3	50.3	31	0.0	10.5	4	0.0	0.998	0.000	0.014	0.002
Scalar occasion 1	244.0	39	0.0	198.7	8	0.0	0.976	-0.022	0.041	0.027
Free: W1heposs I	169.6	38	0.0	74.4	1	0.0	0.984	0.008	0.033	-0.008
Free: W1hlike W	128.1	37	0.0	41.5	1	0.0	0.989	0.005	0.028	-0.004
Scalar: occasion 2	147.2	43	0.0	19.1	5	0.0	0.998	0.009	0.028	0.000
Scalar: occasion 3	**185.7**	**51**	**0.0**	38.5	8	0.0	**0.994**	-0.004	**0.029**	0.001
Metric occasion 3 – scalar occasion 3				135.4	20	0.0		-0.004		0.015

Note: **χ^2 =chi-square; df=degrees of freedom; p=significance; $\Delta\chi^2$= chi-square difference; CFI=comparative fit index (>0.95); RMSEA=Root mean square error or approximation (<0.05); ΔCFI=change in CFI (≤ -0.01); ΔRMSEA=change in RMSEA (≥ 0.016). W=white; I=Indian; P=Pakistani, B=Bangladeshi and BC=Black Caribbean**

to maintain equality constraints on the loadings and intercepts of like indicators across occasions. It was therefore decided to start cross-group invariance tests for model 3 with the fully-constrained model and then based on the MI, gradually release the cross-group non-invariant loadings or intercepts. Horn and McArdle's (1992) suggested procedure was followed only in the case of model 3. In any case, model 3 exhibited excellent fit in its final multigroup solution (shown in bold).

In sum, configural cross-group invariance was established as all baseline models had excellent fit. Full metric cross-group invariance was also established: Model fit did not deteriorate significantly with loading invariance constraints in place based on the change of CFI (ΔCFI column, Tables 6.5a-b) and RMSEA (ΔRMSEA column, Tables 6.5a-b). This level of invariance permitted the cross-group comparison of the structural estimates that are shown in Table 6.4. Although not necessary for the comparison of structural estimates but necessary for the comparison of latent means and intercepts, cross-group scalar measurement invariance was also tested. Partial scalar invariance was established as in all of the cases the cross-group scalar-invariant intercepts were > 80% of the total. Each comparison therefore involved models that had achieved the maximum levels of both metric (full metric) and scalar (partial scalar) longitudinal and cross-group measurement invariance. The establishment of partial scalar invariance offered statistical evidence of *differential item functioning* (DIF) in some of the groups. The cross-group non-invariant intercepts (about 20% of the total) suggest that perceptions of and responses to certain items were moderated by different cultures (see Appendix 4). This gives strong support to the hypothesis that maternal ethnicity, to the extent it reflected different cultures, values and therefore perceptions, moderated these responses.

Comparison of structural estimates of models 1-6 across ethnic groups

Comparisons of structural estimates addressed the question whether the dependence paths p_{21}, connecting occasions 1 and 2 and p_{32}, connecting occasions 2 and 3 in models 1-6, were statistically equivalent across groups. If those paths were found to be noninvariant across ethnicity groups, this noninvariance would suggest evidence of moderation by maternal ethnicity. A number of $c = [k*(k-1)/2]$ pairwise comparisons were conducted, where k represented the number of groups in the analysis. Since there were 5 groups in total in the analysis, there were a total of $c = [5(5-1)/2] = 10$ comparisons for each model resulting in 60 paired comparisons. Because each group was sequentially compared to all others, there was a higher likelihood of getting a result that would be significant at the $\alpha = 0.05$ level purely by chance, thus increasing Type I error. For this reason, a Bonferroni correction adjusted for the α level of the number of pairwise comparisons representing the *family-wise* Type I error rate given by $\alpha_{FW} = 1 - (1- \alpha)^c$ where c = number of pairwise comparisons as described in Bland and Altman (1995).

There is a debate as to the usefulness of this adjustment. While the Bonferroni adjustment decreases Type I error rates, it also increases Type II error rates, making it more likely to fail to identify significant differences (Perneger, 1998; Rothman, 1990). However, the risk of increasing Type I error (false positives) was much more important in this analysis because it would mean that moderation by maternal ethnicity was identified while in reality there was none. Thus, the Bonferroni correction was implemented making the α levels for the identification of such potential moderation effects *less* sensitive. This was done by dividing the $\alpha = 0.05$ level by the number of comparisons ($\alpha_{FW} = \alpha / c$) involving the same group. Since the same group was involved in four (k-1) comparisons, the α level was decreased from 0.05 to 0.0125 (Bhandari *et al.*, 2003). Thus, the hypothesis of equality between two structural parameters was rejected at $\alpha \leq 0.0125$. Although the minimum requirement for the comparison of structural estimates is metric cross-group invariance (Byrne, Shavelson and Muthén, 1989; Vandenberg and Lance, 2000), I compared models whose measurement part was constrained to both metric and scalar invariance.

As already explained, tests of structural invariance are conditional on the achieved level of measurement invariance. To compare structural estimates across groups, the data must first demonstrate at least cross-group metric invariance (Meredith, 1993). Thus, presence of measurement invariance is a welcome and necessary condition allowing for the subsequent comparison of structural estimates across groups. By contrast, lack of structural invariance demonstrates moderation by group membership while presence of structural invariance, lack of such moderation. In the literature, most applications of cross-group invariance tests validated first and second-order multigroup CFA models and very rarely SEM (Hertzog and Schaie, 1986; 1988; Kim, Brody and V., 2003; Lievens *et al.*, 2007; Long *et al.*, 2007; Rigotti, Schyns and Mohr, 2008; Schaie *et al.*, 1989; Yin and Fan, 2003). In those cases, each factor correlation (the equivalent of factor coefficient in SEM) was tested for cross-group structural invariance separately (Byrne, Shavelson and Muthén, 1989; Vandenberg and Lance, 2000; Widaman, Ferrer and Conger, 2010). Following this procedure, the p_{21} and p_{32} paths were tested separately for cross-group invariance. Before systematic pairwise tests commenced, I conducted omnibus tests of cross-group structural invariance, testing the hypotheses that all p_{21} paths (H_o: $p_{21k} = p_{21}$) and all p_{32} paths (H_o: $p_{32k} = p_{32}$) where k = group membership, were cross-group invariant. If the null hypothesis of cross-group structural equality implied by the omnibus test could not be rejected, separate pairwise tests were not necessary. Structural estimates were statistically equivalent across groups suggesting lack of moderation by group membership (here, maternal ethnicity). However, if the hypothesis of the omnibus test was rejected, systematic pairwise tests were conducted to identify the source of structural cross-group noninvariance and thus identify the source of moderation. The hypothesis that paths p_{21} in each pair of groups z and k are invariant (H_o: $p_{21z} = p_{21k}$) is tested first with paths p_{32} freely-estimated, followed by the hypothesis that paths p_{32} are cross-group invariant (H_o: $p_{32z} = p_{32k}$) with paths p_{21} freely-estimated. Thus, in each test, the chi-square difference ($\Delta\chi^2$) represents the difference between the structurally unconstrained model (denoted as 'final scalar') and the two constrained models. Tables 6.6a-b report the results of the omnibus tests and pairwise tests across white (W), Indian (I), Pakistani (P), Bangladeshi (B) and Black Caribbean (BC) groups. Evidence of moderation was assessed on the basis of the significance (p) of the chi-square difference test ($\Delta\chi^2$) for 1 degree of freedom. All the pairwise comparisons are reported for those models where the

Table 6.6a: Tests of cross-group structural invariance for models 1-2

Hypothesis	χ2	df	p	Δχ2	df	p	CFI	ΔCFI	RMSEA	ΔRMSEA	Decision
Model 1: FAMCIRC (parental social class and associated family material circumstances)											
Final scalar	271.3	105	0.0	-	-	-	0.022	-	0.022	-	
$p_{21k} = p_{21}$	281.5	109	0.0	10.2	4	0.037	0.990	0.000	0.022	0.000	NR
$p_{21W} \neq p_{21I}$	106.8	33	0.0	-	-	-	0.991	-	0.037	-	
$p_{21W} = p_{21I}$	114.0	34	1	7.2	1	0.00	0.991	0.000	0.070	0.033	R
Model 2: PAR (parent-child conflict)											
Final scalar	74.2	41	0.0	-	-	-	0.991	-	0.016	-	
$p_{21k} = p_{21}$	95.1	45	0.0	20.9	4	0.00	0.987	-0.004	0.019	0.003	R
$p_{32k} = p_{32}$	130.3	49	0.0	35.2	4	0.00	0.979	-0.008	0.023	0.004	R
$p_{21W} \neq p_{21I}$	20.4	16	0.0	-	-	-	0.998	-	0.013	-	
$p_{21W} = p_{21I}$	20.9	17	0.0	0.5	1	0.47	0.998	0.000	0.011	-0.002	NR
$p_{32W} = p_{32I}$	23.2	18	0.0	2.3	1	0.12	0.998	0.000	0.013	0.002	NR
$p_{21W} \neq p_{21P}$	15.8	11	ns	-	-	-	0.998	-	0.016	-	
$p_{21W} = p_{21P}$	16.3	12	ns	0.5	1	0.47	0.998	0.000	0.015	-0.001	NR
$p_{32W} = p_{32P}$	17.6	13	ns	1.3	1	0.25	0.998	0.000	0.015	0.000	NR
$p_{21W} \neq p_{21B}$	21.4	11	0.0	-	-	-	0.994	-	0.025	-	
$p_{21W} = p_{21B}$	27.2	12	0.0	5.8	1	0.016	0.992	-0.002	0.029	0.004	NR
$p_{32W} = p_{32B}$	54.0	13	0.0	26.8	1	0.00	0.978	-0.014	0.046	0.017	R
$p_{21W} \neq p_{21BC}$	11.5	15	ns	-	-	-	1.000	-	0.000	-	
$p_{21W} = p_{21BC}$	20.1	16	ns	8.6	1	0.00	0.998	-0.002	0.014	0.014	R
$p_{32W} = p_{32BC}$	20.4	17	ns	0.3	1	0.58	0.998	0.000	0.012	-0.002	NR
$p_{21I} \neq p_{21P}$	12.4	10	ns	-	-	-	0.998	-	0.013	-	
$p_{21I} = p_{21P}$	12.4	11	ns	0.0	1	1.00	0.997	-0.001	0.010	-0.003	NR
$p_{32I} = p_{32P}$	16.6	12	ns	4.2	1	0.04	0.995	-0.002	0.017	0.007	NR
$p_{21I} \neq p_{21B}$	19.2	10	0.0	-	-	-	0.992	-	0.027	-	
$p_{21I} = p_{21B}$	23.6	11	0.0	4.4	1	0.04	0.989	-0.003	0.030	0.003	NR
$p_{32I} = p_{32B}$	46.6	12	0.0	23.0	1	0.00	0.970	-0.019	0.048	0.018	R
$p_{21I} \neq p_{21BC}$	22.4	14	ns	-	-	-	0.993	-	0.024	-	
$p_{21I} = p_{21BC}$	33.1	15	0.0	10.7	1	0.00	0.985	-0.008	0.034	0.010	R
$p_{32I} = p_{32BC}$	33.5	16	0.0	0.4	1	0.46	0.986	0.001	0.032	0.002	NR
$p_{21P} \neq p_{21B}$	28.0	8	0.0	-	-	-	0.981	-	0.047	-	
$p_{21P} = p_{21B}$	31.2	9	0.0	3.2	1	0.07	0.979	-0.002	0.047	0.000	NR
$p_{32P} = p_{32B}$	37.8	10	0.0	6.6	1	0.010	0.973	-0.006	0.050	0.003	R
$p_{21P} \neq p_{21BC}$	24.2	89	0.0	-	-	-	0.986	-	0.042	-	
$p_{21P} = p_{21BC}$	32.7	11	0.0	8.5	1	0.00	0.980	-0.006	0.049	0.007	R
$p_{32P} = p_{32BC}$	33.6	11	0.0	0.9	1	0.34	0.980	0.000	0.046	-0.003	NR
$p_{21B} \neq p_{21BC}$	17.5	9	0.0	-	-	-	0.988	-	0.034	-	
$p_{21B} = p_{21BC}$	33.7	10	0.0	16.2	1	0.00	0.967	0.021	0.054	0.020	R
$p_{32B} = p_{32BC}$	42.9	11	0.0	9.2	1	0.00	0.955	-0.012	0.060	0.006	R

Note: **χ^2 =chi-square; df=degrees of freedom; p=significance; $\Delta\chi^2$= chi-square difference; CFI=comparative fit index (>0.95); RMSEA=Root mean square error or approximation (<0.05); ΔCFI=change in CFI (≤ -0.01); ΔRMSEA=change in RMSEA (≥ 0.016); R=reject H_o; NR=fail to reject the H_o;W=white; I=Indian; P=Pakistani, B=Bangladeshi and BC=Black Caribbean** hypothesis of the omnibus tests was rejected. For those models that the hypothesis failed to be rejected, only the pairwise tests that identified cross-group noninvariant structural coefficients are reported. Evidence of moderation was assessed on the basis of the significance (p) of the chi-square difference test ($\Delta\chi^2$) for 1 degree of freedom. In most but not all of the cases, it was also reflected in

Table 6.6b: Tests of cross-group structural invariance for models 3-6

Model 3 HW (pupils' engagement with homework)										
Final scalar	46.8	11	0.0	-	-	-	0.989	-	0.021	-	
$p_{21k} = p_{21}$	57.0	23	0.0	10.2	12	ns	0.987	-0.002	0.022	0.001	NR
Model 4 SCH (pupils' feelings or affect about school)										
Final scalar	489.7	258	0.0	-	-	-	0.980	-	0.017	-	
$p_{21k} = p_{21}$	492.9	262	0.0	3.2	4	ns	0.980	0.000	0.017	0.000	NR
$p_{32k} = p_{32}$	499.9	266	0.0	7.0	4	0.13	0.980	0.000	0.017	0.000	NR
Model 5 TCH (pupils' assessments about teachers' collective effectiveness)										
Final scalar	197.4	104	0.0	-	-	-	0.985	-	0.017	-	
$p_{21k} = p_{21}$	205.1	108	0.0	7.7	4	0.10	0.985	0.000	0.017	0.000	NR
Model 6 YPEX (pupils' educational expectations)										
Final scalar	185.7	51	0.0	-	-	-	0.994	-	0.029	-	
$p_{21k} = p_{21}$	220.8	55	0.0	35.1	4	0.00	0.980	-0.014	0.031	0.003	R
$p_{32k} = p_{32}$	260.7	59	0.0	39.9	4	0.00	0.976	-0.004	0.033	0.002	R
$p_{21W} \neq p_{21I}$	239.5	13	0.0	-	-	-	0.958	-	0.100	-	
$p_{21W} = p_{21I}$	242.8	14	0.0	3.3	1	0.04	0.957	-0.001	0.097	-0.003	NR
$p_{32W} = p_{32I}$	258.2	15	0.0	15.4	1	0.00	0.955	-0.002	0.096	-0.001	R
$p_{21W} \neq p_{21P}$	115.2	14	0.0	-	-	-	0.980	-	0.066	-	
$p_{21W} = p_{21P}$	148.9	15	0.0	33.7	1	0.00	0.973	-0.007	0.074	0.008	R
$p_{32W} = p_{32P}$	155.3	16	0.0	6.4	1	0.011	0.972	-0.001	0.073	-0.001	R
$p_{21W} \neq p_{21B}$	77.3	16	0.0	-	-	-	0.987	-	0.051	-	
$p_{21W} = p_{21B}$	84.4	17	0.0	7.1	1	0.00	0.986	-0.001	0.052	0.001	R
$p_{32W} = p_{32B}$	108.3	18	0.0	23.9	1	0.00	0.981	-0.005	0.058	0.006	R
$p_{21W} \neq p_{21BC}$	58.1	16	0.0	-	-	-	0.990	-	0.045	-	
$p_{21W} = p_{21BC}$	61.0	17	0.0	2.9	1	0.09	0.990	0.00	0.044	-0.001	NR
$p_{32W} = p_{32BC}$	68.7	18	0.0	8.7	1	0.00	0.988	-0.002	0.046	0.002	R
$p_{21I} \neq p_{21P}$	64.8	14	0.0	-	-	-	0.983	-	0.051	-	
$p_{21I} = p_{21P}$	79.0	15	0.0	14.2	1	0.00	0.979	0.000	0.055	0.004	R
$p_{32I} = p_{32P}$	80.7	16	0.0	1.7	1	0.28	0.979	0.000	0.054	-0.001	NR
$p_{21I} \neq p_{21B}$	67.1	16	0.0	-	-	-	0.982	-	0.051	-	
$p_{21I} = p_{21B}$	67.8	17	0.0	0.7	1	0.40	0.982	0.000	0.049	-0.002	NR
$p_{32I} = p_{32B}$	69.4	18	0.0	1.6	1	0.21	0.982	0.000	0.048	-0.001	NR
$p_{21I} \neq p_{21BC}$	75.9	16	0.0	-	-	-	0.975	-	0.059	-	
$p_{21I} = p_{21BC}$	75.9	17	0.0	0.0	1	1.00	0.975	0.000	0.059	0.000	NR
$p_{32I} = p_{32BC}$	76.0	18	0.0	0.0	1	0.75	0.975	0.000	0.059	0.000	NR
$p_{21P} \neq p_{21B}$	24.7	17	0.0	-	-	-	0.997	-	0.020	-	
$p_{21P} = p_{21B}$	31.4	18	0.0	6.7	1	0.010	0.994	-0.003	0.026	0.006	R
$p_{32P} = p_{32B}$	37.6	19	0.0	6.2	1	0.012	0.992	-0.002	0.030	0.004	R
$p_{21P} \neq p_{21BC}$	31.5	17	0.0	-	-	-	0.993	-	0.030	-	
$p_{21P} = p_{21BC}$	38.3	18	0.0	6.8	1	0.010	0.990	-0.003	0.034	0.004	R
$p_{32P} = p_{32BC}$	39.3	19	0.0	1.0	1	0.28	0.990	0.000	0.033	-0.001	NR
$p_{21B} \neq p_{21BC}$	28.8	19	0.0	-	-	-	0.994	-	0.025	-	
$p_{21B} = p_{21BC}$	29.0	20	0.0	0.2	1	0.65	0.994	0.00	0.025	0.000	NR
$p_{32B} = p_{32BC}$	30.1	21	0.0	0.1	1	0.75	0.994	0.00	0.025	0.000	NR

Note: **χ^2 =chi-square; df=degrees of freedom; p=significance; $\Delta\chi^2$= chi-square difference; CFI=comparative fit index (>0.95); RMSEA=Root mean square error or approximation (<0.05); ΔCFI=change in CFI (≤ -0.01); ΔRMSEA=change in RMSEA (≥ 0.016); R=reject H_o; NR=fail to reject the H_o;W=white; I=Indian; P=Pakistani, B=Bangladeshi and BC=Black Caribbean**

the change in CFI (ΔCFI) but not in the change of RMSEA (ΔRMSEA) due to the very well-fitting measurement models. Since bias in the multigroup chi-square was minimized by reducing sample discrepancy (see chapter 5), it was decided to base the decision regarding the rejection of the null hypothesis on the significance of $\Delta\chi^2$. The last column of Tables 6.6a-b report this decision (R=reject or NR=not reject)[8]. The implications of rejection are discussed in the following six sub-sections below. We are now in a position to bring together the implications of the results of the above structural invariance tests and discuss whether each model shows evidence of moderation.

Moderated longitudinal change between ages 14 to 15 in parental social position (model 1)
Unsurprisingly, parental social position including material circumstances hardly changed between pupils' ages 14 to 15. This was shown by the large dependence paths connecting occasions 1 and 2 (p_{21}) of model 1 (FAMCIRC) across group (see Table 6.4). With metric and scalar longitudinal and cross-group invariance established, cross-group comparison of the dependence paths based on the omnibus test did not reveal any major differences ($\Delta\chi^2 = 10.2$ (4) $p = 0.037 > 0.0125$, see Tables 6.6a-b). The exception was Indian parents whose dependence path was significantly different from that of their white counterparts ($\Delta\chi^2 = 7.2$ (1) $p \leq 0.005$). The rate of change of Indian parents' social position and family level material circumstances ($p_{21I} = 0.973$) was found to be significantly greater than that of their white counterparts ($p_{21W} = 0.992$). This finding was consistent with the hypothesis that ethnic group membership moderated this difference. However, the comparison of latent means and intercepts will tell us how different parental social position in the white and Indian groups is and thus place the above observed difference in the change parameter between ages 14-15 in proper perspective. This will be discussed in section 6.3.

Moderated longitudinal change between ages 14 to 16 in reported parent-child conflict (Model 2)
There were several cross-group differences in the structural paths representing change in parent-child conflict between pupils' ages 14 to 15 (p_{21}) and 15 to 16 (p_{32}). The omnibus tests suggested that the null hypotheses of cross-group structural invariance in paths p_{21} ($\Delta\chi^2 = 20.9$ (4) $p \leq 0.005$) and p_{32} ($\Delta\chi^2 = 32.2$ (4) $p \leq 0.005$) had to be rejected (see Table 6.6a-b) implying moderation by maternal ethnicity. Pairwise tests revealed significant cross-group differences in path p_{21} (ages 14-15) between the Bangladeshi (p_{21B}=0.314) mothers and their Indian (p_{21I}=0.822; $\Delta\chi^2 = 10.7$ (1) $p \leq$

[8] When testing for *structural* invariance, all comparisons were conducted with models retaining the same level of achieved measurement invariance (full metric and at least 80% scalar). This meant that for 1 df in the structural model, the ΔCFI and ΔRMSEA would be too insensitive to pick up significant differences by exceeding the thresholds suggested by Cheung and Rensvold (2002), thus increasing Type II error rates. *Tentative* indication of moderation would have to rely only on $\Delta\chi^2$. However, when *measurement* invariance was tested, the $\Delta\chi^2$ was corroborated by the ΔCFI and ΔRMSEA because of the greater possibility of excessive Type I error rates due to the presence of more df (greater numbers of free parameters in the measurement model). Thus, the different reliance on the $\Delta\chi^2$ was an attempt to balance out Type I and Type II excessive error rates.

0.005), Black Caribbean (p_{21BC} = 0.997; $\Delta\chi^2$ = 16.2 (1) $p \leq 0.005$), white (p_{21W}=0.828; $\Delta\chi^2$ = 8.6 (1) $p \leq 0.005$) and Pakistani (p_{21P}=0.647; $\Delta\chi^2$ = 6.6 (1) $p \leq 0.010$) counterparts. In path p_{32} (ages 15 to 16), the greatest differences were again found between the Bangladeshi mothers and their white, Indian, Black Caribbean but not their Pakistani counterparts. Compared to their Bangladeshi counterparts (p_{32B}=0.453), white (p_{32W}=0.737; $\Delta\chi^2$ = 26.8 (1) $p \leq 0.005$), Indian (p_{32I}=0.887; $\Delta\chi^2$ = 23.0 (1) $p \leq 0.005$) and Black Caribbean (p_{32BC}=0.997; $\Delta\chi^2$ = 9.2 (1) $p \leq 0.005$) mothers reported much more stable rates of parent-child conflict. White mothers also differed significantly from their Black Caribbean counterparts ($\Delta\chi^2$ = 8.6 (1) $p \leq 0.005$) during that age period.

This evidence suggests that on average, Bangladeshi and to a lesser extent, Pakistani mothers were much less stable in reporting parent-child conflict between ages 14 to 16. Results were consistent with the hypothesis that the significant differences in longitudinal change in parent-child conflict during ages 14 to 16 were moderated by maternal ethnicity. However we still need to know whether the greater change in parent-child conflict in Pakistani and Bangladeshi families reflected increasing or decreasing parent-child conflict over time. This will be discussed in section 6.3.

Moderated longitudinal change between ages 14 to 15 in pupils' engagement with homework (model 3)

There were no significant cross-group differences in pupils' engagement with homework based on the omnibus test ($\Delta\chi^2$ = 10.2 (12) p = ns, see Tables 6.7a-b) indicating that the level of engagement with homework pupils had at age 14 remained the same a year later. However to interpret this information in the proper context, we need to know the level of pupils' engagement across ages 14 to 15. Low engagement with homework that persisted over time is quite different from high engagement that did the same. At present we only know that change in engagement with homework from age 14 to 15 did not differ significantly across groups and that therefore, maternal ethnicity did not appear to moderate this short-term longitudinal change. Maternal ethnicity however may moderate significant differences in latent means and intercepts in engagement with homework. This hypothesis will be tested in section 6.3.

Moderated longitudinal change between ages 14 to 16 in pupils' feelings about school (model 4)

There were no significant cross-group differences in the change in pupils' feelings about school in path p_{21} (ages 14 to 15; $\Delta\chi^2$ = 3.2 (4) p = ns) or p_{32} (ages 15 to 16; $\Delta\chi^2$ = 7.2 (4) p = ns). This evidence suggests that across all groups, feelings about school at age 14 tended to persist over time at ages 15 and 16. Regardless of ethnic group, the above evidence suggests that *on average* (i.e., based on the hypothesis of cross-group structural equivalence of the omnibus test) pupils' feelings about school at age 15 depended on their feelings at 14 just as those at age 16 depended on those formed at age 15. This dependence was statistically equivalent across groups. Maternal ethnicity did not appear to moderate significant cross-group differences in the change of pupils' feelings about school between ages 14 to 16. However, this finding also needs to be placed in the proper context when changes in the levels of pupils' feelings over time are known. Less positive feelings about school that persisted from ages 14 to 16 paint a very different picture from highly positive feelings that also persisted. I examine this possibility in section 6.3.

Moderated longitudinal change between ages 14-15 in pupils' assessments about their teachers' effectiveness (model 5)

There were no significant cross-group differences in path p_{21} representing change in pupils' assessments about their teachers' effectiveness from age 14 to age 15 ($\Delta\chi^2 = 7.7$ (4) p = ns). Pupils' ideas about their teachers' effectiveness at age 15 depended on their ideas on the same issue at age 14. This temporal dependence was statistically equivalent across groups. In that respect, maternal ethnicity did not appear to moderate this longitudinal change. If pupils assessed their teachers as being highly effective in maintaining discipline at age 14, they were likely to maintain this idea about them at age 15. If they thought that their teachers lacked in this respect, they were just as likely to retain this idea at age 15. Across ethnic groups, pupils appeared to be similar in this respect. This suggests that pupils' attitudes towards their school and teachers formed at age 14 (year 9) were likely to persist at ages 15 (year 10) and 16 (year 11). The data offer no indication however as to how early these attitudes commence or become crystallised.

Moderated longitudinal change between ages 14 to 16 in pupils' educational expectations (model 6)

Model 6 (pupils' expectations) showed the greatest cross-group differences in both path p_{21}, representing change in expectations between ages 14 to 15 ($\Delta\chi^2 = 35.1$ (4) $p \leq 0.005$) and path p_{32}, representing change between ages 15 to 16 ($\Delta\chi^2 = 39.9$ (4) $p \leq 0.005$). The omnibus tests were therefore consistent with the hypothesis that change in expectations was moderated by maternal ethnicity. Some ethnic groups differed most in the change in expectations between ages 14 and 15 while others in the change between ages 15 to 16. More cross-group differences were observed in the dependence path p_{32} suggesting that most differences in pupils' expectations over time occurred between ages 15 to 16 and less from ages 14 to 15. The highest differences between ages 14 to 15 (path p_{21}) were found between the white pupils (p_{21W}=0.814) and their Pakistani (p_{21P}=0.540; $\Delta\chi^2$ = 33.7 (1), $p \leq 0.005$) and Bangladeshi (p_{21I}=0.670; $\Delta\chi^2$ = 7.1 (1), $p \leq 0.005$) peers. Indian young people (p_{21I}=0.709) also differed significantly from their Pakistani peers (p_{21P}=0.540; $\Delta\chi^2$ = 14.2 (1), $p \leq 0.005$). In turn, Pakistani pupils differed significantly from their Bangladeshi peers ($\Delta\chi^2$ = 6.7 (1), $p \leq 0.005$) during the same period.

Significant cross-group differences between age 15 and 16 (path p_{32}) centred mostly on differences between white pupils and their peers in all the other minority groups. Highly significant differences in path p_{32} were found between white pupils (p_{32W}=0.833) and their Bangladeshi (p_{32B}=0.720; $\Delta\chi 2$ = 23.9 (1), $p \leq 0.005$), Indian (p_{32I}=0.749; $\Delta\chi^2$ = 15.4 (1), $p \leq 0.005$); Black Caribbean pupils (p_{32BC}=0.722; $\Delta\chi^2$ = 8.7 (1), $p \leq 0.005$) and Pakistani (p_{32P}=0.739; $\Delta\chi^2$ = 6.4 (1), $p \leq 0.010$) peers. Pakistani pupils also differed significantly from their Bangladeshi peers ($\Delta\chi^2$ = 6.2 (1), $p \leq 0.005$). The above evidence suggests a complex picture of cross-group differences in the structural estimates of model 6 (YPEX). White pupils differed most markedly from the rest of their peers both in having the lowest proportions of those planning to apply successfully to university (see chapter 5) and in being the least likely group to change their expectations from ages 14 to16. So, knowing the level of white pupils' expectations from ages 14 to 16 makes all the difference in understanding what their high temporal stability in expectations means. Significant differences in temporal stability were also found among the three South Asian groups as well as between them and their Black Caribbean peers. But these differences were smaller compared to those observed between the white and the rest of their minority peers. I will now place the above ethnic differences in temporal stability in proper context by analysing differences in latent means and intercepts.

6.3 Comparing latent means and intercepts.

Latent *means* represent the average level of the latent construct in each group. They reflect the general tendencies suggested by their observed indicators but are much more precise estimates of the between-individual averages of the underlying latent construct. Given metric and scalar cross-group invariance, they are error-free representations of between-group differences in this latent construct (Millsap, 2011). We should therefore expect latent means to reflect the general tendencies shown by the 44 manifest indicators outlined in chapter 5. A latent *intercept* in a repeated measures framework represents the origin of the regression of a later occasion of the underlying latent construct, e.g. at *t*+1, on its prior occasion at *t*. It can be interpreted roughly as the analogue of the intercept in a linear regression equation which sets the origin of the slope of a continuous predictor on the outcome. It shows the change in the outcome if the effect of the predictor were zero. Under conditions of measurement invariance, latent intercepts represent the between-individual differences in the origin of the underlying dimension represented by the latent construct at t+1, if the effect of its prior occasion at t were zero. Thus, a significant latent intercept suggests that the previous occasion has contributed to a significant *net* between-individual latent difference in the next occasion (Arbuckle, 2011; Millsap, 2011). Interpreted in this manner, latent intercepts show to what extent longitudinal change from a prior occasion to the next has resulted in significant between-individual differences in the latent construct means of the next occasion. Under proper levels of cross-group measurement invariance, latent intercepts can be compared across groups of different membership (ethnic in this case). Contrary to linear regression, the comparison offers an *unbiased* estimate of the cross-group differences in the predicted origins (the estimated differences in the contributions) of the prior occasion of a latent construct on its later occasion between a reference and a comparison group. Put more simply, the comparison shows whether the difference in the intercepts between a group and a reference group is statistically significant. It shows, in other words, if there is a significant difference in the net effect of the prior occasion (t) on the next (t+1) between the two groups. Technically, these comparisons are tests of cross-group invariance in latent means and intercepts of a designated reference group and at least one comparison group. I describe the logic of such tests below.

Latent means and intercepts are unknown quantities of unobserved constructs. We cannot directly estimate the latent mean or the latent intercept of either the reference or the comparison groups. Sörbom (1974; 1978) has shown however, that we can estimate the *difference* in latent means and intercepts between the reference and the comparison groups if the measurement models of both groups are constrained to measurement equivalence. Thus, latent means and intercepts represent scaled point *differences* between the latent mean(s) and latent intercept(s) of the reference group and those of the comparison groups. They test the hypothesis of cross-group equality in factor means (H_o: $\boldsymbol{\mu}_\kappa = \boldsymbol{\mu}$) and factor intercepts (H_o: $\boldsymbol{\kappa}_\kappa = \boldsymbol{\kappa}$). A difference in latent factor means and intercepts is statistically significant if the ratio of the produced difference to its standard error exceeds the critical ratio (CR) of 1.98 at p = 0.05. A Bonferroni correction was implemented to adjust for Type I error, and as a result, the p level was reduced to p = 0.0125, as described above in section 6.2, p. 146.

Under ‘strong’ measurement invariance (Meredith, 1993), between-group differences stemmed only from the latent construct means (Millsap, 2011). Significant cross-group differences in latent means and intercepts therefore represent error-free evidence of moderation by the group differentiating factor, i.e., maternal ethnicity in this case. All the conditions for ‘strong’ measurement invariance were satisfied in this analysis. Configural and full metric longitudinal and cross-group invariance as well as partial scalar measurement invariance were established. Partial scalar measurement invariance in almost all of the cases was above 80% (as recommended by Millsap and Kwok, 2004) with the exception of model 3 (HW) in the Indian group where cross-group scalar invariance was less than 80%. Even in that case however, longitudinal scalar invariance had been established prior to testing for cross-group scalar invariance. This permitted comparison of latent means and intercepts at least longitudinally. Further, the Indian group had noninvariant intercepts only when compared to the white group but much less so when compared to the other groups, particularly at age 15. It was decided therefore to include the Indian group in the comparison of latent means and intercepts despite the fact that scalar cross-group invariance was only partial. In defence of this decision, latent means have been compared in the literature solely on the basis of metric or ‘weak’ factorial invariance (see for example, Schaie *et al.*, 1998).

Comparison of latent means and intercepts involved 10 comparisons. A Bonferroni correction was also implemented in this case. In the literature, such comparisons commence with full metric and scalar measurement invariance imposed on both measurement parts of the models in the pairwise comparison. This level of invariance must be supported by the data, as was the case in the present analysis, not simply imposed on the measurement model (Millsap, 2013). Sörbom (1974; 1978) suggested *theta* (θ) invariance should be imposed as well (invariant uniquenesses). However, this requirement for ‘strict’ factorial invariance (Meredith, 1993) was not implemented in this analysis. ‘Strict’ factorial invariance is not considered in the literature a prerequisite to proceed with the comparison of latent means and intercepts (Millsap, 2011; Steenkamp and Baumgartner, 1998; Vandenberg and Lance, 2000).

In order to proceed with the pairwise comparisons of latent means, each autoregressive SEM was respecified as a CFA autoregressive longitudinal model, replacing the longitudinal paths p_{21} and p_{32} with factor covariances ($\mathbf{\Phi}_{21}$, $\mathbf{\Phi}_{32}$). In this way, the software estimates differences in factor means of all latent constructs but not latent intercepts since there is no $\mathbf{\Gamma}$ matrix (factor covariances between exogenous and endogenous factors, see equation 4.14, chapter 4). Following standard procedure, the latent means of the reference group were constrained to zero while those of the comparison group were freely estimated. To estimate latent intercepts, the CFA model was respecified as an autoregressive longitudinal SEM, replacing the factor covariances with the longitudinal paths p_{21} and p_{32}. The software now estimated differences in factor means of only the exogenous factors (which were identical to those obtained for the same factor in the prior estimation step) plus differences in factor intercepts for every endogenous factor, since in the case of SEM, both the **B** and the **Γ** matrices are estimated (compare equations 4.6 and 4.14, section 4.1, chapter 4). The level of measurement invariance remained the same but the latent intercepts of the reference model were constrained to zero while those of the comparison group were freely estimated. Tables 6.7a-b show the results from the hypothesis tests of equality of latent means and intercepts and their standard errors for models 1-6. The reference group in each comparison is noted in bold. The white group is first compared to all others followed by Indian group which is compared next to the remaining three

Table 6.7a: Scaled point differences in latent means and intercepts for models 1-3 by ethnic group

Model 1	**FAM1 latent means μ_1**			**FAM2 latent intercepts κ_2**			**FAM2 latent means μ_2**								
Ethnic group	μ_1	SE	p	κ_2	SE	p	μ_2	SE	p	κ_3	SE	p	μ_3	SE	p
White (n=1000)	0.0			0.0			0.0								
Indian (n=751)	-0.228	0.061	0.00	0.036	0.015	0.021	-0.190	0.061	0.002						
Pakistani (n=642)	-1.313	0.069	0.00	0.161	0.039	0.000	-1.259	0.070	0.00						
Bangladeshi (n=484)	-1.873	0.078	0.00	0.024	0.045	0.513	-1.891	0.078	0.00						
BCaribbean (n=324)	-0.081	0.088	0.354	0.065	0.032	0.043	-0.016	0.086	0.856						
Indian (n=751)	0.0			0.0			0.0								
Pakistani (n=642)	-1.080	0.075	0.00	0.138	0.033	0.00	-1.024	0.073	0.00						
Bangladeshi (n=484)	-1.596	0.084	0.00	0.019	0.038	0.611	-1.610	0.085	0.00						
BCaribbean (n=324)	0.143	0.088	0.102	0.063	0.031	0.044	0.206	0.089	0.017						
Pakistani (n=642)	0.0			0.0			0.0								
Bangladeshi (n=484)	-0.404	0.060	0.00	-0.002	0.013	0.903	-0.410	0.060	0.00						
BCaribbean (n=324)	1.336	0.116	0.00	0.059	0.017	0.816	1.381	0.117	0.00						
Bangladeshi (n=484)	0.0			0.0			0.0								
BCaribbean (n=324)	1.482	0.141	0.00	0.059	0.079	0.458	1.523	0.144	0.00						
Model 2	**PAR1 latent means μ_1**			**PAR2 latent intercepts κ_2**			**PAR2 latent means μ_2**			**PAR3 latent intercepts κ_3**			**PAR3 latent means μ_3**		
White (n=1000)	0.0			0.0			0.0			0.0			0.0		
Indian (n=751)	0.115	0.05	0.02	0.064	0.039	0.099	0.159	0.047	0.00	0.066	0.038	0.09	0.224	0.047	0.00
Pakistani (n=642)	0.175	0.06	0.00	0.147	0.045	0.001	0.284	0.044	0.00	0.168	0.046	0.00	0.362	0.045	0.00
Bangladeshi (n=484)	0.811	0.07	0.00	0.520	0.070	0.00	0.853	0.044	0.00	0.274	0.083	0.00	0.833	0.041	0.00
BCaribbean (n=324)	-0.012	0.062	0.853	-0.013	0.058	0.822	-0.020	0.061	0.749	0.050	0.054	0.352	0.026	0.066	0.687
Indian (n=751)	0.0			0.0			0.0			0.0			0.0		
Pakistani (n=642)	0.018	0.057	0.755	0.085	0.045	0.057	0.119	0.049	0.00	0.135	0.045	0.003	0.203	0.049	0.00
Bangladeshi (n=484)	0.653	0.072	0.000	0.415	0.067	0.000	0.692	0.066	0.00	0.187	0.079	0.017	0.670	0.070	0.00
BCaribbean (n=324)	-0.162	0.066	0.013	0.002	0.064	0.970	-0.183	0.061	0.005	0.049	0.059	0.840	-0.136	0.047	0.047
Pakistani (n=642)	0.00			0.0			0.0						0.0		
Bangladeshi (n=484)	0.551	0.074	0.00	0.351	0.065	0.00	0.572	0.068	0.00	0.148	0.074	0.046	0.555	0.072	0.00
BCaribbean (n=324)	-0.270	0.067	0.00	0.019	0.069	0.785	-0.301	0.067	0.00	0.048	0.062	0.438	-0.256	0.071	0.00
Bangladeshi (=484)	0.0			0.0			0.0						0.0		
BCaribbean (n=324)	-0.842	0.073	0.00	0.102	0.114	0.370	-0.861	0.070	0.00	0.045	0.098	0.642	-0.814	0.073	0.00
Model 3	**HW1 latent means μ_1**			**HW2 latent intercepts κ_2**			**HW3 latent means μ_2**								
White (n=1000)	0.0			0.0			0.0								
Indian (n=751)	0.576	0.060	0.00	0.215	0.044	0.00	0.606	0.059	0.00						
Pakistani (n=642)	0.251	0.063	0.00	0.116	0.046	0.012	0.287	0.062	0.00						
Bangladeshi (n=484)	0.329	0.064	0.00	0.094	0.055	0.082	0.317	0.068	0.00						
BCaribbean (n=324)	0.288	0.074	0.00	-0.057	0.067	0.396	0.092	0.081	0.259						
Indian (n=751)	0.00			0.00			0.0								
Pakistani (n=642)	-0.342	0.069	0.00	-0.076	0.048	0.114	-0.304	0.064	0.00						
Bangladeshi (n=484)	-0.264	0.071	0.00	-0.095	0.056	0.086	-0.271	0.069	0.00						
BCaribbean (n=324)	-0.307	0.080	0.00	-0.344	0.067	0.000	-0.505	0.082	0.00						
Pakistani (n=642)	0.00			0.00			0.00								
Bangladeshi (n=484)	0.059	0.073	0.420	0.023	0.056	0.675	0.059	0.072	0.413						
BCaribbean (n=324)	0.008	0.082	0.924	-0.194	0.066	0.003	-0.190	0.084	0.023						
Bangladeshi (n=484)	0.00			0.00			0.00								
BCaribbean (n=324)	-0.052	0.085	0.539	-0.224	0.067	0.00	-0.251	0.087	0.004						

Note: FAM=parental social position; PAR=parent child conflict; HW=pupils' engagement with homework; SCH=pupils' feelings about school; TCH=pupils' assessments about teachers' effectiveness; YPEX; pupils' educational expectations; p= significance; SE=standard error. Reference groups are noted in bold; n=sample size

ethnic groups. This is followed by the Pakistani group which is compared next to the remaining 2 groups and last by the Bangladeshi which compared only to the remaining Black Caribbean group, resulting in 10 comparisons. Differences in latent means of the exogenous factor ($\boldsymbol{\mu}_1$) are reported first, followed by the differences in factor intercepts of the first endogenous factor ($\boldsymbol{\kappa}_2$), whose differences in factor means ($\boldsymbol{\mu}_2$) are reported next, followed by the differences in factor intercepts

Table 6.7b: Scaled point differences in latent means and intercepts for models 4-6 by ethnic group

Model 4	**SCH1 latent means μ_1**			**SCH2 latent intercepts κ_2**			**SCH2 latent means μ_2**			**SCH3 latent intercepts κ_3**			**SCH3 latent means μ_3**		
Ethnic group	μ_1	SE	p	κ_2	SE	p	μ_2	SE	p	κ_3	SE	p	μ_3	SE	p
White (n=1000)	0.00			0.00			0.00			0.00			0.00		
Indian (n=751)	0.171	0.020	0.00	-0.013	0.014	0.04	0.120	0.018	0.00	0.092	0.014	0.00	0.196	0.020	0.00
Pakistani (n=642)	0.171	0.021	0.00	-0.044	0.015	0.00	0.102	0.019	0.00	0.090	0.016	0.00	0.181	0.021	0.00
Bangladeshi (n=484)	0.146	0.022	0.00	-0.065	0.018	0.00	0.060	0.022	0.00	0.087	0.017	0.00	0.144	0.022	0.00
BCaribbean (n=324)	0.007	0.029	0.803	-0.078	0.022	0.00	-0.075	0.026	0.00	0.003	0.023	0.883	-0.060	0.029	0.04
Indian (n=751)	0.00			0.00			0.00			0.00			0.00		
Pakistani (n=642)	0.000	0.020	0.999	-0.065	0.014	0.00	-0.067	0.019	0.00	-0.064	0.014	0.08	0.011	0.020	0.576
Bangladeshi (n=484)	-0.023	0.021	0.285	-0.086	0.017	0.00	0.108	0.021	0.00	0.057	0.017	0.00	-0.029	0.021	0.170
BCaribbean (n=324)	-0.155	0.029	0.00	-0.101	0.022	0.00	-0.236	0.025	0.00	-0.027	0.023	0.236	-0.223	0.029	0.00
Pakistani (n=642)	0.00			0.00			0.00			0.00			0.00		
Bangladeshi (n=484)	-0.002	0.023	0.936	-0.093	0.019	0.00	-0.105	0.023	0.00	0.062	0.018	0.00	-0.017	0.023	0.470
BCaribbean (n=324)	-0.149	0.031	0.000	-0.113	0.024	0.00	-0.252	0.029	0.00	-0.028	0.025	0.269	-0.230	0.032	0.00
Bangladeshi (n=484)	0.00			0.00			0.00			0.00			0.00		
BCaribbean (n=324)	-0.122	0.032	0.000	-0.104	0.024	0.00	-0.224	0.030	0.00	-0.016	0.026	0.342	-0.200	0.033	0.000
Model 5	**TCH1 latent means μ_1**			**TCH2 latent intercepts κ_2**			**TCH2 latent means μ_2**								
White (n=1000)	0.00			0.00			0.00								
Indian (n=751)	0.100	0.023	0.00	-0.009	0.017	0.587	0.059	0.023	0.011						
Pakistani (n=642)	0.103	0.025	0.00	-0.009	0.016	0.635	0.102	0.025	0.000						
Bangladeshi (n=484)	0.098	0.027	0.00	0.014	0.015	0.484	0.079	0.026	0.002						
BCaribbean (n=324)	-0.016	0.034	0.623	-0.077	0.026	0.004	-0.112	0.032	0.000						
Indian (n=751)	0.00			0.00			0.00								
Pakistani (n=642)	0.076	0.025	0.002	-0.028	0.019	0.126	0.022	0.025	0.385						
Bangladeshi (n=484)	0.015	0.027	0.568	-0.011	0.018	0.538	-0.003	0.025	0.890						
BCaribbean (n=324)	-0.098	0.033	0.003	-0.097	0.025	0.000	-0.184	0.031	0.000						
Pakistani (n=642)	0.00			0.00			0.00								
Bangladeshi (n=484)	-0.033	0.027	0.224	-0.027	0.018	0.140	-0.051	0.025	0.042						
BCaribbean (n=324)	-0.144	0.033	0.000	-0.110	0.025	0.000	-0.224	0.032	0.000						
Bangladeshi (n=484)	0.00			0.00			0.00								
BCaribbean (n=324)	-0.110	0.034	0.001	-0.098	0.025	0.000	-0180	0.033	0.000						
Model 6	**YPEX1 latent means μ_1**			**YPEX2 latent intercepts κ_2**			**YPEX2 latent means μ_2**			**YPEX3 latent intercepts κ_3**			**YPEX3 latent means μ_3**		
White (n=1000)	0.00			0.00			0.00			0.00			0.00		
Indian (n=751)	0.499	0.036	0.000	0.080	0.023	0.00	0.506	0.033	0.00	0.170	0.022	0.00	0.602	0.034	0.00
Pakistani (n=642)	0.345	0.038	0.000	0.045	0.028	0.250	0.335	0.036	0.00	0.065	0.025	0.01	0.343	0.038	0.00
Bangladeshi (n=484)	0.234	0.042	0.000	0.067	0.031	0.029	0.261	0.040	0.00	0.090	0.028	0.00	0.312	0.040	0.00
BCaribbean (n=324)	0.263	0.050	0.000	-0.064	0.039	0.300	0.160	0.047	0.00	0.139	0.037	0.00	0.281	0.050	0.00
Indian (n=751)	0.00			0.00			0.00			0.00			0.00		
Pakistani (n=642)	-0.192	0.035	0.000	-0.056	0.028	0.04	-0.209	0.033	0.00	-0.035	0.025	0.232	-0.199	0.036	0.00
Bangladeshi (n=484)	-0.304	0.039	0.000	-0.041	0.031	0.350	-0.281	0.038	0.00	-0.015	0.028	0.450	-0.231	0.038	0.00
BCaribbean (n=324)	-0.276	0.047	0.000	-0161	0.039	0.000	-0.384	0.045	0.00	0.030	0.037	0.321	-0.262	0.048	0.00
Pakistani (n=642)	0.00			0.00			0.00			0.00			0.00		
Bangladeshi (n=484)	-0.111	0.040	0.004	0.003	0.031	0.892	-0.078	0.039	0.045	0.027	0.028	0.257	-0.029	0.040	0.471
BCaribbean (n=324)	-0.086	0.018	0.070	-0.120	0.038	0.002	-0.184	0.046	0.000	0.072	0.036	0.05	0.00	-0.060	0.220
Bangladeshi (n=484)	0.00			0.00			0.00			0.00			0.00		
BCaribbean (n=324)	-0.008	0.051	0.818	-0.099	0.039	0.010	-0.111	0.048	0.021	0.094	0.037	0.01	0.012	0.051	0.809

Note: FAM=parental social position; PAR=parent child conflict; HW=pupils' engagement with homework; SCH=pupils' feelings about school; TCH=pupils' assessments about teachers' effectiveness; YPEX; pupils' educational expectations; p= significance; SE=standard error. Reference groups are noted in bold; n=sample size

(**κ_3**) and factor means (**μ_3**) of the second endogenous factors. As in the previous section, I consider each model in turn from Tables 6.7a-b above.

Cross-group differences in latent means and intercepts in parental social position (model 1)

The negative factor means observed for all the groups at young people's ages 14 and 15 for parental social position (labelled FAM1 and FAM2 in Tables 6.7a-b) suggest that all groups had lower levels in parental social position relative to the white group. The only group for which this difference in latent means was not significant was the Black Caribbean ($\Delta_{\mu BC}$ = -0.081, p = ns). This is quite surprising as general population estimates have consistently shown that Indian families have socioeconomic profiles far closer to or at a par with those of white families, while Black Caribbean families are much less similar (ONS, 2010). While other studies using the same dataset (Strand, 2007; 2008) have reported similar findings to mine, this incongruence should caution us that the generalisability of the cross-group differences based on the LSYPE might be limited. With this caveat in mind, the most striking difference in that respect was observed between the white and the Bangladeshi ($\Delta_{\mu B}$ = -1.873, $p \leq 0.005$) followed by the Pakistani ($\Delta_{\mu P}$ = -1.313, $p \leq 0.005$) for whom greater levels of disadvantage have been well documented in the literature (see chapter 2). Indian parents were the least different from their white counterparts but the difference was still significant ($\Delta_{\mu I}$= -0.228, $p \leq 0.005$). Indian parents however were much higher in terms of their social position than their other South Asian counterparts. Pakistani parents were significantly higher than their Bangladeshi counterparts. Black Caribbean parents were significantly higher than their Pakistani and Bangladeshi counterparts but not significantly different from their Indian counterparts. This reflects the relative disadvantage of minority groups already shown in chapter 5.

The differences of latent intercepts tell us about the relative change in parental social position and material circumstances. A significant positive intercept means that the contribution of parental social position at pupil's age 14 to parental social position at pupils' age 15 was on average higher than that of the reference group. Tables 6.7a-b suggest that this was the case only for the Pakistani and the Indian parents (see model 1, column $\boldsymbol{\kappa}_2$, for Indian and Pakistani groups). Differences decreased relative to the white reference group at pupils' age 15 only in the Pakistani and the Indian group. This was consistent with the significant positive latent intercepts observed in these two groups. Taken together, this evidence suggests that while differences in the contribution of parental social position remained significant between Indian and Pakistani parents and their white counterparts at age 15, these differences became less, suggesting that Indian and Pakistani parents' social position improved faster relative to that of their white counterparts. In all the other groups, the levels of parental social position remained the same between ages 14 to 15. This was also consistent with the findings of the previous analysis regarding the general cross-group structural invariance in path p_{21} except in the case of the Indian group. The fact that the Pakistani group was not singled out during that test suggests that the test of latent means and intercepts was much more sensitive in picking up small differences over time[9]. The evidence was consistent with the hypothesis that maternal ethnicity moderated significant cross-group differences in latent means and intercepts.

Cross-group differences in latent means and intercepts in parent-child conflict (model 2)

Higher scores on the parent-child latent construct represent *better* parent-child relations. Tables 6.7a-b show that at age 14, all the minority groups had significantly less parent-child conflict relative to the white reference group. Among those, the Bangladeshi ($\Delta_{\mu B}$ = 0.811, p≤ 0.005) and the Pakistani ($\Delta_{\mu P}$ = 0.175, p≤ 0.005) parents had the greatest significant differences in their latent means, while Black Caribbean parents were not different in this respect from their white counterparts ($\Delta_{\mu B}$ = -0.012, p = ns). These differences were confirmed with different reference groups (see Tables 6.7a-b). Bangladeshi parents had significantly less parent-child conflict than their Indian and Pakistani counterparts, while Black Caribbean parents significantly more parent-child conflict than their Indian, Pakistani and Bangladeshi counterparts. This evidence is consistent with the tendencies of the manifest indicators for parent-child conflict described in chapter 5.

Most importantly however, Bangladeshi and Pakistani parents reported changes in their parent-child conflict at age 15 and 16 that *widened* the positive gap in their latent means relative to the white group. This suggests that from age 14 to 15, parent-child conflict in Bangladeshi and Pakistani families got significantly *less*, relative to the white group. This was confirmed by the latent intercepts at age 15 and age 16 of the Bangladeshi and the Pakistani groups. Both were positive and highly significant suggesting that there was a significantly higher positive net gain in better parent-child relations (less parent-child conflict). This increased the Bangladeshi and Pakistani gap in this dimension relative to the white group. On the contrary, there was no gap between the white and Black Caribbean parents in terms of parent-child conflict. The gap in latent mean difference between the white and Indian groups slowly but steadily widened between ages 14 to 16 suggesting faster-deteriorating parent-child relations in white families relative to their Indian counterparts. This evidence suggests that minority ethnic groups differed considerably and consistently relative to their white counterpart mainly because parent-child conflict took a turn for the worse in the white group.

[9] Of course, if the model is misspecified (due to omitted paths, for example), then structural parameters will be estimated with error. In this case, it is likely that path coefficients will remain relatively unaffected while latent intercepts will be more prone to bias from specification error. However, although specification error always remains a possibility, it is less likely to occur in models 1-6 since each model represents a relatively simple autoregressive structure based on 2 and 3 waves of panel data supporting a high level of longitudinal measurement invariance.

This lends strong support to the hypothesis that maternal ethnicity was a moderator of these differences.

Cross-group differences in latent means and intercepts in pupils' engagement with homework (model 3)

Tables 6.7a-b provide evidence that all minority groups had significantly higher engagement with homework relative to that of their white peers. This evidence confirms the general picture regarding ethnic differentials in pupils' homework engagement outlined in chapter 5. At age 14, the highest differences in latent means were noted among the Indian ($\Delta_{\mu I} = 0.576$, $p \leq 0.005$) pupils, followed by the Bangladeshi ($\Delta_{\mu B} = 0.329$, $p \leq 0.005$), the Black Caribbean ($\Delta_{\mu BC} = 0.288$, $p \leq 0.005$) and the Pakistani ($\Delta_{\mu P} = 0.251$, $p \leq 0.005$) pupils. The significant difference among those groups however became apparent in their latent intercepts. At age 15, net gains increasing the gap in minority pupils' engagement with homework relative to the white pupils were seen only in the case of the Indian ($\Delta_{\kappa I} = 0.215$, $p \leq 0.005$) and the Pakistani ($\Delta_{\kappa P} = 0.116$, $p \leq 0.005$). Most importantly, while all South Asian groups maintained the same levels of homework engagement between ages 14 to 15, Black Caribbean pupils *decreased* their engagement such that their initial positive gap relative to their white peers at age 14 disappeared at age 15 ($\Delta_{\mu BC} = 0.081$, p = ns). On the contrary, the gap in latent means in engagement with homework between Black Caribbean pupils and their Bangladeshi and Pakistani peers widened at age 15 while it was insignificant the previous year, at age 14. Black Caribbean pupils' gap in homework engagement relative to their Indian peers almost doubled in favour of Indian pupils at age 15. This reflects the strong downward trend in homework engagement of Black Caribbean pupils relative to that of the South Asian groups.

The cross-group invariant path p_{21}, representing change in homework engagement from age 14 to age 15 can now be placed in proper perspective. Indian people marked no change in their homework engagement between ages 14 to 15 by having consistently much *higher* engagement relative to their white peers during this time. On the contrary, white pupils maintained consistently lower homework engagement relative to the South Asian groups. Thus, practically all the other groups maintained their positive gaps in engagement with homework relative to their white peers. The exception was the Black Caribbean pupils in whose case, change in homework engagement from age 14 to age 15 meant *lower* engagement, coming to par with the level of homework engagement of their white peers. This evidence suggests that maternal ethnicity moderated not only minority differences in engagement with homework relative to the white group, but also significant between-group differences among minority groups.

Cross-group differences in latent means and intercepts in pupils' feelings about school (model 4)
In general, all minority groups had significantly higher positive feelings about school relative to their white peers at age 14 confirming the evidence suggested by their pertinent indicators in chapter 5. The exception was the Black Caribbean pupils who did not differ significantly in their feelings about school relative to their white peers. This suggests that between ages 14-16, white and Black Caribbean pupils maintained consistently lower latent means in their feelings about school relative to their South Asian peers. One of the most significant findings was a general drop in the latent mean levels of feelings about school at age 15 which was consistent with the observed drop in frequencies of manifest indicators for model 4 discussed in chapter 5. While differences in latent means remained positive and significant at age 15, all South Asian groups experienced a slump in their feelings about school relative to that of their white peers in year 10 narrowing their gaps relative to their white peers. Black Caribbean pupils' latent mean level in feelings about school became significantly *less* than that of their white peers at year 10 ($\Delta_{\mathbf{\mu}BC} = -0.075$, p = 0.005) and remained so in year 11 ($\Delta_{\mathbf{\mu}BC} = -0.060$, p = 0.04) although the difference was nonsignificant when adjusted by the Bonferroni correction. This suggests that as regards feelings about school, Black Caribbean pupils appeared to be the most disaffected even exceeding their white peers, particularly at year 10 and 11. The relative narrowing of the gap between the South Asian groups and their white peers at age 15 suggests that South Asian pupils felt less positive towards their school at that age. However, this drop in their feelings about school was temporary as the gap disappeared the following year. On the contrary, Black Caribbean pupils' feelings about school deteriorated further at age 16 relative to those of their South Asian peers. While the qualitative literature has brought attention to this fact (see chapter 2), it is the first time that we know exactly *when* this disaffection begins to take a turn for the worse. All groups recovered from this fall off in commitment at age 16 except the Black Caribbean pupils. Differences in South Asian latent means in feelings about school increased again at 16, maintaining the positive gaps relative to their white peers as they were at age 14.

Strictly, quantitative evidence for the fall off in commitment is made apparent in the estimated differences in latent intercepts for each of the groups. At age 15, they were all negative and significant suggesting that for all groups, feelings about school at age 14 reduced the net gain of all groups in this dimension relative to their white peers. At age 16 however, the latent intercepts for all South Asian groups became positive and significant creating again the net gain that existed at age 14. This slump in feelings about school might have to do with GCSE exam results, tier placements or other changes in school policies that disappointed a considerable proportion of young people at age 15. But since only the Black Caribbean pupils remained more disaffected relative to their South Asian and white peers at age 16, more research is needed to understand this longitudinal change. The evidence is consistent with the hypothesis that this longitudinal change was significantly moderated by different maternal ethnic group membership.

Cross-group differences in latent means and intercepts in pupils' assessments about teachers' effectiveness (model 5)

With the exception of Black Caribbean pupils, all other minority pupils had significantly higher assessments regarding teachers' effectiveness relative to their white peers, confirming the results of the tabular analysis of manifest indicators in chapter 5. At age 14, the greater difference in latent means was noted in the Pakistani ($\Delta_{\mu P} = 0.163$, $p \leq 0.005$) pupils, followed by their Indian ($\Delta_{\mu I} = 0.100$, $p \leq 0.005$) and their Bangladeshi ($\Delta_{\mu B} = 0.098$, $p \leq 0.005$) peers. Black Caribbean pupils had consistently significantly lower assessments about their teachers' effectiveness relative to their Indian ($\Delta_{\mu BC} = -0.098$, $p \leq 0.005$), Pakistani ($\Delta_{\mu BC} = -0.144$, $p \leq 0.005$) and Bangladeshi ($\Delta_{\mu BC} = -0.110$, $p \leq 0.005$) but not their white peers ($\Delta_{\mu BC} = -0.016$, p = ns). An important finding was that Black Caribbean pupils' assessments got significantly *lower* even relative to their white peers at age 15 ($\Delta_{\mu BC} = -0.112$, $p \leq 0.005$). This suggested that at age 15, Black Caribbean pupils held the *lowest* assessments about their teachers' effectiveness and quality relative to all of their other peers. Given their greater disaffection shown in their attitudes about school relative to those of their other peers, this is not surprising. What is quite interesting though is that Black Caribbean pupils' negative feelings about schools and teachers deteriorated even more relative to their peers over time.

The tests of cross-group structural invariance did not pick up any significant differences in path p_{21} marking the change in pupils' assessments from age 14 to15. This cross-group invariance was generally confirmed by the analysis of the latent means and intercepts. For all minority groups except the Black Caribbean, differences in latent means hardly changed between ages 14 to 15 becoming slightly less at age 15 (see Table 6.8). None of the latent intercepts at age 15 were statistically significant suggesting that gaps in this dimension remained stable. But we now know that the structurally invariant path p_{21} across ethnic groups in model 5 meant different things for each group in the analysis. It meant that Pakistani, Indian and Bangladeshi young people were consistent in holding positive assessments about their teachers at age 15 just as they used to at age 14. Black Caribbean pupils however were consistent in holding more negative assessments and increased their negative gaps in this dimension relative to all of their peers. The evidence gives strong support to the hypothesis that maternal ethnicity moderated differences in latent means and intercepts regarding pupils' assessments about their teachers' effectiveness.

Cross-group differences in latent means and intercepts in pupils' educational expectations (model 6)

At age 14, all groups held significant positive differences in their latent means in educational expectations relative to their white peers. This tendency was already evident in the frequencies of the pertinent indicators discussed in chapter 5. The highest differences were noted in the Indian ($\Delta_{\boldsymbol{\mu}I}$ = 0.499, $p \leq 0.005$) pupils, followed by their Pakistani ($\Delta_{\boldsymbol{\mu}P}$ = 0.345, $p \leq 0.005$), Black Caribbean ($\Delta_{\boldsymbol{\mu}BC}$ = 0.263, $p \leq 0.005$) and Bangladeshi ($\Delta_{\boldsymbol{\mu}B}$ = 0.234, $p \leq 0.005$) peers. All of these gaps widened at age 15 and even more so at age 16 relative to white pupils. However, the gaps in latent mean differences of minority pupils relative to their white peers widened very differently in each minority group. Based on the cross-group differences in the latent intercepts for each group at ages 15 and 16, Indian pupils had the highest net gain difference in expectations thus maintaining the biggest gaps in latent mean differences in expectations relative to all other groups between ages 14 to 16. Differences in their expectations increased most dramatically relative to all other groups between ages 15 to 16. Pakistani pupils also held consistent positive gaps in latent mean differences in expectations relative to their white peers. But contrary to their Indian peers, these gaps hardly changed between ages 14 to 16 (see Model 6, columns, $\boldsymbol{\mu}_1$, $\boldsymbol{\mu}_2$ and $\boldsymbol{\mu}_3$ for Indian and Pakistani pupils, Tables 6.7a-b). Bangladeshi pupils widened their positive gaps in latent mean differences in expectations between ages 14 to 15 and still more between ages 15 to 16. Like their Indian peers, they increased their latent mean differences more during ages 15 to 16. However, comparing the latent intercepts in the Indian and Bangladeshi groups at ages 15 and 16, Indian pupils widened their positive gaps in expectations relative to their white peers much faster than did Bangladeshi pupils. This is easily confirmed by the nonsignificant negative difference in latent intercepts for Bangladeshi pupils at age 15 ($\Delta_{\boldsymbol{\kappa}B}$ = -0.041, p = ns) and 16 ($\Delta_{\boldsymbol{\kappa}B}$ = -0.015, p = ns).

Black Caribbean pupils were remarkable in being the only group of pupils to start off at age 14 with a positive gap in their latent mean expectations relative to their white peers ($\Delta_{\boldsymbol{\mu}BC}$ = 0.260, $p \leq$

0.005); to lower their expectations, narrowing this gap considerably at age 15 ($\Delta_{\mu BC} = 0.160$, $p \leq 0.005$; and more than regain that advantage relative to their white peers by increasing their latent mean differences again at age 16 ($\Delta_{\mu BC} = 0.281$, $p \leq 0.005$). This peculiar curve was confirmed by their nonsignificant negative difference in their latent intercept at age 15 ($\Delta_{\kappa BC} = -0.064$, p = ns) and their significant positive difference in their latent intercept difference at age 16 ($\Delta_{\kappa BC} = 0.134$, $p \leq 0.005$). In terms of the rate of increase in their latent mean expectations, Black Caribbean pupils caught up with their Pakistani and Bangladeshi peers at age 16. This was also confirmed by the Black Caribbean latent intercept differences when those two groups were the reference groups (see Model 6, columns $\boldsymbol{\kappa}_2$ and $\boldsymbol{\kappa}_3$, last six rows of Table 6.7b).

The above evidence was entirely consistent with the observed cross-group noninvariance of the paths p_{21} and p_{32} in model 6 discussed above. However we are in a position now to interpret this cross-group noninvariance in terms of the *levels* of expectations. Cross-group structural non-invariance existed particularly in paths p_{21} and p_{32} (connecting the occasions of model 6) because Indian pupils increased their positive gaps in expectations faster than any other group between ages 14 to 16. Pakistani pupils were different from their Indian peers because Pakistani pupils' expectations remained much more stable (but considerably lower) than those of their Indian peers. Bangladeshi pupils were different because although their expectations increased over time, the gaps between them and their other South-Asian peers varied. Finally Black Caribbean pupils were different in that no other group showed a narrowing of their positive gap in expectations relative to their white peers from ages 14 to 15 followed by a significant widening of the same positive gap from ages 15 to 16.

There are quite important substantive implications regarding Black Caribbean pupils based on the above analysis. Despite their relatively less positive feelings about school and teachers' effectiveness and their lower engagement with homework during year 10, they were able to maintain higher expectations relative to their white peers, whose expectations remained the lowest relative to those of all their minority peers at year 11. This suggests that maternal ethnicity moderated differently not only changes in expectations from ages 14 to 16 but also changes in the latent mean levels of pupils' expectations. This moderation created and maintained significant gaps in the latent mean levels of pupils' expectations that varied in each group over time.

6.4 Discussion

This chapter addressed two questions: First whether parental social position, parent-child conflict, pupils' engagement with homework, feelings about school, assessments about their teachers' effectiveness and educational expectations changed over time. Second, whether this change was moderated by maternal ethnicity. The analysis suggested that in general, parental social position did not change significantly over a year, from pupils' age 14 to 15. In that respect, hypothesis (i) was supported. However, during that time, there was some evidence that Indian and Pakistani families significantly decreased their gaps relative to their white counterparts thus showing signs of improving their parental social position. There were changes in parent-child conflict over time which differed across groups. Parent-child conflict in Muslim South Asian families was much less relative to that in white and Black Caribbean families and tended to diminish over time. As a result hypothesis (ii) was also supported. There were no significant cross-group differences in terms of any temporal change in pupils' engagement with homework, their feelings about school and assessments of their teachers' effectiveness. Based on the above evidence, hypotheses (iii)-(v) that suggested that homework engagement, positive feelings about school and assessments about teachers' effectiveness would change over time could not be supported. However, in terms of the expected differences in the *levels* of homework engagement, positive feelings about school and assessments of teachers' effectiveness, hypotheses (iii)-(v) were fully supported. Indian, Pakistani and Bangladeshi pupils maintained consistently and significantly higher averages (assessed by factor means) in homework engagement, positive feelings about school and assessments of teachers' effectiveness as compared to their white and Black Caribbean peers. In contrast, there were significant cross-group differences in the *change* of young people's educational expectations over time. In that respect, hypothesis (vi) was also supported. Expectations increased over time most dramatically in the Indian pupils relative to all other groups, while earlier expectations determined later expectations for all groups. It would appear that pupils' homework habits, feelings about school and impressions about their teachers' effectiveness are more resistant to change over ages 14-16 once formed at age 14. By contrast, pupils' educational expectations are much more likely to change, typically for the better, over time for minority groups but less so for their white peers, which also supported hypothesis (vi).
However, the analysis showed that examining only cross-group invariance in the structural estimates representing change over time offered limited information. It could not reveal full information about the *nature* of any change over time. For this reason, an analysis of latent means and intercepts was conducted and revealed that even if structural paths were cross-group invariant, there were still

consistent and highly significant cross-group differences in latent means and intercepts in the latent constructs.

The findings were consistent with the hypothesis that maternal ethnicity moderated the longitudinal relations specified by models 1-6 in a variety of ways. First maternal ethnicity, to the extent it captured cultural background and different perceptions of the LSYPE respondents, was suggestive of the differential item functioning (DIF) of particular indicators in models 1-6 (see Appendix 4). However, only about 20% of the intercepts exhibited DIF, i.e., were cross-group non-invariant. As a result they were freely-estimated. Second, maternal ethnicity moderated changes in the mean levels of the latent constructs which were statistically demonstrated by the systematic rejection of the null hypothesis of cross-group equivalence in latent means and intercepts. Almost all cross-group latent mean differences were highly significant. The required levels of cross-group measurement invariance (configural, full metric and about 80% partial scalar) were supported by the data[10]. As a result, the analysis presented error-free estimates of the extent to which differences stemming from the latent constructs themselves (see, Chan, 1998) were responsible for the obtained latent mean and intercept differences[11]. Thus, results were consistent with what we would expect to see if a significant moderating influence from maternal ethnicity was in force. Third, cross-group differences in the structural estimates representing longitudinal change in parent-child conflict and educational expectations were similarly consistent with the hypothesis that they reflected moderation by maternal ethnicity. Differences were estimated with cross-group configural, full metric and satisfactory levels of partial scalar invariance achieved. The ‘strong’ level of achieved cross-group measurement invariance in addition to the bias-corrected standard errors; and a necessary Bonferroni adjustment for p levels to manage the number of statistical comparisons being made, increase our confidence to the conclusion that the findings were consistent with the hypothesis that structural estimates (path coefficients, latent means and intercepts) were moderated by maternal ethnicity.

[10] At no time was measurement invariance *imposed* on the data. The data always supported the required level of achieved measurement invariance.

[11] One may speculate about *causes* of the obtained significant differences in latent intercepts. These differences may reflect different perceptions and sensitivities driving the respondents’ responses. Differential item functioning (DIF) might be rooted in different experiences of ethnic concentration, discrimination, migration histories, etc. Thus, ‘ethnicity’ as a moderator of these differences might not refer to a simple label but to an umbrella term incorporating different individual and group experiences behind differential perceptions and responses.

Indian, Pakistani, Bangladeshi and Black Caribbean pupils differed remarkably both among themselves and relative to their white peers in many respects. They differed significantly in terms of their parental social position, with Indian and Pakistani parents showing signs for improving parental class position even within the short span of a single year. In terms of parent-child conflict, South Asian families maintained much lower levels relative to the white and Black Caribbean families. Engagement with homework was much higher in all South Asian groups relative to the white group and remained so until age 16. Black Caribbean pupils significantly decreased their engagement with homework at age 15 even relative to their white peers. South Asian pupils generally had more positive feelings about school while Black Caribbean pupils the least positive feelings relative to their white peers. Similarly, South Asian pupils had significantly higher assessments of their teachers' effectiveness relative to their white peers but Black Caribbean pupils maintained the least favourite assessments.

The level of educational expectations increased dramatically in the Indian group but more modestly in the other South Asian groups. White pupils were the only group to maintain consistently the lowest levels of expectations over time relative to all others, including the Black Caribbean pupils. Black Caribbean pupils experienced a dramatic decrease in their expectation at age 15 from which they recovered at age 16 maintaining a significant positive gap relative to their white peers. All the above evidence was consistent with the hypothesis that maternal ethnicity moderated consistently and significantly the above between-group differences not only relative to their white peers, but also among themselves. Parental ethnicity was highlighted in the qualitative literature as a moderator of developmental outcomes but it is satisfying that the present quantitative analysis confirmed this finding.

The analysis highlighted year 9 (age 14) as an important determinant of all subsequent phases of development in the above six dimensions during year 10 (age 15) and year 11 (age 16). Year 10 marked a drop in positive feelings about school across all groups from which only the white and Black Caribbean pupils did not recover at year 11. Finally, year 10 appeared to be critical for the Black Caribbean pupils in that it marked a turn for the worse with regard to their feelings about school and teachers and a drop in their expectations. While their expectations recovered the following year, their ideas about school and teachers remained the lowest relative to those of the other minority pupils.

6.5 Conclusions

This chapter reported the results of the preliminary analysis on which subsequent analysis was conditional. The results showed that the data supported the required levels of measurement invariance. Therefore the latent constructs were comparable over time and across ethnicity groups which permitted the cross-group comparison of latent means and intercepts. This analysis provided a valuable interpretative framework which will be used in the subsequent mediation analysis to address the rest of the research questions of this thesis. The next analytic step is to explore the potential contribution of parental social position, parent-child conflict, pupils' homework engagement, feelings about school and assessments of their teachers' effectiveness in influencing pupils' educational expectations and the routes via which they exert their potential longitudinal effect on expectations. I engage in this task in chapter 7.

Chapter 7 Results for research questions 3 and 4: Assessing mediational routes to pupils' expectations between ages 14 to 16.

Introduction

The preliminary analysis in chapter 6 suggested that all latent constructs representing parental social position, parent-child conflict, pupils' engagement with homework, feelings about school, assessments about teachers' effectiveness and educational expectations in models 1-6 which were presented in chapter 4, were comparable over time and across ethnic groups. This meant that the latent constructs exhibited the required psychometric properties to permit subsequent analysis to address research questions (RQ) 3 and 4 in this chapter. These are:

(3) *What are the potential interrelations of parent-child conflict, pupils' engagement with homework, feelings about school, assessment of teachers' effectiveness and adolescent expectations? That is, how do these four influences potentially impact on the development of adolescent educational expectations? Do they impact on adolescent expectations at age 16 by mediating at age 15 (a) the effects of parental social position at age 14; (b) their own prior effects at age 14 or (c) the feedback effects of prior expectations at 14? Are these potential influences exerted on the outcome, directly or indirectly?*

(4) *Does the impact of parent-child conflict, pupils' engagement with homework, feelings about school, and assessment of teachers' effectiveness on adolescent pupils' educational expectations change as a function over time of white, Indian, Pakistani, Bangladeshi and Black Caribbean maternal ethnicity?*

These two research questions are addressed by first combining models 1 to 6 to formulate model 7, and then applying a multigroup analysis of model 7 based on maternal ethnicity as described in chapter 4. Model 7 translates several inter-related hypotheses. A pupil's educational expectations at age 16 may have developed as a function of three types of potential joint mediational routes involving the four hypothesised mediators at age 15: parent-child conflict, pupils' homework engagement, feelings about school and assessments of teachers' effectiveness. The first hypothesised route involves mediation of the effect of parental social position at pupils' age 14. The second hypothesised route considers potential mediation of the earlier influences of the above four mediators at age 14 to pupils' expectations at age 16 via mutual cross-lagged effects at age 15; The third route explores the potential mediation of the feedback effects from pupils' expectations (the outcome) at age 14 on pupils' expectations at age 16 via the four mediators and pupils' expectations at age 15. Thus, model 7 is capable of testing for these three types of multiple mediation simultaneously. I argue that this better represents social reality, as these influences are likely to unfold simultaneously in real life (Maxwell, 2013a). The presence of multiple mediators operating simultaneously is also entirely consistent with ecological systems theory (see chapter 3). To address research question 4, model 7 was estimated on the LSYPE panel data for the white, Indian, Pakistani, Bangladeshi and Black Caribbean samples of mothers and young people in multigroup analysis, as explained in chapters 4 through 6.

On the basis of the review of literature, there are several directional hypotheses relating to specific minority groups.

i. *The longitudinal effect of parental social position on pupils' expectations will be stronger in the white and Black Caribbean groups but much weaker in the Indian, Pakistani and Bangladeshi groups.*
ii. *Parental social position at age 14 is expected to exert significant effects on parent-child conflict, homework engagement, feelings about school and assessments of teachers' effectiveness at age 15 and via them on pupils' expectations at age 16.*
iii. *The longitudinal effect of parent-child conflict on pupils' expectations will be generally less in South Asian families and stronger in white and Black Caribbean families.*
iv. *The longitudinal effect of pupils' homework engagement on pupils' expectations will be much stronger in the case of Indian, Pakistani and Bangladeshi groups as compared to the case of white and Black Caribbean groups.*
v. *The longitudinal effect of pupils' positive feelings about school on their expectations will be stronger in the Indian, Pakistani and Bangladeshi groups and weaker in the white and Black Caribbean groups.*
vi. *The longitudinal effect of pupils' assessments about teachers' effectiveness on their expectations will be stronger in the case of Indian, Pakistani and Bangladeshi pupils and weaker in the case of white and Black Caribbean pupils.*
vii. *There will be significant cross-lagged influences between parent-child conflict, pupils' homework engagement, feelings about school and assessments about their teachers' effectiveness but these will be heavily moderated by maternal ethnicity. This moderation is expected to be stronger in South Asian groups.*
viii. *It is expected that parent-child conflict, pupils' homework engagement, feelings about school and assessments about their teachers effectiveness at pupils age 15 will mediate the prior influences of these factors at age 14 to pupils' expectations at age 16. All these mediational routes will be moderated by maternal ethnicity. This moderation is expected to be stronger in the case of South Asian groups.*
ix. *It is expected that pupils' expectations at age 14 will influence parent-child conflict, pupils' homework engagement, feelings about school and assessments about their teachers' effectiveness at pupils' age 15 and via them, expectations at age 16. All these mediational routes will be moderated by maternal ethnicity. This moderation will be stronger in the South Asian groups.*
x. *It is expected that pupils' expectations at age 14 will be a major influence on expectations at age 16 via expectations at age 15. This mediational route will be moderated by maternal ethnicity and this mediation is expected to be stronger in the South Asian groups.*

The chapter is organised in the following manner: in section 7.1, I present the findings regarding the three types of hypothesised mediational influences to address research question 3. In section 7.2, I conduct the necessary cross-group structural invariance tests to address research question 4. In section 7.3, I bring together the findings with those of chapter 6 and place them in the context of the literature reviewed in chapter 2.

7.1 Direct, indirect and total effects for each type of mediation

Direct and indirect effects were formally defined in section 4.3, chapter 4. In any model involving multiple occasions of a predictor, a mediator and an outcome (MacKinnon, 2008), a *direct effect* (*c*) represents the time-lagged influence of the predictor on the outcome. The predictor is also hypothesised to affect the outcome indirectly via the mediator (Kenny, 2013; Kline, 2005). The predictor first exerts a significant time-lagged direct effect on the mediator (*a*). The mediator then exerts another time-lagged direct effect on the outcome (*b*). The indirect effect is the product *ab* while c' represents the effect of the predictor on the outcome adjusted for the mediator. Cole and Maxwell (2003, p. 564) have shown that with a single mediator, the longitudinal indirect effect is simply the time-lagged product *ab,* controlling for all prior occasions of the mediator and the outcome. When several mediators are included in the longitudinal model, the indirect effect from the predictor to the outcome is the sum of all the specific indirect effects to the outcome via each mediator. This is referred to as the *total indirect effect* (see also (Kline, 2005). The *total effect* is simply the sum of all indirect and direct effects. I discuss this point further below as it is central to the analysis that follows.

Each type of mediation estimated by model 7 involves its own indirect effects. Figure 7.1 illustrates the three types of mediation that are simultaneously estimated by model 7. For clarity, the figure includes only two instead of four mediators and excludes all factor covariances at baseline (t). Figure 7.1 is identical to Figure 4.1, chapter 4. Now however, the figure identifies all the direct paths in each type of mediation to illustrate how indirect effects will be calculated for each hypothesised mediational route referred to above. Paths *x1*, *x2*, *d1*, *d2*, *d3*, *d4*, *y1* and *y2* signify longitudinal dependence linking the occasions of the predictor, the mediators and the outcome as explained in chapter 4. *Type 1* is a typical application of the Cole and Maxwell (2003) longitudinal mediation model for three waves of panel data. It estimates the mediation of the effect of the predictor at time *t* on the outcome at time *t*+2 via the occasions of two mediators at time *t*+1.

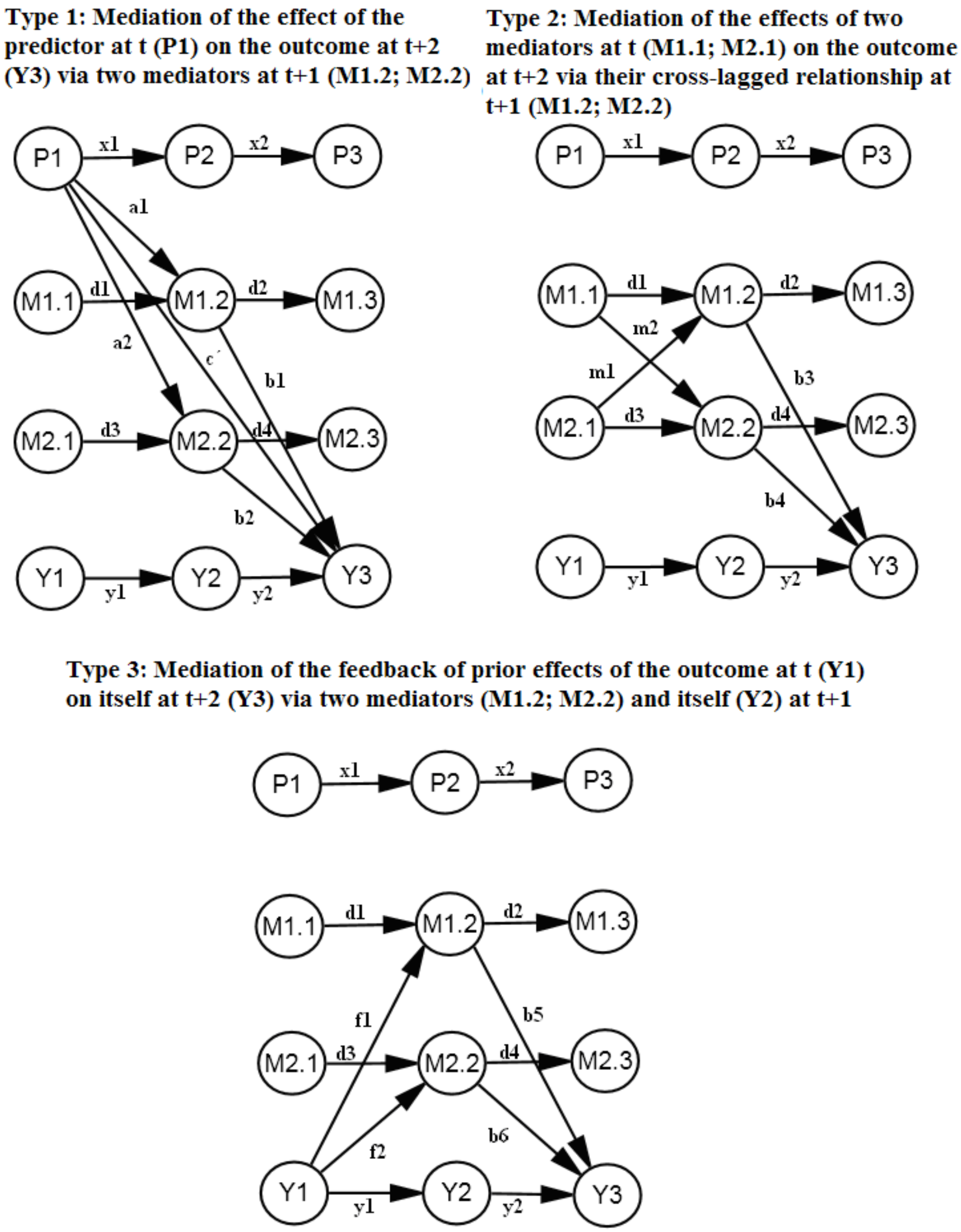

Figure 7.1 The three types of hypothesised mediational routes affecting pupils' expectations at age 16 estimated by model 7 (only part of which is illustrated here – please refer to Figure 4.9 for the complete structural part of model 7)

In this case, the total indirect effect of P1 on Y3 is the sum of two specific indirect effects *a1b1 + a2b2* while *c´* is the direct effect of P1 on Y3 adjusted for the effects of the two mediators. *Type 2* refers to mediation of the effects of the two mediators at time *t* (M1.1 and M2.1) on the outcome at time *t*+2 (Y3) via the cross-lagged influence each mediator exerts on each other at time *t*+1. In that case, the total indirect effect from M1.1 to Y3 includes the two specific indirect effects *m2b4 + d1b3*, while the total indirect from M2.1 to Y3 includes the two specific indirect effects *m1b3 + d3b4*. Finally, *type 3* refers to the feedback of the outcome at time *t* on itself at time *t*+2 via the two mediators at time *t*+1. I have already defined 'feedback effects' as a special case of time-lagged effects from the outcome at age 14 on the mediators and the outcome at age 15, and via them, on the outcome at age 16 (please see introduction to chapter 4). In that case, the total indirect of Y1 on Y3 is the sum of three specific indirect effects, *f1b5 + f2b6 + y1y2*. The software produces only estimates of total but not specific indirect effects. When the analysis requires it, I decompose total indirect effects into specific indirect effects following Alwin and Hauser's (1975) method of effect decomposition in path analysis. Having explained how indirect effects will be calculated, I now turn to the assessment of their significance based on their effect size.

The assessment of the statistical significance of direct and indirect effects was also discussed in chapter 4 and what follows is a brief reminder before the results are presented. As discussed in chapter 4, Sobel's (1982) formula to estimate standard errors (SE) for the indirect effect, cannot be used to calculate SE for the total indirect effect (Cole and Maxwell, 2003, p 572). In fact, there is no formula for the SE of total indirect effects (Maxwell, 2013b, see Appendix 7). Under ML estimation, AMOS Graphics 20 provides bootstrapped standard errors for the unstandardized total direct, indirect and indirect effects when covariance matrices are fed as input (bootstrapped SE for standardised estimates require complete raw data). Most importantly, AMOS provides bootstrapped bias-corrected two-tailed (90%) significance for total indirect effects. To estimate the significance (the p value) of any *specific* indirect effect, Macho and Lederman's (2011) method was used. This method forces the software to produce estimates for specific indirect effects. Bootstrapping can then be applied to provide SE for these specific indirect effects. However, as discussed in chapter 4, while this method is easily implemented in AMOS, it does not estimate standardised specific indirect effects or their SE. Further, AMOS does not provide bootstrapped SE for *standardised* indirect effects when covariance matrices are supplied as input. Thus, I report the estimated bootstrapped significance (based on 1000 bootstrapped samples) of the *unstandardized total indirect effect* as an approximation of the significance of the effect size of the *standardized total indirect effect*. Albeit an approximation (Kline, 2005), it can be used to attach a level of significance to total indirect *effect size*. Significance for the direct effects is based on the ML-standard errors which are also compared to their bootstrapped counterparts where necessary. For the total effects only the bootstrapped significance is reported.

Regarding *effect size* as distinct from its significance, typically, standardised effect sizes ≤ 0.10 are considered small, while sizes around 0.30 medium and ≥ 0.50 large (Cohen, 1988; Shrout and

Bolger, 2002). However more recent work by Preacher and Kelley (2011) and Kenny (2013) suggested different norms for assessing the magnitude of total standardised indirect effect size, recommending that these effect sizes should be squared because the indirect effect is a product of two effects (*a* and *b*). Thus, as a 'rule of thumb', a small indirect effect is ≤ 0.01, a medium 0.09 and a large ≥ 0.25. In the analysis that follows I adopt these norms but also attach the bootstrapped bias-corrected significance to each total standardized indirect effect in line with Kenny's (2013) recommendations.

As explained in Figures 4.9 and 7.1, and text on p. 89-90 in chapter 4, the structural parts of the models for the white, Indian, Pakistani, Bangladeshi and Black Caribbean groups were identically specified, as per Figure 4.9. For each of the five ethnic groups, a model 7 was constructed, comprised out of models 1-6 that had been previously estimated for that ethnic group and discussed in chapter 6. The group-specific models 1-6 entered model 7 for each group, complete with their appropriate constraints for the achieved level of measurement invariance and their horizontal indicator error structure. Once specified as part of model 7, the initial occasions at *t* of models 1-6 comprised the exogenous variable structure in model 7. Cross-sectional covariances were specified across these variables at *t*, according to the typical Cole and Maxwell (2003) specification. The second and third occasions of models 1-6 at *t*+1 and *t*+2 respectively, comprised the combined structure of the endogenous variables of each model 7. Based on mediation theory and the Cole and Maxwell (2003) specification for autoregressive mediation models, there were no cross-sectional structural paths specified as the direction of influence in these paths is indeterminate. All models 7 assume that the correlations of different variables at *t*, *t*+1 and *t*+2 are explained (a), by the initial cross-sectional correlations among the exogenous variables at *t*; (b) by the covariances across the error terms of the different exogenous at *t* and the endogenous variables at *t*+1and *t*+2; (c) by the covariances of the disturbance terms across the different endogenous variables at *t*+1 and *t*+2. The set of these covariances comprised a complex indicator error structure among the indicator errors and disturbance terms of the different exogenous and the endogenous variables at *t*, *t*+1 and *t*+2. None of these correlations and covariances are shown in Figure 7.1 but they were specified in the actual models.

Not all of these assumptions were justified, however. In practice, it was shown that only some of these error covariances were significantly different from zero and these were different in each group. Insignificant error covariances were dropped from the measurement parts of models 7 in these groups, releasing extra degrees of freedom and improving group-specific model fit. Freely estimating error covariances across variables at *t*, *t*+1 and *t*+2 that were significantly different from zero also improved group-specific model fit. The procedure was guided by the modification indices (MI) as suggested by the Lagrange modifier[12]. As a result, the measurement parts of models 7 differed slightly across groups. Slightly different model specifications were possible because AMOS Graphics 20 permitted multigroup analysis with differently specified group-specific measurement models. Following Cole and Maxwell's (2003) recommendations, method and trait variance in each group was extracted this way, and overall model fit was maximised. Thus, the final baseline multigroup solution for model 7 estimated 5 versions of model 7, one for each group in the analysis. Each of these models had identical structural parts which were unrestricted but slightly varying measurement parts, as explained above. This made it possible to compare nested multigroup models which were restricted in their structural parts to the structurally unrestricted multigroup baseline model 7. The complete AMOS syntax for this multigroup solution can be inspected in Appendix 2.

Given its considerable complexity (including 44 manifest variables), the multigroup solution for model 7 exhibited very acceptable fit to data (χ^2 = 8249.97 (4210), $\hat{C}$/d = 1.96; p = 0.005; IFI = 0.929; TLI = 0.930; CFI = 0.930; RMSEA = 0.017 (0.017 – 0.018) with PCLOSE = 1.000). The sample-adjusted IFI and the noncentrality-based TLI and CFI were close to 0.950, while the RMSEA was excellent around a very tight confidence interval. This suggests that the model fitted the data quite acceptably within a reasonable error of approximation (Browne and Cudeck, 1993). The measurement part (factor loadings) of model 7 for each group is shown in Table 7.1. As already explained, models 1-6 were simultaneously estimated as constituent parts of model 7 for each ethnic group and held to both longitudinal and cross-group measurement invariance achieved for that group. It is expected therefore that the magnitudes of the factor loadings will differ slightly from those reported in Table 6.2, p. 135, when models 1-6 were estimated separately and held to only longitudinal measurement invariance. Inspection of all the standardised loadings in Table 7.1 suggests that they are all positive, of acceptable magnitudes and both longitudinally and cross-group consistent. Except in two cases in the Bangladeshi group in model 1 (FAMCIRC), which exhibited marginal significance (but quite acceptable magnitudes) all other loadings were highly significant as well. The indicator intercepts of model 7 can be inspected in Appendix 4 that shows all intercepts

[12] Modification indices (MI) suggest the expected improvement in model fit if the specific parameter is released (i.e., freely estimated) for an increment of one degree of freedom. MI were adhered to provided that freeing the suggested parameter made theoretical sense and improved model fit against the loss of a degree of freedom.

for models 1-6. The intercepts of models 1-6 in each group hardly changed when all models were estimated simultaneously under the multigroup solution for model 7. Finally, the estimated variances of indicators, factors and disturbance terms of the multigroup solution for model 7 are reported in Table A6.1 (Appendix 6).

Table 7.1: The measurement part (indicator loadings) of model 7

Indicator loadings			White			Indian			Pakistani			Bangladeshi			BlackCaribbean		
			b	S.E.	**β**	**b**	S.E.	**β**	**b**	S.E.	**β**	**b**	S.E.	**β**	**b**	S.E.	**β**
r_W1nsseccatdad	<---	FAMCIRC1	1.000		**.637**	1.000		**.622**	1.000		**.575**	1.000		**.491**	1.000		**.554**
r_W1nssecmum	<---	FAMCIRC1	.968	.043	**.539**	.968	.043	**.568**	.968	.043	**.503**	1.055	.110	**.689**	.968	.043	**.614**
HHdepW1	<---	FAMCIRC1	.284	.014	**.411**	.284	.014	**.441**	.284	.014	**.345**	.284	.014	**.306**	.284	.014	**.434**
W1GrssyrHHbands	<---	FAMCIRC1	1.087	.043	**.714**	1.087	.043	**.743**	1.087	.043	**.557**	1.087	.043	**.456**	1.087	.043	**.721**
r_W2nsseccatdad	<---	FAMCIRC2	1.000		**.645**	1.000		**.628**	1.000		**.585**	1.000		**.457**	1.000		**.515**
r_W2nssecmum	<---	FAMCIRC2	.968	.043	**.546**	.968	.043	**.571**	.968	.043	**.514**	1.055	.110	**.697**	.968	.043	**.573**
HHdepW2	<---	FAMCIRC2	.284	.014	**.401**	.284	.014	**.502**	.284	.014	**.420**	.284	.014	**.324**	.284	.014	**.451**
W2GrssyrHHbands	<---	FAMCIRC2	1.087	.043	**.700**	1.087	.043	**.748**	1.087	.043	**.607**	1.087	.043	**.488**	1.087	.043	**.754**
W1parqualMP	<---	PAR1	1.000		**.784**	1.000		**.719**	1.000		**.727**	1.000		**.845**	1.000		**.550**
r_W1kiddifMP	<---	PAR1	.211	.010	**.384**	.211	.010	**.359**	.211	.010	**.380**	.211	.010	**.381**	.211	.010	**.295**
W2parqualMP	<---	PAR2	1.000		**.812**	1.000		**.730**	1.000		**.733**	1.000		**.809**	1.000		**.832**
r_W2kiddifMP	<---	PAR2	.211	.010	**.354**	.211	.010	**.356**	.211	.010	**.373**	.076	.029	**.124**	.211	.010	**.381**
W3parqualMP	<---	PAR3	1.000		**.896**	1.000		**.751**	1.000		**.892**	1.000		**.847**	1.000		**.684**
r_W3kiddifMP	<---	PAR3	.211	.010	**.388**	.211	.010	**.374**	.211	.010	**.424**	.211	.010	**.384**	.211	.010	**.322**
W1hwndayYP	<---	HW1	1.000		**.997**	1.000		**.811**	1.000		**.830**	1.000		**.735**	1.000		**.997**
r_W1hwdoYP	<---	HW1	.297	.009	**.513**	.297	.009	**.576**	.297	.009	**.514**	.297	.009	**.468**	.297	.009	**.530**
W2hwnday1YP	<---	HW2	1.000		**.898**	1.000		**.786**	1.000		**.876**	1.000		**.779**	1.000		**.997**
r_W2hwdoYP	<---	HW2	.297	.009	**.468**	.297	.009	**.548**	.297	.009	**.533**	.297	.009	**.523**	.297	.009	**.556**
r_W1yys1YP	<---	SCH1	1.000		**.614**	1.000		**.613**	1.000		**.550**	1.000		**.716**	1.000		**.621**
W1yys4YP	<---	SCH1	1.277	.031	**.610**	1.277	.031	**.597**	1.277	.031	**.502**	1.277	.031	**.670**	1.277	.031	**.646**
W1yys9YP	<---	SCH1	1.091	.030	**.580**	1.091	.030	**.559**	1.091	.030	**.484**	.640	.074	**.523**	1.091	.030	**.573**
r_W1yys6YP	<---	SCH1	1.067	.019	**.657**	1.067	.019	**.663**	1.067	.019	**.588**	1.067	.019	**.772**	1.067	.019	**.699**
r_W2YYS1YP	<---	SCH2	1.000		**.624**	1.000		**.537**	1.000		**.518**	1.000		**.534**	1.000		**.585**
W2YYS4YP	<---	SCH2	1.277	.031	**.621**	1.277	.031	**.547**	1.277	.031	**.485**	1.277	.031	**.523**	1.277	.031	**.562**
W2YYS9YP	<---	SCH2	1.091	.030	**.596**	1.091	.030	**.532**	1.091	.030	**.499**	1.091	.030	**.509**	1.091	.030	**.562**
r_W2YYS6YP	<---	SCH2	1.067	.019	**.673**	1.067	.019	**.585**	1.067	.019	**.570**	1.067	.019	**.539**	1.067	.019	**.599**
r_W3yys1YP	<---	SCH3	1.000		**.677**	1.000		**.647**	1.000		**.617**	1.000		**.604**	1.000		**.637**
W3yys4YP	<---	SCH3	1.277	.031	**.685**	1.277	.031	**.656**	1.277	.031	**.599**	1.277	.031	**.542**	1.277	.031	**.670**
W3yys9YP	<---	SCH3	1.091	.030	**.646**	1.091	.030	**.619**	1.091	.030	**.543**	1.091	.030	**.531**	1.091	.030	**.656**
r_W3yys6YP	<---	SCH3	1.067	.019	**.697**	1.067	.019	**.682**	1.067	.019	**.607**	1.067	.019	**.667**	1.067	.019	**.650**
r_W1yys15YP	<---	TCH1	1.000		**.545**	1.000		**.568**	1.000		**.559**	1.000		**.617**	1.000		**.586**
r_W1yys16YP	<---	TCH1	1.050	.031	**.539**	1.050	.031	**.555**	1.050	.031	**.513**	1.050	.031	**.595**	1.050	.031	**.595**
r_W1yys18YP	<---	TCH1	1.025	.039	**.544**	1.025	.039	**.586**	1.025	.039	**.547**	1.025	.039	**.577**	1.025	.039	**.588**
r_W1yys19YP	<---	TCH1	1.246	.041	**.660**	1.246	.041	**.694**	1.246	.041	**.669**	1.246	.041	**.691**	1.246	.041	**.694**
r_W2yys15YP	<---	TCH2	1.000		**.542**	1.000		**.563**	1.000		**.591**	1.000		**.492**	1.000		**.563**
r_W2yys16YP	<---	TCH2	1.050	.031	**.535**	1.050	.031	**.550**	1.050	.031	**.584**	1.050	.031	**.524**	1.050	.031	**.572**
r_W2yys18YP	<---	TCH2	1.025	.039	**.568**	1.025	.039	**.589**	1.025	.039	**.602**	1.025	.039	**.476**	1.025	.039	**.580**
r_W2yys19YP	<---	TCH2	1.246	.041	**.644**	1.246	.041	**.689**	1.246	.041	**.694**	1.246	.041	**.651**	1.246	.041	**.736**
r_W1hlikeYP	<---	YPEX1	1.000		**.942**	.659	.011	**.618**	.659	.011	**.681**	.659	.011	**.666**	.659	.011	**.657**
r_W1heposs9YP	<---	YPEX1	1.000		**.715**	1.000		**.846**	1.000		**.864**	1.000		**.871**	1.000		**.784**
r_W2hlikeYP	<---	YPEX2	.659	.011	**.784**	.659	.011	**.677**	.659	.011	**.679**	.659	.011	**.683**	.659	.011	**.714**
r_W2heposs9YP	<---	YPEX2	1.000		**.915**	1.000		**.883**	1.000		**.850**	1.000		**.900**	1.000		**.816**
r_W3hlikeYP	<---	YPEX3	.659	.011	**.806**	.659	.011	**.681**	.659	.011	**.730**	.659	.011	**.684**	.659	.011	**.514**
r_W3heposs9YP	<---	YPEX3	1.000		**.896**	1.000		**.924**	1.000		**.885**	1.000		**.892**	1.000		**.669**

Note: The measurement part of model 7 is constrained to both longitudinal and cross-group configural, metric and partial scalar measurement invariance. For indicator labels, please refer to Tables 4.1 and 6.2.

Since the longitudinal and cross-group invariance of the dependence paths (connecting measurement occasions within each model over time) were analysed separately in chapter 6, attention in chapter 7 now focuses on the three types of mediation in the structural model, as described above. Table 7.2 shows the unstandardized (**b**) and standardized (**β**) ML estimates of direct effects (together with their SE and p value) for *type 1* (M), *type 2* (B) and *type 3* (F) mediation as defined above and in Figure 7.1 as well as dependence paths (D). Number 1 attached to M, B, F and D denotes that the effects involved occasions 1 and 2 while number 2, occasions 2 and 3. M(a) and M(b) code the effects of the predictor on the mediator (*a*) and the effects of the mediators on the outcome (*b*). M(c′) codes the direct effects of the predictor on the outcome, adjusted for the mediator (*c′*). As the focus of this chapter is on structural relations, I present both the measurement and the structural parts for model 7 but focus mainly on the structural part. For comparison, I included the ML-based standard errors in Table 7.2. Bootstrapped standard errors are reported in the other Tables of this chapter. With respect to the three types of mediation tested, Table 7.2 provides the opportunity to visually inspect the differential patterning of these direct effects for each ethnic group. Areas marked in green denote significant relationships. Areas marked in orange signify marginally-significant relationships. All dependence paths were significant but this was expected because typically these effects are positive and of considerable magnitude. Most of these paths were slightly attenuated while some of them inflated as compared to the estimates in chapter 6 (see Table 6.4 to make this comparison). This was also expected because in chapter 6, the effects of dependence paths were estimated per each model, controlling only for the influence of their prior occasions. In model 7 however, dependence paths were re-estimated controlling for prior occasions of all models. The increased complexity of model 7 will most probably explain any differences in magnitude in the estimates for dependence paths as well as the presence of slightly larger ML standard errors for the most part. The stationarity assumption for all dependence paths was tested in chapter 6 by means of model-specific tests of longitudinal structural invariance and equilibrium (see Appendix 5). Most dependence paths were longitudinally invariant and therefore stationary (Cole and Maxwell, 2003). No further tests will therefore be conducted for these paths.

There is considerable variation in the strength of various effects and surprisingly little consistency across groups. The direction of significant relationships was not necessarily similar across groups. For example, the feedback effect of expectations at age 14 on feelings about school was very significant in both the Pakistani and the Black Caribbean groups. However, it was negative in the first ethnic group but positive in the second.

Table 7.2 Unstandardized (b) and standardized (β) estimates, SE and p values for dependence, mediational, cross-lagged and feedback effects by ethnic group

Effect type and direction				White				Indian				Pakistani				Bangladeshi				Black Caribbean			
				b	SE	p	β	b	SE	p	β	b	SE	p	β	b	SE	p	β	b	SE	p	β
Direct dependence paths																							
D1	FAMCIRC2		FAMCIRC1	1,007	,020	***	**,994**	,989	,018	***	**,970**	1,108	,026	***	**,999**	1,016	,019	***	**,999**	,955	,031	***	**1,000**
D1	PAR2	←	PAR1	,889	,070	***	**,850**	,851	,106	***	**,836**	,732	,096	***	**,714**	,353	,058	***	**,399**	1,421	,163	***	**,982**
D1	HW2	←	HW1	,456	,029	***	**,470**	,666	,062	***	**,705**	,599	,066	***	**,581**	,593	,084	***	**,593**	,305	,065	***	**,295**
D1	SCH2	←	SCH1	,851	,059	***	**,833**	,674	,064	***	**,774**	,879	,097	***	**,894**	,474	,052	***	**,697**	,622	,097	***	**,684**
D1	TCH2	←	TCH1	,692	,069	***	**,688**	,780	,073	***	**,790**	,762	,091	***	**,704**	,528	,064	***	**,667**	1,050	,151	***	**,989**
D1	YPEX2	←	YPEX1	,758	,040	***	**,565**	,774	,055	***	**,691**	,475	,050	***	**,468**	,688	,058	***	**,627**	,755	,091	***	**,708**
D2	PAR3	←	PAR2	,799	,047	***	**,759**	,955	,112	***	**,909**	,856	,086	***	**,723**	,621	,087	***	**,543**	,864	,086	***	**,902**
D2	SCH3	←	SCH2	,966	,067	***	**,884**	1,197	,089	***	**,953**	,960	,100	***	**,829**	1,013	,120	***	**,927**	1,001	,113	***	**,836**
D2	YPEX3	←	YPEX2	,793	,032	***	**,775**	,716	,040	***	**,704**	,663	,049	***	**,603**	,638	,052	***	**,664**	,692	,073	***	**,864**
Direct mediational *a, b or c´* effects (referring to Type 1 mediation in Figure 7.1)																							
M(a)1	PAR2	←	FAMCIRC1	,001	,032	,967	**,002**	-,027	,038	,484	**-,042**	-,102	,056	,069	**-,124**	,006	,079	,935	**,006**	-,042	,056	,459	**-,074**
M(a)1	HW2	←	FAMCIRC1	,067	,034	,048	**,066**	,119	,037	,001	**,154**	,150	,060	,013	**,147**	,174	,074	,020	**,168**	,140	,050	,005	**,170**
M(a)1	TCH2	←	FAMCIRC1	,035	,014	,011	**,110**	,012	,016	,462	**,037**	-,008	,026	,763	**-,019**	,014	,027	,590	**,039**	,016	,022	,474	**,054**
M(a)1	SCH2	←	FAMCIRC1	,021	,013	,090	**,065**	,007	,012	,548	**,031**	,005	,020	,797	**,018**	,021	,024	,371	**,065**	-,018	,017	,270	**-,078**
M(a)2	PAR3	←	FAMCIRC2	,030	,027	,272	**,040**	-,010	,038	,783	**-,016**	-,072	,051	,159	**-,082**	-,010	,079	,903	**-,008**	,081	,042	,051	**,162**
M(a)2	SCH3	←	FAMCIRC2	,005	,013	,696	**,014**	-,007	,015	,635	**-,024**	,016	,020	,447	**,052**	-,005	,025	,831	**-,016**	,045	,021	,030	**,154**
M(b)1	YPEX2	←	TCH1	-,322	,092	***	**-,146**	-,042	,079	,594	**-,030**	,091	,103	,374	**,061**	-,229	,089	,010	**-,154**	,171	,145	,240	**,115**
M(b)1	YPEX2	←	SCH1	,679	,095	***	**,309**	,106	,091	,245	**,062**	,192	,135	,157	**,098**	,135	,078	,084	**,095**	,055	,151	,717	**,034**
M(b)1	YPEX2	←	HW1	,094	,019	***	**,141**	,022	,026	,404	**,038**	,086	,028	,002	**,150**	,108	,036	,003	**,163**	,064	,035	,070	**,123**
M(b)1	YPEX2	←	PAR1	,046	,030	,118	**,045**	,061	,032	,054	**,081**	,011	,037	,761	**,016**	-,047	,027	,078	**-,084**	-,041	,071	,561	**-,039**
M(b)2	YPEX3	←	PAR2	,031	,028	,263	**,031**	-,005	,028	,864	**-,006**	,090	,033	,007	**,118**	-,045	,029	,120	**-,074**	,085	,045	,058	**,144**
M(b)2	YPEX3	←	HW2	,043	,020	,035	**,061**	,042	,026	,098	**,069**	-,014	,027	,610	**-,023**	,060	,035	,087	**,094**	-,003	,029	,929	**-,006**
M(b)2	YPEX3	←	SCH2	,133	,095	,162	**,060**	,106	,098	,278	**,053**	,440	,139	,001	**,201**	-,021	,146	,883	**-,011**	-,101	,136	,455	**-,071**
M(b)2	YPEX3	←	TCH2	-,061	,092	,503	**-,027**	,027	,071	,707	**,018**	-,057	,092	,536	**-,037**	-,173	,127	,171	**-,096**	,112	,104	,280	**,100**
M(c´)	YPEX3	←	FAMCIRC1	,051	,020	,010	**,071**	,036	,018	,045	**,077**	,223	,035	***	**,357**	-,014	,036	,687	**-,022**	,090	,026	***	**,270**
Direct cross-lagged effects (referring to Type 2 mediation in Figure 7.1)																							
B1	HW2	←	PAR1	,087	,048	,073	**,058**	,025	,059	,673	**,020**	,033	,068	,625	**,026**	-,022	,050	,657	**-,026**	,174	,127	,171	**,082**
B1	SCH2	←	HW1	,014	,010	,176	**,044**	-,004	,016	,777	**-,015**	,011	,017	,532	**,037**	,050	,021	,018	**,158**	-,019	,020	,339	**-,064**
B1	TCH2	←	SCH1	,112	,064	,078	**,112**	-,177	,084	,035	**-,149**	-,066	,122	,591	**-,046**	,067	,057	,243	**,087**	-,221	,138	,109	**-,192**
B1	SCH2	←	TCH1	-,032	,056	,573	**-,031**	,035	,051	,488	**,049**	-,036	,064	,578	**-,048**	,025	,054	,642	**,036**	,161	,088	,066	**,193**
B1	HW2	←	SCH1	,639	,139	***	**,201**	-,097	,174	,577	**-,034**	,524	,246	,034	**,149**	,435	,149	,004	**,202**	-,310	,275	,259	**-,097**
B1	PAR2	←	HW1	-,005	,025	,846	**-,007**	,045	,046	,334	**,058**	,057	,046	,212	**,069**	,054	,071	,447	**,051**	-,003	,069	,967	**-,004**
B1	PAR2	←	TCH1	-,002	,123	,985	**-,001**	,042	,136	,759	**,022**	-,164	,164	,317	**-,076**	,136	,177	,442	**,058**	,153	,261	,558	**,076**
B1	PAR2	←	SCH1	-,003	,125	,980	**-,001**	,051	,161	,751	**,022**	,298	,221	,178	**,105**	,103	,163	,528	**,045**	-,594	,263	,024	**-,272**
B1	HW2	←	TCH1	,227	,145	,118	**,071**	,158	,157	,316	**,067**	,095	,186	,610	**,035**	,112	,163	,490	**,050**	,898	,268	***	**,305**
B1	SCH2	←	PAR1	,059	,018	***	**,124**	,033	,020	,094	**,086**	,050	,023	,031	**,140**	,008	,015	,605	**,029**	,023	,042	,590	**,037**
B1	TCH2	←	PAR1	,038	,019	,049	**,081**	,002	,026	,935	**,004**	-,019	,030	,529	**-,037**	-,005	,018	,800	**-,015**	,037	,057	,513	**,049**
B1	TCH2	←	HW1	-,022	,012	,059	**-,072**	-,001	,022	,957	**-,003**	,044	,023	,052	**,106**	,002	,024	,930	**,006**	-,056	,031	,072	**-,151**
B2	PAR3	←	HW2	,006	,026	,808	**,009**	-,046	,050	,352	**-,054**	,058	,046	,207	**,060**	,085	,076	,267	**,070**	-,062	,043	,150	**-,106**
B2	PAR3	←	SCH2	-,076	,123	,538	**-,033**	,274	,186	,140	**,098**	,272	,227	,230	**,080**	-,190	,323	,557	**-,050**	-,108	,198	,585	**-,053**
B2	SCH3	←	TCH2	-,112	,062	,071	**-,100**	-,147	,061	,016	**-,161**	-,155	,067	,021	**-,193**	-,222	,096	,021	**-,229**	,053	,079	,499	**,056**
B2	PAR3	←	TCH2	,009	,122	,939	**,004**	-,044	,135	,746	**-,022**	-,269	,157	,086	**-,114**	,525	,282	,062	**,155**	,168	,153	,271	**,104**
B2	SCH3	←	HW2	,001	,012	,937	**,003**	,008	,021	,689	**,021**	-,027	,019	,140	**-,085**	,015	,023	,523	**,043**	-,001	,020	,973	**-,002**
B2	SCH3	←	PAR2	-,011	,018	,532	**-,022**	-,037	,023	,098	**-,079**	,042	,022	,060	**,104**	-,011	,018	,521	**-,035**	-,020	,033	,546	**-,040**
Direct feedback effects (referring to Type 3 mediation in Figure 7.1)																							
F1	TCH2	←	YPEX1	,048	,025	,058	**,079**	-,018	,040	,648	**-,024**	-,024	,039	,539	**-,032**	-,071	,039	,068	**-,122**	,167	,068	,015	**,219**
F1	SCH2	←	YPEX1	,028	,024	,244	**,044**	-,035	,029	,227	**-,062**	-,090	,030	,002	**-,176**	-,015	,033	,659	**-,028**	,100	,048	,037	**,167**
F1	HW2	←	YPEX1	,223	,063	***	**,115**	,135	,093	,145	**,073**	-,164	,090	,069	**-,090**	,011	,107	,921	**,006**	,337	,148	,023	**,160**
F1	PAR2	←	YPEX1	,270	,097	,005	**,198**	-,065	,085	,443	**-,043**	-,073	,077	,344	**-,050**	,001	,115	,992	**,001**	,238	,156	,128	**,165**
F2	SCH3	←	YPEX2	,020	,019	,299	**,039**	,000	,028	,987	**-,001**	,036	,030	,230	**,062**	,028	,035	,415	**,055**	,005	,048	,924	**,007**
F2	PAR3	←	YPEX2	-,046	,040	,248	**-,043**	,015	,070	,825	**,011**	,291	,076	***	**,170**	-,097	,111	,383	**-,054**	-,055	,102	,587	**-,048**

Note: b=unstandardised coefficient; SE=standard error; p=ML asymptotic significance; β=standardised coefficient; '***' denotes p ≤ .0005

In general, different direct, indirect and total effects were significant across groups. Tables 7.3-7.5 present the matrices for the standardised direct, total indirect and total effects of the structural part of model 7 produced by the software and grouped by ethnic group along with their sample size. The column and row headings refer to the names of each latent factor in model 7. Factors in rows show where each effect starts. Factors in columns denote where each effect ends. Zeros represent unspecified direct paths. Significance in Tables 7.3-7.5 is based on the bootstrapped bias-corrected p value for each sample of mothers (based on 1000 bootstrapped samples). Table 7.3 reports the same information as Table 7.2 but in matrix form. It reports all direct effects from every row factor to every column factor. Bootstrapped significance can be readily contrasted to the ML-based p value reported in Table 7.2. Table 7.4 contains a matrix of total indirect effects for the same factors as Table 7.3. Therefore each entry represents the *sum* of all possible indirect effects from a row factor on a column factor. Zeros here represent absence of a total indirect effect between a row and a column factor, suggesting either that only direct effects were specified between the two or no effects at all. Table 7.5 simply adds the entries of the direct and total indirect effect matrices of Tables 7.3 and 7.4 offering the total effect exerted from every row factor on every column factor. For example, the *total effect* of parental social position at pupils' age 14 (FAMCIRC1) on their expectations at age 16 (YPEX3) in the white group is 0.076 (direct=0.071 + total indirect=0.005) which is highly significant (p = 0.010).

Table 7.3 Standardized direct effect matrix with bias-corrected bootstrapped two-tailed significance (in parenthesis) by ethnic group

	TCH1	SCH1	HW1	PAR1	FAMCIRC1	YPEX1	YPEX2	TCH2	SCH2	HW2	PAR2	FAMCIRC2	YPEX3	SCH3	PAR3
White (n=1000)															
YPEX2	-.146 (.006)	.309 (.004)	.141 (.002)	.045 (.173)	.000	.565 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.688 (.003)	.112 (.157)	-.072 (.070)	.081 (.075)	.110 (.017)	.079 (.065)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	-.031 (.691)	.833 (.004)	.044 (.183)	.124 (.003)	.065 (.102)	.044 (.343)	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.071 (.185)	.201 (.002)	.470 (.002)	.058 (.097)	.066 (.058)	.115 (.343)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	-.001 (.996)	-.001 (.960)	-.007 (.883)	.850 (.003)	.002 (.058)	.198 (.028)	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.994 (.003)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	.000	.000	.000	.000	.071 (.018)	.000	.775 (.002)	-.027 (.598)	.060 (.211)	.061 (.055)	.031 (.298)	.000	.000	.000	.000
SCH3	.000	.000	.000	.000	.000	.000	.039 (.345)	-.100 (.054)	.884 (.002)	.003 (.064)	-.022 (.567)	.014 (.692)	.000	.000	.000
PAR3	.000	.000	.000	.000	.000	.000	-.043 (.310)	.004 (.864)	-.033 (.636)	.009 (.844)	.759 (.001)	.040 (.308)	.000	.000	.000
Indian (n=751)															
YPEX2	-.030 (.630)	.062 (.294)	.038 (.425)	.081 (.084)	.000	.691 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.790 (.003)	-.149 (.045)	-.003 (.996)	.004 (.931)	.037 (.473)	-.024 (.642)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	.049 (.585)	.774 (.002)	-.015 (.813)	.086 (.201)	.031 (.632)	-.062 (.285)	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.067 (.344)	-.034 (.603)	.705 (.003)	.020 (.764)	.154 (.003)	.073 (.132)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	.022 (.790)	.022 (.721)	.058 (.476)	.836 (.002)	-.042 (.509)	-.043 (.488)	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.970 (.003)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	.000	.000	.000	.000	.077 (.050)	.000	.704 (.002)	.018 (.730)	.053 (.281)	.069 (.107)	-.006 (.863)	.000	.000	.000	.000
SCH3	.000	.000	.000	.000	.000	.000	-.001 (.989)	-.161 (.027)	.953 (.004)	.021 (.709)	-.079 (.158)	-.024 (.733)	.000	.000	.000
PAR3	.000	.000	.000	.000	.000	.000	.011 (.782)	-.022 (.721)	.098 (.175)	-.054 (.354)	.909 (.003)	-.016 (.781)	.000	.000	.000
Pakistani (n=642)															
YPEX2	.061 (.411)	.098 (.187)	.150 (.005)	.016 (.796)	.000	.468 (.003)	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.704 (.003)	-.046 (.613)	.106 (.066)	-.037 (.590)	-.019 (.803)	-.032 (.540)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	-.048 (.635)	.894 (.003)	.037 (.520)	.140 (.028)	.018 (.813)	-.176 (.004)	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.035 (.594)	.149 (.054)	.581 (.002)	.026 (.590)	.147 (.021)	-.090 (.085)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	-.076 (.461)	.105 (.306)	.069 (.284)	.714 (.001)	-.124 (.130)	-.050 (.383)	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.999 (.001)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	.000	.000	.000	.000	.357 (.003)	.000	.603 (.003)	-.037 (.580)	.201 (.005)	-.023 (.606)	.118 (.017)	.000	.000	.000	.000
SCH3	.000	.000	.000	.000	.000	.000	.062 (.325)	-.193 (.058)	.829 (.003)	-.085 (.162)	.104 (.095)	.052 (.517)	.000	.000	.000
PAR3	.000	.000	.000	.000	.000	.000	.170 (.004)	-.114 (.305)	.080 (.451)	.060 (.370)	.723 (.003)	-.082 (.300)	.000	.000	.000
Bangladeshi (n=487)															
YPEX2	-.154 (.033)	.095 (.175)	.163 (.007)	-.084 (.068)	.000	.627 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.667 (.002)	.087 (.534)	.006 (.927)	-.015 (.758)	.039 (.661)	-.122 (.097)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	.036 (.688)	.697 (.002)	.158 (.039)	.029 (.548)	.065 (.426)	-.028 (.674)	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.050 (.512)	.202 (.022)	.593 (.004)	-.026 (.703)	.168 (.027)	.006 (.918)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	.058 (.588)	.045 (.610)	.051 (.468)	.399 (.002)	.006 (.943)	.001 (1.000)	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.999 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	.000	.000	.000	.000	-.022 (.749)	.000	.664 (.002)	-.096 (.307)	-.011 (.863)	.094 (.113)	-.074 (.188)	.000	.000	.000	.000
SCH3	.000	.000	.000	.000	.000	.000	.055 (.480)	-.229 (.035)	.927 (.004)	.043 (.602)	-.035 (.504)	-.016 (.829)	.000	.000	.000
PAR3	.000	.000	.000	.000	.000	.000	-.054 (.344)	.155 (.124)	-.050 (.691)	.070 (.351)	.543 (.001)	-.008 (.906)	.000	.000	.000
Black Caribbean (n=324)															
YPEX2	.115 (.453)	.034 (.837)	.123 (.143)	-.039 (.643)	.000	.708 (.003)	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.989 (.012)	-.192 (.591)	-.151 (.310)	.049 (.731)	.054 (.745)	.219 (.397)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	.193 (.640)	.684 (.096)	-.064 (.791)	.037 (.680)	-.078 (.388)	.167 (.453)	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.305 (.031)	-.097 (.432)	.295 (.002)	.082 (.270)	.170 (.010)	.160 (.094)	.000	.000	.000	.000	.000	.000	.000	.000	.000

Table 7.3 Standardized direct effect matrix with bias-corrected bootstrapped two-tailed significance (in parenthesis) by ethnic group

	TCH1	SCH1	HW1	PAR1	FAMCIRC1	YPEX1	YPEX2	TCH2	SCH2	HW2	PAR2	FAMCIRC2	YPEX3	SCH3	PAR3
PAR2	.076 (.513)	-.272 (.076)	-.004 (.938)	.982 (.002)	-.074 (.563)	.165 (.250)	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	1.000 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	.000	.000	.000	.000	.270 (.005)	.000	.864 (.004)	.100 (.515)	-.071 (.684)	-.006 (.995)	.144 (.065)	.000	.000	.000	.000
SCH3	.000	.000	.000	.000	.000	.000	.007 (.898)	.056 (.537)	.836 (.017)	-.002 (.919)	-.040 (.542)	.154 (.055)	.000	.000	.000
PAR3	.000	.000	.000	.000	.000	.000	-.048 (.653)	.104 (.704)	-.053 (.820)	-.106 (.260)	1.000 (.002)	.162 (.122)	.000	.000	.000

Table 7.4 Standardized total indirect effect matrix with bias-corrected bootstrapped two-tailed significance (in parenthesis) by ethnic group

	TCH1	SCH1	HW1	PAR1	FAM1	YPEX1	YPEX2	TCH2	SCH2	HW2	PAR2	FAM2	YPEX3	SCH3	PAR3
White (n=1000)															
YPEX2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	-.129 (.008)	.299 (.004)	.142 (.002)	.070 (.022)	.005 (.428)	.451 (.003)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH3	-.101 (.082)	.737 (.004)	.053 (.087)	.084 (.032)	.060 (.142)	.049 (.259)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR3	.010 (.829)	-.040 (.396)	-.009 (.829)	.640 (.002)	.040 (.432)	.126 (.088)	.000	.000	.000	.000	.000	.000	.000	.000	.000
Indian (n=751)															
YPEX2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.970	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	.001 (.971)	.079 (.141)	.074 (.088)	.058 (.187)	.013 (.121)	.489 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH3	-.081 (.281)	.759 (.003)	-.004 (.925)	.016 (.728)	.008 (.826)	-.051 (.337)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR3	.004 (.955)	.102 (.139)	.014 (.862)	.768 (.003)	-.060 (.298)	-.041 (.408)	.000	.000	.000	.000	.000	.000	.000	.000	.000
Pakistani (n=642)															
YPEX2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	-.009 (.919)	.249 (.006)	.089 (.043)	.122 (.014)	-.014 (.515)	.244 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH3	-.182 (.056)	.755 (.005)	-.022 (.765)	.197 (.003)	.046 (.571)	-.108 (.046)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR3	-.126 (.131)	.178 (.040)	.101 (.023)	.536 (.004)	-.160 (.020)	.028 (.502)	.000	.000	.000	.000	.000	.000	.000	.000	.000
Bangladeshi (n=487)															
YPEX2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

Table 7.4 Standardized total indirect effect matrix with bias-corrected bootstrapped two-tailed significance (in parenthesis) by ethnic group

	TCH1	SCH1	HW1	PAR1	FAM1	YPEX1	YPEX2	TCH2	SCH2	HW2	PAR2	FAM2	YPEX3	SCH3	PAR3
HW2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	-.167 (.017)	.063 (.395)	.158 (.003)	-.087 (.024)	.011 (.506)	.429 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH3	-.128 (.133)	.638 (.003)	.178 (.011)	.011 (.858)	.043 (.610)	.037 (.565)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR3	.145 (.036)	.013 (.766)	.054 (.353)	.216 (.002)	.010 (.861)	-.050 (.348)	.000	.000	.000	.000	.000	.000	.000	.000	.000
						BCaribbean (n=324)									
YPEX2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	.193 (.211)	-.077 (.628)	.093 (.285)	.109 (.235)	-.001 (.915)	.644 (.004)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH3	.214 (.290)	.572 (.012)	-.062 (.481)	-.005 (.914)	.094 (.241)	.150 (.325)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR3	.132 (.624)	-.322 (.115)	-.054 (.847)	.990 (.002)	.079 (.557)	.130 (.466)	.000	.000	.000	.000	.000	.000	.000	.000	.000

Table 7.5 Standardized total effect matrix with bias-corrected bootstrapped two-tailed significance by ethnic group

	TCH1	SCH1	HW1	PAR1	FAM1	YPEX1	YPEX2	TCH2	SCH2	HW2	PAR2	FAM2	YPEX3	SCH3	PAR3
							White (n=1000)								
YPEX2	-.146 (.006)	.309 (.004)	.141 (.002)	.045 (.173)	.000	.565 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.688 (.003)	.112 (.157)	-.072 (.070)	.081 (.075)	.110 (.017)	.079 (.065)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	-.031 (.691)	.833 (.004)	.044 (.183)	.124 (.003)	.065 (.102)	.044 (.343)	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.071 (.185)	.201 (.002)	.470 (.002)	.058 (.097)	.066 (.058)	.115 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	-.001 (.996)	-.001(.960)	-.007 (.883)	.850 (.003)	.002 (.976)	.198 (.028)	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.994 (.003)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	-.129 (.008)	.299 (.004)	.142 (.002)	.070 (.022)	.076 (.010)	.451 (.003)	.775 (.002)	-.027 (.598)	.060 (.211)	.061 (.055)	.031 (.298)	.000	.000	.000	.000
SCH3	-.101 (.082)	.737(.004)	.053 (.087)	.084 (.032)	.060 (.142)	.049 (.259)	.039 (.345)	-.100 (.054)	.884 (.002)	.003 (.964)	-.022 (.567)	.014 (.692)	.000	.000	.000
PAR3	.010 (.829)	-.040 (.396)	-.009 (.829)	.640 (.002)	.040 (.432)	.126 (.088)	-.043 (.310)	.004 (.864)	-.033 (.634)	.009 (.844)	.759 (.001)	.040 (.308)	.000	.000	.000
							Indian (n=751)								
YPEX2	-.030 (.630)	.062 (.294)	.038 (.425)	.081 (.084)	.000	.691 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.790 (.003)	-.149 (.045)	-.003 (.996)	.004 (.931)	.037 (.473)	-.024 (.642)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	.049 (.585)	.774 (.002)	-.015 (.813)	.086 (.201)	.031 (.632)	-.062 (.285)	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.067 (.344)	-.034 (.603)	.705 (.003)	.020 (.764)	.154 (.003)	.073 (.132)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	.022 (.790)	.022 (.721)	.058 (.476)	.836 (.002)	-.042 (.509)	-.043 (.488)	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.970 (.003)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	.001 (.971)	.079 (.141)	.074 (.088)	.058 (.187)	.090 (.826)	.489 (.002)	.704 (.002)	.018 (.730)	.053 (.281)	.069 (.107)	-.006 (.863)	.000	.000	.000	.000
SCH3	-.081 (.281)	.759 (.003)	-.004 (.003)	.016 (.728)	.008 (.032)	-.051 (.337)	-.001 (1.000)	-.161 (.027)	.953 (.004)	.021 (.709)	-.079 (.158)	.024 (.733)	.000	.000	.000
PAR3	.004 (.955)	.102 (.139)	.014 (.139)	.768 (.003)	-.060 (.033)	-.041 (.408)	.011 (.782)	-.022 (.721)	.098 (.175)	-.054 (.354)	.909 (.003)	-.016 (.781)	.000	.000	.000
							Pakistani (n=642)								

Table 7.5 Standardized total effect matrix with bias-corrected bootstrapped two-tailed significance by ethnic group

	TCH1	SCH1	HW1	PAR1	FAM1	YPEX1	YPEX2	TCH2	SCH2	HW2	PAR2	FAM2	YPEX3	SCH3	PAR3
YPEX2	.061 (.411)	.098 (.187)	.150 (.005)	.016 (.796)	.000	.468 (.003)	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.704 (.003)	-.046 (.613)	.106 (.066)	-.037 (.590)	-.019 (.803)	-.032 (.540)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	-.048 (.635)	.894 (.003)	.037 (.520)	.140 (.028)	.018 (.813)	-.176 (.004)	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.035 (.594)	.149 (.054)	.581 (.002)	.026 (.590)	.147 (.021)	-.090 (.085)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	-.076 (.461)	.105 (.306)	.069 (.284)	.714 (.001)	-.124 (.130)	-.050 (.383)	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.999 (.003)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	-.009 (.919)	.249 (.006)	.089 (.043)	.122 (.014)	.344 (.571)	.244 (.002)	.603 (.003)	-.037 (.580)	.201 (.005)	-.023 (.606)	.118 (.017)	.000	.000	.000	.000
SCH3	-.182 (.056)	.755 (.005)	-.022 (.765)	.197 (.003)	.046 (.003)	-.108 (.046)	.062 (.325)	-.193 (.058)	.829 (.003)	-.085 (.162)	.104 (.095)	.052 (.517)	.000	.000	.000
PAR3	-.126 (.131)	.178 (.040)	.101 (.043)	.536 (.004)	-.160 (.003)	.028 (.502)	.170 (.004)	-.114 (.305)	.080 (.451)	.060 (.370)	.723 (.003)	.082 (.300)	.000	.000	.000
Bangladeshi (n=487)															
YPEX2	-.154 (.033)	.095 (.175)	.163 (.007)	-.084 (.068)	.000	.627 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.667 (.002)	.087 (.534)	.006 (.927)	-.015 (.758)	.039 (.661)	-.122 (.097)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	.036 (.688)	.697 (.002)	.158 (.039)	.029 (.548)	.065 (.426)	-.028 (.674)	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.050 (.512)	.202 (.022)	.593 (.004)	-.026 (.703)	.168 (.027)	.006 (.918)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	.058 (.588)	.045 (.610)	.051 (.468)	.399 (.002)	.006 (.943)	.001 (1.000)	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	.999 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	-.167 (.017)	.063 (.395)	.158 (.003)	-.087 (.024)	-.011 (.867)	.429 (.002)	.664 (.002)	-.096 (.307)	-.011 (.863)	.094 (.113)	-.074 (.188)	.000	.000	.000	.000
SCH3	-.128 (.133)	.638 (.003)	.178 (.011)	.011 (.858)	.043 (.610)	.037 (.565)	.055 (.480)	-.229 (.035)	.927 (.004)	.043 (.602)	-.035 (.504)	.016 (.829)	.000	.000	.000
PAR3	.145 (.036)	.013 (.766)	.054 (.353)	.216 (.002)	.010 (.861)	-.050 (.348)	-.054 (.344)	.155 (.124)	-.050 (.691)	.070 (.351)	.543 (.001)	.008 (.906)	.000	.000	.000
BCaribbean (n=324)															
YPEX2	.115 (.453)	.034 (.837)	.123 (.143)	039 (.643)	.000	.708 (.003)	.000	.000	.000	.000	.000	.000	.000	.000	.000
TCH2	.989 (.012)	-.192 (.591)	-.151 (.310)	.049 (.731)	.054 (.745)	.219 (.397)	.000	.000	.000	.000	.000	.000	.000	.000	.000
SCH2	.193 (.640)	.684 (.096)	-.064 (.791)	.037 (.680)	-.078 (.388)	.167 (.453)	.000	.000	.000	.000	.000	.000	.000	.000	.000
HW2	.305 (.031)	-.097 (.432)	.295 (.002)	.082 (.270)	.170 (.010)	.160 (.094)	.000	.000	.000	.000	.000	.000	.000	.000	.000
PAR2	.076 (.513)	-.272 (.076)	-.004 (.938)	.982 (.002)	-.074 (.563)	.165 (.250)	.000	.000	.000	.000	.000	.000	.000	.000	.000
FAMCIRC2	.000	.000	.000	.000	1.000 (.002)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
YPEX3	.193 (.211)	-.077 (.628)	.093 (.285)	.109 (.235)	.269 (.006)	.644 (.004)	.864 (.004)	.100 (.515)	-.071 (.684)	-.006 (.995)	.144 (.065)	.000	.000	.000	.000
SCH3	.214 (.290)	.572 (.012)	-.062 (.481)	-.005 (.914)	.094 (.241)	.150 (.325)	.007 (.898)	.056 (.537)	.836 (.017)	-.002 (.919)	-.040 (.542)	.154 (.055)	.000	.000	.000
PAR3	.132 (.624)	-.322 (.115)	-.054 (.847)	.990 (.002)	.079 (.557)	.130 (.466)	-.048 (.653)	.104 (.704)	-.053 (.820)	-.106 (.260)	1.000 (.002)	.162 (.122)	.000	.000	.000

7.1.1 Type 1: mediation of the effect of parental social position at age 14 on pupils' expectations at age 16 via parent-child conflict, pupils' homework engagement, feelings about school and assessments about teachers' effectiveness at age 15.

For mediation to exist over time there has to be a significant indirect effect exerted from the predictor at pupils' age 14 (parental social position, FAMCIRC1) to their expectations at age 16 (YPEX3) via the mediators at age 15 (parent-child conflict, PAR2); homework engagement (HW2); feelings about school, (SCH2); and assessments about teachers' effectiveness (TCH2). In Figure 7.1, paths a1 and a2 illustrate two direct *a* effects from the predictor (P1) at age 14 on the mediators M1.2 and M2.2 at age 15. Paths b1 and b2 alternatively illustrate two *b* effects, from the same mediators at age 15 to the outcome (Y3) at age 16. To arrive at a better understanding of the involved mechanisms of indirect effect, I also discuss the specific *a* and *b* effects in addition to discussing the total indirect effect in this section.

I will now consider the results for each ethnic group firstly within Table 7.3 and secondly, within Table 7.4. Table 7.3 suggests that the effect of parental social position at age 14 on pupils' expectations at age 16 is only direct and is not mediated via parent-child conflict, pupils' engagement with homework, feelings about school or their assessments of teachers' effectiveness in any of the five groups in the analysis. Table 7.4 suggests that the total indirect (TI) effect of parental social position on pupils' expectations is insignificant in the white ($\boldsymbol{\beta}_{TIW}$ = 0.005, p = .428), Indian ($\boldsymbol{\beta}_{TII}$ = 0.090 p = .121) Pakistani ($\boldsymbol{\beta}_{TIP}$ = -0.014, p = .515), the Bangladeshi ($\boldsymbol{\beta}_{TIB}$ = 0.043, p = .610) in the Black Caribbean ($\boldsymbol{\beta}_{TIBC}$ = -0,001, p = .915) groups. Based on bootstrapped SE, Table 7.3 suggests that instead, the *c´* effect remains statistically significant across almost all groups. Parental social position at 14 (FAMCIRC1) has a direct positive significant effect on adolescent expectations at age 16 (YPEX3). This direct effect is strongest in the Pakistani ($\boldsymbol{\beta}_{DP}$ = 0.357, p = 0.003) and the Black Caribbean ($\boldsymbol{\beta}_{BC}$ = 0.270, p = 0.005) groups, but much weaker in the Indian ($\boldsymbol{\beta}_{DI}$ = 0.077, p = 0.050) and the white ($\boldsymbol{\beta}_{DW}$ = 0.071, p = 0.018) groups. It is insignificant in the Bangladeshi ($\boldsymbol{\beta}_{DB}$ = -0.022, p = 0.749) group.

The direct effect of parental social position appears therefore to be moderated by group membership. But the statistical significance of the observed cross-group differences implying moderation will be formally tested by structural invariance tests in section 7.2. In the present context, this finding suggests that parental social position has widely varying longitudinal influences on adolescent expectations in each ethnic group. The fact that its effect is much weaker in the white and Indian groups and insignificant in the Bangladeshi groups offers partial support to the hypothesis that the formation and development of adolescent expectations is *less* dependent on parental social position at least in three in the five ethnic groups. Pupils in those ethnic groups form their expectations in relative disregard of parental status and level of material circumstances (deprivation) in families. But this finding has quite different implications for each ethnic group. For white pupils who maintain the lowest expectations but have the highest levels in their parental social position relative to those of the other groups (see chapter 6), this finding suggests that expectations will remain *low* on average regardless of the level of parental social position. For the Indian and Bangladeshi pupils however it means that their much higher expectations relative to those of their white peers will tend to remain *high* irrespective of parental social position. On the contrary, Pakistani and Black Caribbean pupils' adolescent expectations at age 16 are very significantly and positively affected by parental social position at pupils' age 14 despite the fact that parents in the two ethnic groups differed significantly in their average parental social position (see Table 6.7a). In both cases Pakistani and Black Caribbean pupils' significantly higher adolescent expectations at age 16 relative to those of their white peers are affected by parental position at pupils' age 14. In order to unpack the components of the first type of mediation, I will now examine the evidence on the influence of parental social position on the mediators (*a* effects) as well as the influence of the mediators on pupils' expectations (*b* effects).

The influence of parental social position on parent-child conflict, pupils' engagement with homework, feelings about school and assessments of teachers' effectiveness (a effects).

All direct effects from the predictor (parental social position and family material circumstances) at pupils' age 14 on the mediators at age 15 (*a* effects) come under type 1 mediation (see Figure 7.1). The evidence on direct effects reported in Tables 7.2 and 7.3 suggests that parental social position at age 14 exerts quite varied longitudinal influences on the four mediators. Only pupils' engagement with homework (FAMCIRC1→HW2) was consistently and significantly positive across all groups in the analysis (see Table 7.2). The effect was strongest in the Black Caribbean ($\boldsymbol{\beta}_{BC}$ = 0.170, p= 0.016), Bangladeshi ($\boldsymbol{\beta}_{B}$ = 0.168, p= 0.027), Indian ($\boldsymbol{\beta}_{I}$ = 0.157, p= 0.003), Pakistani ($\boldsymbol{\beta}_{P}$ = 0.147, p= 0.021) but very weak and marginally significant (based on the bootstrapped significance) in the white families ($\boldsymbol{\beta}_{W}$ = 0.066, p= 0.058) (see Table 7.3). Tests of cross-group invariance of this structural estimate in section 7.2 will confirm whether there has been a moderating influence of maternal ethnicity on these effects.

However, parental social position at age 14 did not exert any significant direct longitudinal effect on minority parent-child conflict, minority pupils' feelings about school or assessments of teachers' effectiveness at age 15 (see Tables 7.2 and 7.3). The exception was the white group where the effect of parental position at age 14 on pupils' assessments about their teachers' effectiveness at age 15 was positive and significant (**β**$_W$ = 0.110, p= 0.017). For these pupils, family disadvantage appears to influence their impressions of teachers' effectiveness to a greater extent than in the case of their peers. The finding that parental social position at age 14 affected pupils' engagement with homework at age 15 appears at odds with certain studies discussed in the literature review that found no effect from parental SES on adolescent homework (see chapter 2). However, those studies did not control for prior occasions of pupils' homework engagement at age 14. As a result, greater faith should be placed on the present finding. Substantively, the finding suggests that higher parental social position was associated with higher pupils' engagement with homework and did so much more intensely for minority rather than white families. Better family material circumstances and higher parental social position had much more positive influence on homework engagement in minority families than in white families. However, higher parental social position in white families promoted better pupils' assessments of teachers' effectiveness. This association was not observed in minority families perhaps due to their smaller samples. To complete the discussion of *a* and *b* effects under mediation type 1 as suggested by model 7, I discuss the findings regarding the effects of the mediators on the outcome (*b* effects).

The influence of parent-child conflict, pupils' engagement with homework, feelings about school and assessments of teachers' effectiveness on pupils' expectations (b effects).

Two kinds of *b* effects were estimated: Those measuring the effect of the four mediators at age 14 on pupils' expectations at age 15, and the effect of the repeated measures of the above factors at age 15 on pupils' expectations at age 16 (coded M(b)1 and M(b2) in Table 7.2). Both kinds of *b* effects come under mediation type 1, showing the effects of the mediators on the outcome at ages 15 and 16. Comparison of M(b1) and M(b)2 shows how much the magnitude of each *b* effect changed when a greater number of prior occasions were controlled for. Thus, we should expect that the magnitude of the oblique direct paths showing the effect of parent-child conflict on expectations (PAR→YPEX); homework engagement on expectations (HW→YPEX); feelings about school on expectations (SCH→YPEX) and assessments of teachers' effectiveness on expectations (TCH→YPEX) will be different between ages 14 to 15 (M(b)1) and between ages 15 to 16 (M(b)2) (see Table 7.2). I complete the discussion of type 1 mediation focusing on the evidence about the direct effects first and secondly about the indirect effects of the four mediators on expectations.

Direct effects of parent-child conflict on expectations

Parent-child conflict does not generally exert significant direct longitudinal influences on pupils' expectations between ages 14 to 15 in any of the groups. However, parent-child conflict at age 15 has a positive and significant direct effect on pupils' expectations at age 16 in the Pakistani group ($\boldsymbol{\beta}_P$ = 0.118, p= 0.017) and that effect was marginally significant in the Black Caribbean group ($\boldsymbol{\beta}_{BC}$ = 0.144, p= 0.065). Between ages 15 and 16 therefore, lower rates of parent-child conflict appear to promote higher expectations in the Pakistani and possibly in the Black Caribbean young people.

Direct effects of pupils' engagement with homework on pupils' expectations

Engagement with homework appeared to be more influential during earlier rather later pupils' ages. At age 14, engagement with homework exerts a significant positive effect on pupils expectations at age 15 in the white ($\boldsymbol{\beta}_W$ = 0.141, p= 0.002), Pakistani ($\boldsymbol{\beta}_P$ = 0.150, p= 0.005), and Bangladeshi ($\boldsymbol{\beta}_B$ = 0.163, p= 0.007) groups. However, engagement with homework at age 15 has practically no direct effect on pupils' expectations at age 16 except perhaps in the case of white pupils where its effect is small and of marginal bootstrapped significance ($\boldsymbol{\beta}_W$ = 0.055, p= 0.055). Thus, higher engagement with homework appears to be more effective in increasing adolescent expectations in the Bangladeshi and the Pakistani as well as in the white group but only between year 9 and year 10. By contrast, for Indian and Black Caribbean pupils, engagement with homework has no effect on their expectations.

Direct effects of pupils' feelings about school on expectations

The influence of pupils' positive feelings about school is also limited and inconsistent on their expectations over time. Feelings about school at age 14 are strongly and positively associated with expectations at age 15 in the white group ($\boldsymbol{\beta}_P$ = 0.309, p= 0.004) but not in any minority group. However, feelings about school at age 15 have a significant direct positive effect on Pakistani pupils' expectations at age 16 ($\boldsymbol{\beta}_P$ = 0.201, p= 0.005) but not for any other group. This positive association between feelings about school and expectations that became evident between ages 15 to 16 in the Pakistani and between ages 14 to 15 in the white pupils, suggests different things for the two groups of pupils. White pupils' expectations as well as feelings about school were on average much lower between ages 14 to 16 relative to those of all other groups. It would appear therefore that less positive feelings about school at age 14 promoted low expectations at age 15. By contrast, Pakistani pupils' much stronger positive feelings about school at age 15 appeared to promote higher expectations at age 16. It is interesting however that no such association was found in the case of the Indian, Bangladeshi and Black Caribbean pupils (see Table 7.3).

Direct effects of pupils' assessments of their teachers' effectiveness on expectations

Another interesting finding was the association between pupils' assessments about their teachers' effectiveness (TCH) and pupils' expectations (YPEX) over time. Between ages 14 to 15, this effect was significant but *negative* in the white (β_P = -0.146, p= 0.006) and the Bangladeshi (β_P = -0.154, p= 0.033) pupils. Between ages 15 to 16, this effect remained negative in those groups but became insignificant based on both the asymptotic and bootstrapped tests of significance (see Tables 7.2 and 7.3). Higher scores on the latent construct TCH at ages 14 and 15 denote pupils' higher assessments of teachers' effectiveness in maintaining discipline. However, white and Bangladeshi pupils' higher assessments at age 14 were inversely related to their expectations at age 15. This is somewhat puzzling. It could be that stricter teachers were less likely to tolerate less engagement with homework which was more likely to be the case with white pupils as analysed in chapter 6. The evidence above suggests that there was a valid longitudinal connection between engagement with homework and pupils' expectations. So, for the case of white pupils such a mechanism appears plausible. However, this mechanism is not at all plausible with Bangladeshi pupils who exhibited both higher average engagement with homework relative to their white peers and stronger positive association of their homework with their expectations (see Table 7.3). Possible explanations about the negative association between teachers' effectiveness and expectations in white and Bangladeshi pupils between ages 14 and 15 are discussed in sections 8.5-6, chapter 8. This completes the discussion of direct effects. Analysis of *indirect* effects from the same four mediators on adolescent expectations follows.

Indirect effects of parent-child conflict on pupils' expectations

Parent-child conflict at age 14 (PAR1) had a significant total indirect effect on pupils' expectations at age 16 (YPEX3). The absence of any direct effects of this factor across all groups is consistent with what we would expect if parent-child conflict at age 14 affected adolescent expectations at age 16 only indirectly. This indirect influence was strongest in the Pakistani (β_P = 0.122, p= 0.014) but much weaker in the white (β_I = 0.070, p= 0.022) and the Bangladeshi (β_B = -0.087, p= 0.024) families. Indian and Black Caribbean pupils' expectations remained unaffected by parent-child conflict. In general, the significant positive indirect effect suggests that lower incidence of parent-child conflict promoted higher adolescent expectations. It is curious therefore that the opposite seemed to be the case in Bangladeshi families. The negative indirect effect may indicate strain-producing greater parental pressure towards the maintenance of higher expectations in adolescents.

Indirect effects of pupils' engagement with homework on expectations

Engagement with homework at age 14 (HW1) exerted very significant positive total indirect effects on adolescent expectations at age 16 (YPEX3), over and above the direct effect exerted on the same factor by homework at age 15 (HW2) across almost all groups in the analysis. These total indirect effects cannot be summed up because they were exerted from the same source on the outcome but at different points in time. Table 7.5 provides the total effect separately for the effects of HW1 on YPEX2 and HW2 on YPEX3 as well as of HW1 on YPEX3. The direct and the indirect effects reflect possible mechanisms through which homework may affect expectations at age 16. In the white group for example, engagement with homework at 14 exerted a significant positive *direct* effect on expectations at 15 ($\boldsymbol{\beta}_W$ = 0.141, p= 0.002, see column 3, row 1, Table 7.3) as well as a significant positive *total indirect* effect on expectations at 16 ($\boldsymbol{\beta}_W$ = 0.142, p= 0.002, see column 3, row 7, Table 7.4) via parent-child conflict, engagement with homework, feelings about school and assessments of teachers' effectiveness and expectations at age 15. However, as already explained, total indirect effects represent the sum of all possible *specific indirect effects* from a row factor (here HW1) to a column factor (here YPEX3). To see the relative effect sizes of these specific indirect effects, the total indirect effect must be decomposed. I demonstrate this decomposition below but only for the case of the white group.

It is possible to decompose the above total indirect effect (0.142) reported in Table 7.4 into its constituent parts, based on the information suggested by Table 7.3. The following 10 direct paths are required (see model 7, chapter 4): (1) HW1→PAR2→YPEX3; (2) HW1→HW2→YPEX3; (3) HW1→SCH2→YPEX3; (4) HW1→TCH2→YPEX3 and (5) HW1→YPEX2→YPEX3. These were estimated in Table 7.3 as follows: [(-.007)(.031)] + [(.470)(.061)] + [(.044)(.060)] + [(-.072)(-.027)] + [(.141)(.775)] = -.000217 + .02867 + .00264 + .001944 + .109275 = 0.142 (within rounding). This decomposition of the total indirect effect of homework at age 14 on pupils' expectations at age 16 shows that the most important route of this total indirect effect was via pupils' expectations at age 15. For white pupils therefore, homework at age 14 exerted both a direct effect between ages 14 to 15 and a total indirect effect between ages 15 and 16 which was exerted mainly through white pupils' expectations at age 15. According to Table 7.4, this total indirect effect was stronger in the Pakistani ($\boldsymbol{\beta}_P$ = 0.249, p= 0.043) and the Bangladeshi ($\boldsymbol{\beta}_B$ = 0.158, p= 0.003) but it was weak and nonsignificant in the Indian ($\boldsymbol{\beta}_I$ = 0.079, p= 0.088) and in the Black Caribbean (β_{BC} = 0.093, p= 0.285) groups. Contrary to all their peers, Indian and Black Caribbean pupils' expectations at age 16 were affected neither directly nor indirectly by homework. This is quite interesting given that at age 16, Indian and Black Caribbean pupils represented the two extremes in terms of pupils' homework engagement (see, Tables 6.7a-b).

Indirect effects of pupils' feelings about school on their expectations

Regarding the total indirect effect of pupils' feelings about school at age 14 (SCH1) on expectations at age 16 (YPEX3), the indirect effect was strongest in the white group (β_W = 0.299, p= 0.003). Given that this group also showed the only significant direct effect of pupils' feelings about school at age 14 on their expectations at age 15 (β_W = 0.309, p= 0.004), the presence of a similarly strong indirect effect was not surprising. What was surprising however was the presence of a similarly strong total indirect effect on Pakistani pupil's expectations at age 16 (β_P = 0.249, p= 0.006) in the absence of any evidence for a direct effect in that group. Results were consistent with the hypothesis that more positive feelings about school at age 14 promoted higher expectations in Pakistani pupils two years later but did so *indirectly*, involving multiple routes of indirect influence. Feelings about school did not seem to affect the expectations of Indian, Bangladeshi or Black Caribbean pupils.

Indirect effects of pupils' assessments of their teachers' effectiveness on pupils' expectations

A significant negative total indirect effect of pupils' assessments of teachers' effectiveness at age 14 on white (β_W = -0.129, p= 0.008) and Bangladeshi (β_B = -0.167, p= 0.017) pupils' expectations was observed in addition to the significant negative direct effect involving the same factors in those two groups. Model 7 therefore suggests that stricter teachers who may have caused a less favourable impression in white and Bangladeshi pupils have a dampening direct and indirect effect on those pupils' expectations at age 16. But Bangladeshi pupils appear to have retained higher average expectations despite their unfavourable impressions of teachers' effectiveness. I discuss this seemingly counterintuitive finding in sections 8.5 and 8.6, chapter 8. Having now completed the discussion of the type 1 mediation, as illustrated in Figure 7.1, I now turn to the type 2 mediation involving cross-lagged effects among the four mediators.

7.1.2 Type 2: mediation of earlier effects of parent-child conflict, pupils' homework engagement, feelings about school and assessments about teachers' effectiveness at age 14 on pupils' expectations at age 16 via one another's cross-lagged effects at age 15.

Significant direct cross-lagged effects over time denote that a pair of factors affects each other longitudinally. In Figure 7.1, paths m1 and m2 represent two such direct cross-lags effects.

Cross-lagged effects gain added importance under an ecological systems approach. A path from pupils' feelings about school at age 14 to their homework engagement at age 15; and a second path from pupils' homework engagement at age 14 to their feelings about school at age 15 for example, represent a pair of cross-lagged effects between a home- and a school-related proximal process. This pair of cross-lagged effects reflects ecological influences between home and school exerted during the same time frame (between ages 14 to 15). Providing that structural invariance tests suggest that cross-group differences in cross-lagged estimates are significant, the findings are consistent with what we would expect if the cross-lagged structural estimates were moderated by maternal ethnicity. The significance of these cross-group differences however will be assessed and discussed in section 7.3. Like type 1, type 2 mediation also involves direct and indirect effects. I will consider direct cross-lagged effects first, followed by a discussion about indirect cross-lagged effects.

Direct cross-lagged effects

Model 7 estimated 12 direct cross-lagged paths between pupils' ages 14 to 15 and 2 between ages 15 to 16. Only some of these 12 direct relationships were significant across the five groups in the analysis. I will limit my discussion to the significant direct cross-lagged relationships based on their estimated bootstrapped significance (see Table 7.3).

Three general observations can be made out from the analysis of direct cross-lagged influences: First, only some of the relations were significant (at $p \leq 0.05$); second, different relationships were significant across groups; third, in a few cases, significant relationships had opposite signs across groups. Because measurement cross-group invariance for model 7 was supported by the data, comparisons of effect sizes and direction of structural estimates were possible.

In general, the findings suggest that there are very few true cross-lagged direct relationships in the sense that both longitudinal paths involved in a pair of cross-lagged effects are statistically significant. This was the case only in the Bangladeshi group and only between pupils' engagement with homework and feelings about school between ages 14 and 15. Both factors affect each other positively in that group but the effect of feelings about school at age 14 on homework at age 15 ($\boldsymbol{\beta}_B$ = 0.202, p= 0.022) is stronger than the effect of homework at age 14 on feelings about school at age 15 ($\boldsymbol{\beta}_B$ = 0.158, p= 0.039). However, feelings about school at 14 affect engagement with homework at 15 in the white ($\boldsymbol{\beta}_B$ = 0.201, p= 0.002) and Pakistani ($\boldsymbol{\beta}_B$ = 0.149, p= 0.054) groups, but engagement with homework at 14 does not affect feelings about school at age 15 in those ethnic groups. In most of the cases therefore, a hypothesised cross-lagged relationship proved to be unidirectional.

Moreover, in a cross-lagged relationship consisting of a pair of unidirectional paths, the first path could be significant and positive in one minority group but negative or insignificant in another. For example, in the cross-lagged relationship between pupils' feelings about school and parent-child conflict, the effect of parent-child conflict at age 14 on feelings about school at age 15 was positive and significant in the white ($\boldsymbol{\beta}_W$ = 0.124, p= 0.003) and Pakistani groups ($\boldsymbol{\beta}_P$ = 0.140, p= 0.028). However, that effect was significant and negative ($\boldsymbol{\beta}_{BC}$ = -0.272, p= 0.024) in the Black Caribbean group. Similarly, while pupils' assessments about teachers' effectiveness at age 14 affect engagement with homework at 15 quite significantly in the Black Caribbean group ($\boldsymbol{\beta}_{BC}$ = 0.305, p= 0.031), the effect of engagement with homework at 14 on assessments of teachers' effectiveness at 15 is observed only in the Pakistani group where it is marginally significant ($\boldsymbol{\beta}_P$= 0.106, p= 0.066).

Among all the estimated direct cross-lagged effects, two appear to be consistently significant across most groups. The first refers to the relation of pupils' feelings about school at age 14 (SCH1) and engagement with homework at 15 (HW2). This structural relationship was significant across the white ($\boldsymbol{\beta}_W$ = 0.201, p= 0.002) , the Pakistani ($\boldsymbol{\beta}_P$ = 0.149, p= 0.054) and the Bangladeshi ($\boldsymbol{\beta}_B$ = 0.202, p= 0.022) groups. The second relationship refers between assessments of teachers' effectiveness at age 15 (TCH2) and feelings about school at age 16 (SCH3). Judging by the p values associated with ML estimates (see Table 7.2) as well as their bootstrapped significance (see Table 7.3), this structural path was significant and negative across the Indian ($\boldsymbol{\beta}_I$ = -0.161, p= 0.027) , Pakistani ($\boldsymbol{\beta}_P$ = -0.193, p= 0.021) , Bangladeshi ($\boldsymbol{\beta}_B$ = -0.229, p= 0.035) but marginally so in the white ($\boldsymbol{\beta}_{BC}$ = -0.100, p= 0.054) groups. Contrary to my hypothesis in the Introduction and chapter 2, this finding suggests that for most pupils in the sample, positive feelings about their school are *inversely* related to the number of discipline-enforcing teachers. Schools with greater numbers of discipline-enforcing teachers at age 15 decrease pupils' positive feelings about school at age 16. I discuss this finding in relation to the other negative associations observed with teachers' effectiveness in sections 8.5 and 8.6, chapter 8.

In sum, minority groups differed widely in the hypothesized direct cross-lagged effects that were found to be significant. These findings are consistent with what we would expect to see if differential moderation by maternal ethnicity was in operation. More positive pupils' feelings about school at age 14 are positively associated with their engagement with homework at age 15 in the white, Pakistani and Bangladeshi groups but not in their Indian or Black Caribbean peers. For almost all pupils, the more they think their teachers are effective (in enforcing discipline) at age 14, the less positive their feelings about school are at age 15. For Indian pupils, this negative relationship is also significant between ages 15 and 16. The notable exception was the Black Caribbean pupils. On the basis of the findings of chapter 6, Black Caribbean pupils were shown to have the least positive feelings about both school and teachers relative to all of their peers. Indeed, there is support for this finding in the literature (see chapter 2). Yet, Black Caribbean pupils' feelings about school remain unaffected longitudinally by their ideas about teachers' effectiveness. In fact, Black Caribbean pupils are the only ones whose ideas about teachers' effectiveness at age 14 are *positively* related to their homework at age 15 ($\boldsymbol{\beta}_{BC}$ = 0.305, p= 0.031). But since Black Caribbean pupils are also very low in both of these factors (see relevant factor means, Tables 6.7a-b), the strong positive association means that their low assessments about their teachers are likely to perpetuate their low homework engagement. Further, the stricter those pupils thought their teachers were at age 14, the more parent-child conflict was reported in their families at age 15 ($\boldsymbol{\beta}_{BC}$ = -0.272, p= 0.024). This may be indicative of a strained relationship between home and school in Black Caribbean families since pupils' perceptions about teachers appear to be longitudinally associated with less homework and more parent-child conflict.

For the rest of the groups, analysis of cross-lagged relationships suggests that lower parent-child conflict promotes more positive feelings about both school and teachers. That appears to be the case for white families between ages 14 to 15. Pakistani pupils are a more complicated case. Lower parent-child conflict and higher engagement with homework promote more positive feelings about schools and teachers between ages 14 and 15. Between ages 15 to 16 however, the stricter Pakistani pupils feel their teachers are at age 15, the less positive their feelings about school are at age 16. For Bangladeshi pupils, engagement with homework and feelings about school reinforce each other between ages 14 to 15. However, after year 10, Bangladeshi pupils resemble their Pakistani peers in that the stricter they think their teachers are, the less favourable their feelings about school become. I now turn to indirect cross-lagged effects on pupils' educational expectations at age 16 under mediation type 2.

Indirect cross-lagged effects

There were very few indirect effects exerted from parent-child conflict, pupils' engagement with homework, feelings about school and assessments about teachers' effectiveness at age 14 on their expectations at age 16 via cross-lagged relationships of these mediators at age 15. Table 7.6 below decomposes each total indirect effect from parent-child conflict (PAR1), pupils' homework engagement (HW1), feelings about school (SCH1) and assessments about teachers' effectiveness (TCH1) at age 14 on pupils' expectations at age 16 (YPEX3) via all possible cross-lagged relationships of the same factors at age 15 (PAR2, HW2, SCH2 and TCH2), using information provided by Table 7.3. Because this decomposition excludes all indirect effects via expectations at age 15, the 'total indirect' column in Table 7.6 does not match the entries in Table 7.4. Following Kenny's (2013) recommendations, standardised specific indirect effects of at least medium size are highlighted in bold. These were bootstrapped, in line with Macho and Lederman's (2011) estimation method and their significance (based on their unstandardised counterpart) appears in parenthesis. The evidence suggests that there was a significant positive effect from Pakistani pupils' feelings about school at age 14 on their expectations at age 16 via their feelings about school at age 15. Black Caribbean pupils' parent- child conflict and

Table 7.6 Decomposition of standardised total indirect effects into specific indirect effects of parent-child conflict, pupils' homework engagement, feelings about school and assessments about teachers effectiveness at age 14 on pupils' expectations at age 16 via one another's occasions at age 15.

Ethnic group	Independent at *t*	Dependent at *t*+2	via (at t+1)				Total indirect
			PAR2	HW2	SCH2	TCH2	
White (n=1000)	PAR1	YPEX3	.026	.004	.007	-.002	0.035
Indian (n=751)			-.005	.001	.005	.000	0.001
Pakistani (n=642)			.084	.000	.028	.001	0.113
Bangladeshi (n=487)			-.030	.002	-.000	-.001	-0.029
BlackCaribbean (n=324)			**.141** (.439)	-.000	-.001	.004	0.144
White (n=1000)	HW1	YPEX3	-.000	.029	.002	.001	0.032
Indian (n=751)			-.000	.049	-.001	-.000	0.048
Pakistani (n=642)			.008	-.013	.007	-.004	-0.002
Bangladeshi (n=487)			-.004	.060	-.001	-.001	0.054
BlackCaribbean (n=324)			-.000	-.002	.005	-.020	-0.017
White (n=1000)	SCH1	YPEX3	-.000	.012	.050	.012	0.074
Indian (n=751)			-.000	.002	.041	.003	0.046
Pakistani (n=642)			.012	-.003	**.180** (.004)	.001	0.190
Bangladeshi (n=487)			-.003	.019	-.008	-.008	0.00
BlackCaribbean (n=324)			-.039	.000	-.049	-.019	-0.107
White (n=1000)	TCH1	YPEX3	-.000	.004	-.001	-.018	-0.015
Indian (n=751)			-.000	.004	.002	.014	0.02
Pakistani (n=642)			-.000	-.010	-.000	.026	0.016
Bangladeshi (n=487)			-.004	.005	-.000	-.064	-0.063
BlackCaribbean (n=324)			.010	-.021	-.013	**.100** (.314)	0.076

Source: Table 7.2. Note: All effects are rounded to the third decimal. Significant effects are marked in bold. Note: PAR=parent-child conflict; HW=pupils' homework engagement; SCH=feelings about school; TCH=assessments of teachers' effectiveness. Numbers next to PAR, HW, SCH and TCH refer to occasions. The number in parenthesis refers to bias-corrected bootstrapped significance, based on 1000 bootstrapped samples.

assessments about teachers' effectiveness at age 14 also exerted positive indirect effects on their expectations at age 16 via parent-child conflict and assessments about teachers at age 15. However, neither were significant probably due to the small sample size of Black Caribbean group (n=324).

In sum, cross-lagged relations at age 15 do not generally mediate earlier effects of the four mediators at age 14 on pupils' expectations at age 16. When such mediation occurs, as in the case of Pakistani and Black Caribbean pupils, the indirect effect is conveyed via the time lagged occasion of the same mediator, rather than via that mediator's cross-lagged relationship with any other. This indicates the importance of controlling for earlier occasions of each mediator at age 14 in estimating indirect effects on pupils' expectations at age 16. For Pakistani pupils at least, feelings about school exerted positive effects on their expectations at age 16 both directly between ages 15 and 16 (see Table 7.2) and indirectly between ages 14 to 16 (see Table 7.6).

7.1.3 Type 3: mediation of earlier feedback effects of pupils' expectations at age 14 on themselves at age 16 via parent-child conflict, pupils' homework engagement, feelings about school and assessments about teachers' effectiveness and expectations at age 15.

Longitudinal feedback mechanisms are one of the most interesting relations in SEM because they demonstrate whether and how the outcome at earlier ages affects its causes at later ages either directly or indirectly. In Figure 7.1, paths f1 and f2 illustrate two direct feedback paths from the outcome at age 14 on the mediators M1.2 and M2.2 at age 15. Ecological systems theory predicts that outcomes affect the proximal process that has brought them about (see chapter 3). Significant direct feedback paths from expectations at age 14 on the four mediators at age 15 therefore constitute a direct test of this theoretical proposition. Further, significant indirect paths from expectations at age 14 to expectations at age 16 via the four mediators at age 15 also suggest alternative routes of indirect influences of the outcome, which operate in parallel to its direct influences. Finally, if these feedback effects change significantly across groups under measurement invariance, then significant differences are consistent with the hypothesis of moderation by group membership. As in the case of type 1 and 2 mediation therefore, we should expect to find both direct and indirect 'feedback effects', as these were defined in chapter 4. I will first examine the direct feedback effects, followed by the indirect feedback effects.

Direct feedback effects of expectations at age 14 on the four mediators at age 15

Most of the significant direct feedback effects were found in the white group. White pupils' expectations at 14 were positively associated with their homework engagement ($\boldsymbol{\beta}_W$ = 0.115, p= 0.002), parent-child conflict ($\boldsymbol{\beta}_W$ = 0.198, p= 0.028) and assessments about teachers' effectiveness ($\boldsymbol{\beta}_W$ = 0.079, p= 0.058) at age 15 although the latter longitudinal association was marginally significant under both ML estimation and bootstrapped significance. Pakistani pupils' expectations at age 14 were negatively associated with their feelings about school at 15 ($\boldsymbol{\beta}_P$ =

- 0.176, p= 0.004). Higher expectations appear to cause *less* positive feelings about school, perhaps indicating that for some reason, Pakistani pupils' higher average expectations relative to their white peers (see chapter 6) became incompatible with their *perceived* standard of their school. This negative direct effect is not found between ages 15 to 16. At age 15, Pakistani pupils' higher expectations also promote less parent-child conflict ($\boldsymbol{\beta}_{BC}$ = 0.170, p= 0.004). Black Caribbean pupils' expectations at age 14 are positively associated with assessments about teachers' effectiveness ($\boldsymbol{\beta}_{BC}$ = 0.219, p= 0.015) and feelings about school ($\boldsymbol{\beta}_{BC}$ = 0.167, p= 0.037) at 15. However some caution is needed in interpreting those effects because their statistical significance based on ML estimation was not always confirmed by bootstrapped significance (see Tables 7.2 and 7.3).

The above findings are consistent with ecological systems theory. Expectations at an earlier time point exert an effect on the factors influencing these proximal processes at a later time point. There is considerable evidence for differential patterning of influences over time. For instance, higher expectations at age 14 decreased parent-child conflict at 15 in white and Pakistani families, and promoted higher assessments about teachers' effectiveness for the white and Black Caribbean groups. Direct feedback effects were not always in the same direction however. Expectations at age 14 appear to lower feelings about school in the Pakistani group but to increase them in the Black Caribbean group at age 15. The above findings are consistent with the predictions of ecological systems theory. Expectations, the developmental outcome in this study, are longitudinally and significantly affected directly and indirectly by a number of prior causes. Consistent with the predictions of ecological systems theory however, earlier expectations also exerted significant longitudinal effects on their causes at later time points. I next consider the evidence for the presence of indirect feedback effects.

Indirect feedback effects

Cross-group invariance tests of models 1-6 in chapter 6 implied that structural paths p_{21} and p_{32} (connecting measurement occasions 1 and 2 as well as 2 and 3) were moderated by maternal ethnicity. However, these were all *direct* paths. For example, indirect influences between pupils' expectations at age 14 to their expectations at age 16 via other factors were not analysed at that point in the analysis. Table 7.4 contains results from subsequent analyses under the overarching framework of model 7 that suggest that there are quite strong, significant and positive total *indirect* effects from pupils' expectations at age 14 to their expectations at age 16 that involved all the intervening factors in-between pupils' expectations at age 14 and 16. The strongest total indirect effects were found in the Black Caribbean ($\boldsymbol{\beta}_{BC}$ = 0.644, p= 0.037) group, followed by the Indian (β_I = 0.489, p= 0.003), the white (β_W = 0.451, p= 0.003), the Bangladeshi (β_B = 0.429, p= 0.002) and the Pakistani (β_P = 0.244, p= 0.002) groups.

However, indirect influences on pupils' expectations at age 16 were exerted mainly via expectations at age 15. Focusing on row 7 in Table 7.4 for each group shows that all mediators at age 14 (TCH1, SCH1, HW1 and PAR1, see row factors, Table 7.4) exerted total indirect effects on pupils' expectations at age 16 (YPEX3, see column factors, Table 7.4, row 7) while the total indirect effect from parental social position (FAM1) on expectations at age 16 was negligible across groups. However, each of these total indirect effects is the *sum* of all possible specific indirect effects from each row latent factor to each column latent factor. Thus, each estimate includes shared specific indirect effects that must be extracted before we can reach an understanding of the routes of feedback from expectations at age 14 to expectations at age 16. Table 7.7 decomposes each of the above total indirect effects into the specific indirect to expectations at age 16 (YPEX3) via each of the mediators at age 15 (PAR2, HW2, SCH2 and TCH2) and sums it under the column 'total indirect excluding YPEX2'. For comparison, the last column reports the specific indirect to pupils' expectations at age 16 (YPEX3) only via their expectations at age 15 (YPEX2).

Table 7.7 Decomposition of specific standardised indirect effects of pupils' expectations at age 14 on pupils' expectations at age 16 via parent-child conflict, pupils' homework engagement, feelings about school and assessments about teachers effectiveness at age 15.

Ethnic group	Independent at *t*	Dependent at *t*+2	via (at *t*+1)				Total indirect excluding YPEX2	Specific indirect only via YPEX2
	YPEX1	YPEX3	PAR2	HW2	SCH2	TCH2		
White			.006	.007	.003	-.002	.014	**.437**
Indian			.006	.005	-.003	-.004	.004	**.486.**
Pakistani			-.006	.002	-.038	.001	-.041	**.282**
Bangladeshi			.000	.000	.000	.012	.012	**.416**
BlackCaribbean			.024	-.000	.012	.022	.031	**.612**

Source: Table 7.2, chapter 7. Note: All effects are rounded to the third decimal. Significant effects are marked in bold

Adding horizontally each entry in the last two columns of Table 7.7 returns the total standardised indirect effect of pupils expectations at age 14 on their expectations at age 16 reported in Table 7.4. The evidence shows clearly that the main route via which feedback from pupils' expectations at age 14 to pupils' expectations at age 16 was conveyed was their expectations at age 15. Having now completed the description of mediation types 1, 2 and 3, based on the evidence suggested by model 7, we are now in a position to consider the evidence on moderation of these three types of mediational routes by maternal ethnicity.

7.2 Evidence for moderation by maternal ethnicity based upon tests of cross-group differences

The detection of significant cross-group differences in parameter estimates involving the three types of mediation discussed above is consistent with the hypothesis that these differences have been moderated by maternal ethnicity. With the measurement part of model 7 held to metric and scalar cross-group invariance, as established in chapter 6, I am now going to proceed with systematic tests of cross-group invariance of the relevant structural estimates. Tests of cross-group structural invariance are meaningful for structural estimates that were found to be statistically significant in at least one of the five groups. If the particular structural parameter estimate was insignificant in all five groups, it was meaningless to test for moderation since even if it did exist, the estimates would still not be statistically different from zero. Significant cross-group differences were tested based on the chi-square difference test ($\Delta\chi^2$) in conjunction with the CFI (ΔCFI) and the RMSEA (ΔRMSEA) difference tests. Comparisons were made between the structurally unconstrained baseline model and the nested model in which the particular structural relation of interest was constrained to equivalence.

The chi-square difference test was primarily relied upon in the following series of tests. The main reason was that in a complex model with many estimated parameters, both the CFI and the RMSEA will be unlikely to change significantly if only 4 of these parameters were constrained to equality at a time. Over-reliance on the CFI and RMSEA change in this case could therefore increase Type II error rates, i.e., failing to reject the null hypothesis of no difference too often, indicating false negatives. True differences due to moderation would not be identified because the model complexity would render the CFI and RMSEA largely insensitive. Precisely because bias from widely-discrepant sample sizes in multi-group analysis has been minimised as explained in chapter 5, p. 108, it is expected that reliance on the bias-adjusted chi-square will be less problematic as is typically the case (Byrne, 2010).

Another alternative would be to use the Akaike Information Criterion (AIC) (Akaike, 1973; 1987), or the Browne-Cudeck Criterion (BCC) (Browne and Cudeck, 1989) that penalise model complexity and can be applied for nested models. Both are available in AMOS Graphics 20. However, the problem with these indices is that there are no simulation studies that have identified critical ranges for these indices as there were in the case of the χ^2, CFI and RMSEA. Indeed very few studies have used them in multigroup structural equivalence tests as they were not developed for multiple group analyses (Byrne, 2010). Another problem is that taking the differences from AIC and BCC between two models does not have a straightforward interpretation because neither of the two indices has a normed 0-1 range. However, AIC and BCC are good indices for *explorative* specification search processes involving nested comparisons whose main purpose is to identify the best-fitting model regardless of theory (Arbuckle, 2011). For these reasons, I did not use either AIC or BCC and relied mostly on the $\Delta\chi^2$ for the following tests of structural invariance. However, any indication of moderation based on chi-square change alone will be treated as *tentative*, pending further confirmation in future studies.

Except for dependence paths which were tested for structural invariance in chapter 6, the cross-group invariance of all the structural estimates appearing in each row of Table 7.2 that were significant in at least one group (shown in green) was tested. For each omnibus test, all the relevant unstandardized parameters in each group were constrained to be structurally equivalent. If the $\Delta\chi^2$ was significant, it was interpreted as *tentatively* signifying the presence of noninvariance in at least one of the structural parameters constrained to cross-group equality. Further tests to locate the noninvariant unstandardised structural estimates then followed. If however the above tests did not indicate significant differences, no further tests were carried out and the hypothesis of structural equivalence for the constrained parameters (H_o: $\mathbf{b}_W = \mathbf{b}_I = \mathbf{b}_P = \mathbf{b}_B = \mathbf{b}_{BC} = \mathbf{b}$) was not rejected. Table 7.8 presents the results of these tests. The decision to reject

Table 7.8 Tests of structural invariance for model 7 involving the three types of mediation

	χ²	df	p	Č/d	Δχ²	df	p	CFI	ΔCFI	RMSEA	ΔRMSEA	Decision
Baseline	8249.97	4210	0.0		-	-	-	0.930	-	0.017	-	
Direct mediational effects (referring to Type 1 mediation in Figure 7.1) showing *a*, *b* and *c´* effects												
Null hypotheses												
FAMCIRC1→HW2 inv (a1)	8253.0	4214	0.0	1.96	3.029	4	ns	0.930	0.000	0.017	0.000	NR
FAMCIRC1→TCH2 inv (a1)	8252.59	4214	0.0	1.96	2.619	4	ns	0.930	0.000	0.017	0.000	NR
FAMCIRC2→PAR3 inv (a2)	8255.6	4214	0.0	1.96	5.629	4	ns	0.930	0.000	0.017	0.000	NR
FAMCIRC2→SCH3 inv (a2)	8254.4	4214	0.0	1.96	4.429	4	ns	0.930	0.000	0.017	0.000	NR
TCH1→YPEX2 inv (b1)	8264.9	4214	0.0	1.96	14.929	4	0.00	0.930	0.000	0.017	0.000	R
SCH1→YPEX2 inv (b1)	8275.4	4214	0.0	1.96	25.429	4	0.00	0.930	0.000	0.017	0.000	R
HW1→YPEX2 inv (b1)	8256.0	4214	0.0	1.96	6.1	4	ns	0.930	0.000	0.017	0.000	NR
PAR1→YPEX2 inv (b1)	8258.8	4214	0.0	1.96	8.1	4	ns	0.930	0.000	0.017	0.000	NR
PAR2→YPEX3 inv (b1)	8261.8	4214	0.0	1.96	11.8	4	0.01	0.930	0.000	0.017	0.000	R
HW2→YPEX3 inv (b2)	8255.0	4214	0.0	1.96	5.1	4	ns	0.930	0.000	0.017	0.000	NR
SCH2→YPEX3 inv (b2)	8258.1	4214	0.0	1.96	8.2	4	ns	0.930	0.000	0.017	0.000	NR
FAMCIRC1→YPEX3 inv (c´)	8275.1	4214	0.0	1.96	25.2	4	0.00	0.930	0.000	0.017	0.000	R
Direct cross-lagged effects (referring to Type 2 mediation in Figure 7.1)												
Null hypotheses												
PAR1→HW2 inv	8253.5	4214	0.0	1.96	3.6	4	ns	0.930	0.000	0.017	0.000	NR
HW1→SCH2 inv	8256.0	4214	0.0	1.96	6.1	4	ns	0.930	0.000	0.017	0.000	NR
SCH1→TCH2 inv	8260.2	4214	0.0	1.96	7.4	4	ns	0.930	0.000	0.017	0.000	NR
SCH1→HW2 inv	8266.1	4214	0.0	1.96	16.2	4	0.00	0.930	0.000	0.017	0.000	R
SCH1→PAR2 inv	8256.7	4214	0.0	1.96	6.8	4	ns	0.930	0.000	0.017	0.000	NR
TCH1→HW2 inv	8277.0	4214	0.0	1.96	23.1	4	0.00	0.930	0.000	0.017	0.000	R
PAR1→SCH2 inv	8255.2	4214	0.0	1.96	5.3	4	ns	0.930	0.000	0.017	0.000	NR
PAR1→TCH2 inv	8253.8	4214	0.0	1.96	3.9	4	ns	0.930	0.000	0.017	0.000	NR
HW1→TCH2 inv	8258.5	4214	0.0	1.96	8.6	4	ns	0.930	0.000	0.017	0.000	NR
TCH2→SCH3 inv	8253.0	4214	0.0	1.96	3.3	4	0.00	0.930	0.000	0.017	0.000	NR
TCH2→PAR3 inv	8256.6	4214	0.0	1.96	6.7	4	0.00	0.930	0.000	0.017	0.000	NR
PAR2→SCH3 inv	8256.5	4214	0.0	1.96	6.6	4	ns	0.930	0.000	0.017	0.000	NR
Direct feedback effects (referring to Type 3 mediation in Figure 7.1)												
Null hypotheses												
YPEX1→TCH2 inv	8261.2	4214	0.0	1.96	11.3	4	0.03	0.930	0.000	0.017	0.000	R
YPEX1→SCH2 inv	8262.5	4214	0.0	1.96	12.6	4	0.01	0.930	0.000	0.017	0.000	R
YPEX1→HW2 inv	8265.0	4214	0.0	1.96	15.1	4	0.00	0.930	0.000	0.017	0.000	R
YPEX1→PAR2 inv	8260.0	4214	0.0	1.96	9.6	4	0.05	0.930	0.000	0.017	0.000	R
YPEX2→PAR3 inv	8265.7	4214	0.0	1.96	15.8	4	0.00	0.930	0.000	0.017	0.000	R

Note: inv=invariant; a1=a effect between ages 14 to 15; a2=a effect between ages 15 to 16; b1=b effect between ages 14 to 15; b2=b effect between ages 15 to 16; c´= c´ effect between the predictor at age 14 on the outcome at age 16; ns=not significant; χ² =chi-square; df=degrees of freedom; p=significance; Δχ²= chi-square difference; CFI=comparative fit index (>0.95); RMSEA=Root mean square error or approximation (<0.05); ΔCFI=change in CFI (≤ -0.01); ΔRMSEA=change in RMSEA (≥ 0.016)

(R) or not reject (NR) the null hypothesis is reported in the last column of the Table. In general, the evidence suggests that for the majority of structural parameter estimates, the null hypothesis of cross-group invariance could not be rejected. However, there were also quite a few parameter estimates that were found not to be cross-group invariant, implying moderation by maternal ethnicity. As expected, the values of the CFI and RMSEA were insensitive to the structural invariance tests. A significant chi-square difference test offered an indication as to which structural parameter estimates were cross-group noninvariant. Since in all hypothesis tests four parameters were constrained to cross-group equality, the degrees of freedom for the chi-square difference test between the structurally- unconstrained baseline model (4210) and the constrained nested model (4214) were 4 for all tests. I will now proceed with the discussion of only those effects for which the null hypothesis was rejected. Since there were no *a* effects for which the null hypothesis was rejected for the first type of mediation, I consider *b* and *c´* effects only, followed by the examination of moderation of the second and third type of mediation involving cross-lagged and feedback effects (see Figure 7.1).

7.2.1 Moderation in the first type of mediation: b and c′ effects

Moderated b effects

As regards mediational relationships, evidence was consistent with the hypothesis that maternal ethnicity moderated two *b* effects (showing the effect of the mediator on the outcome). Initially, Table 7.2 provides evidence that the significant negative effect of pupils' assessments of their teachers' effectiveness at age 14 on their expectations at age 15 were significantly different in the white ($\boldsymbol{\beta}_W$ = -0.146, p = 0.005) and the Bangladeshi ($\boldsymbol{\beta}_B$ = -0.154, p = 0.005) group as compared to the same effects in the other three groups in the analysis. The strong positive effect of pupils' feelings about school at age 14 on their expectations at age 15 ($\boldsymbol{\beta}_W$ = 0.309, p = 0.005) was also significantly different in the white group as compared to the other four ethnic groups in the analysis. The results of the structural invariance tests were consistent with what we would expect to see if maternal ethnicity had increased the negative influence of white and Bangladeshi pupils' assessments about teachers' effectiveness at age 14 on their expectations at age 15. The stricter white and Bangladeshi pupils think their teachers are at age 14, the lower their expectations are at age 15. White pupils' feelings about school have the strongest positive influence on their expectations at age 15 compared to their minority peers. Yet this does not result in an increase of white pupils' expectations because both their feelings about school and expectations are the lowest relative to those of their minority peers. Among the latter, positive feelings about school helped to increase expectations because minority pupils have much higher levels in both factors.

Moderated c′ effects

There was also evidence of moderation of the *c′* effect (showing the effect of the predictor on the outcome adjusted for the influence of all mediators). The effect of parental social position at pupils' age 14 on pupils' expectations at age 16 was significantly different in the Pakistani ($\boldsymbol{\beta}_P$ = 0.357, p = 0.005) and the Black Caribbean ($\boldsymbol{\beta}_{BC}$ = 0.270, p = 0.005) as compared to the same parameter in the other groups. This finding is consistent with what we would expect to see if moderating influences of different strength from Pakistani and Black Caribbean maternal ethnicities were in effect, *increasing* the effect of parental social position at age 14 on pupils expectations at age 16 significantly differently in these two minority groups. Higher parental social position and better family material circumstances promote higher expectations in Pakistani and Black Caribbean pupils to a significantly greater extent than did similar levels of parental social position and family-level material circumstances in the white and Indian pupils (see Table 7.2). Higher parental social position at age 14 also affected positively the expectations of white and Indian pupils, but the effect was much weaker and did not differ significantly between the two ethnic groups. By contrast, the direct effect of parental social position on Bangladeshi pupils' expectations was minimal, negative and insignificant. This suggests that Bangladeshi pupils' expectations developed independently of the level of parental social position and in that respect, Bangladeshi pupils were significantly different from their peers. This is quite a strong finding because the higher expectations of Bangladeshi pupils relative to those of their white peers between ages 14 to 16 were observed despite their being the most disadvantaged of the five groups (see chapter 6).

7.2.2 Moderation in the second type of mediation involving cross-lagged effects

The presence of significant cross-group differences in cross-lagged influences was revealed in only two instances, where the null hypothesis was rejected (see Table 7.8, last column, R). Indian and Black Caribbean pupils were significantly different in relation to their peers in that they were the only two cases where the longitudinal effect of feelings about school at age 14 did *not* affect their engagement with homework at age 15. This is in stark contrast to the strong and positive effect feelings about school exerted on the white, Pakistani and Bangladeshi pupils' homework. Thus, maternal ethnicity for Indian and Black Caribbean pupils appears to significantly *decrease* the longitudinal effect of pupils' feelings about school at age 14 on their homework engagement at age 15. Analysis of latent means and intercepts in chapter 6 showed that Indian pupils appeared to be the pupils most engaged with homework and to maintain the most positive feelings about school between ages 14 to 16 relative to their white peers. Black Caribbean pupils in contrast, maintained the lowest feelings about school and teachers and the lowest engagement with homework relative to those of their Indian peers between ages 14 to 16. The *seemingly* similar low longitudinal association over time between feelings about school at age 14 and homework engagement at age 15 in the Indian and Black Caribbean pupils is therefore qualitatively different.

The influence of pupils' assessments about teachers at age 14 on engagement with homework at age 15 was noninvariant in the case Black Caribbean pupils. The stricter they think their teachers are on discipline issues at age 14, the higher their engagement with homework is at age 15 ($\boldsymbol{\beta}_{BC}$ = 0.305, p = 0.005, see Table 7.2). But since Black Caribbean pupils have the lowest latent means in both factors, the strong positive association means that their lower levels in assessments about teachers' effectiveness at age 14 are more likely to continue to be associated with lower homework engagement at age 15. The results contained in Table 7.8, are consistent with what we would expect to see if a significant moderating influence from Black Caribbean maternal ethnicity on the longitudinal relationship between the assessments of teachers' effectiveness and homework engagement was in evidence.

7.2.3 Moderation in the third type of mediation involving direct and indirect feedback effects of pupils' earlier expectations at age 14 on later expectations at age 16 via the four mediators and themselves age 15

The strongest body of evidence that was consistent with the hypothesis of moderation by maternal ethnicity was found in the direct feedback effects of pupils' expectations at age 14 on parent-child conflict, engagement with homework, feelings about school and assessments of teachers' effectiveness at age 15. As the 'decision column' in Table 7.8 suggests, these structural paths were not cross-group invariant in all cases. This suggests that the hypothesis of moderation by maternal ethnicity was most likely to be supported in the third type of mediation involving feedback rather than in the first type involving *a*, *b* or *c´* effects or the second type involving cross-lagged structural relationships.

The direct effect of pupils' expectations at age 14 on their assessments of teachers' effectiveness at age 15 was found not to be structurally cross-group invariant. The main source of noninvariance was the strong positive effect exerted by the Black Caribbean pupils' expectations at age 14 on their assessments of teachers' effectiveness at age 15 ($\boldsymbol{\beta}_{BC}$ = 0.219, p = 0.015) which did not arise for any other group (see Table 7.2). The results are therefore consistent with the hypothesis that a significantly different positive effect of pupils' expectations at age 14 on their assessments of teachers' effectiveness is moderated by Black Caribbean maternal ethnicity.

The direct structural path expressing the feedback of pupils' expectations at age 14 on their feelings about school at age 15 was also not cross-group invariant. The source of noninvariance in this case was the Pakistani group ($\boldsymbol{\beta}_{P}$ = -0.176, p = 0.002) as it happened to be the only significant negative estimate. The most interesting finding was the Pakistani pupils' very significant negative feedback effect from their expectations at age 14 to their feelings about school at age 15. The significance of this effect was confirmed by its bootstrapped significance (see Table, 7.3). Taking into consideration the fact that Pakistani pupils' expectations were second in level only to those of their Indian peers and much higher relative to those of all other pupils, this negative effect may reflect a disjuncture between Pakistani pupils' early expectations and their satisfaction with their impressions about the school they were attending at age 15. Perhaps higher expectations at age 14 were seen as relatively incompatible with their school quality causing less positive feelings about school at age 15. It is therefore likely that the drop in feelings about school experienced by the Pakistani pupils (as well as by all others) at age 15, as suggested by the analysis of latent means and intercepts (see chapter 6) might be explained by Pakistani pupils' higher expectations at age 14. The same parameter was positive but very different in terms of effect size in the white group ($\boldsymbol{\beta}_W$ = 0.044, p = ns, see Table 7.2) and in the Black Caribbean group ($\boldsymbol{\beta}_{BC}$ = 0.167, p = 0.037, see Table 7.2) but insignificant in both cases (see Table 7.3). Tests suggested it was structurally non-invariant only in the case of the white group. The results of these tests were consistent with the hypothesis that maternal ethnic group membership was a moderator of the above effect in the white group and the Pakistani group.

The direct feedback effect of Pakistani pupils' expectations on their engagement with homework was found not to be structurally invariant as it was the only negative effect. However this effect was nonsignificant (see Tables 7.2 and 7.3) and therefore it will not be interpreted. In terms of effect size, this feedback effect was strongest in the Black Caribbean ($\boldsymbol{\beta}_{BC}$ = 0.160, p = 0.023) followed by the white ($\boldsymbol{\beta}_{BC}$ = 0.115, p = 0.005) group (see Table 7.2). Caution is needed in interpreting these effects because their significance was not confirmed by bootstrapping (see Table 7.3). They offer however a tentative indication that pupils' engagement with homework at age 15 were at least to a certain extent driven by their expectations at age 14 in the white and the Black Caribbean groups. The analysis of latent means and intercepts in chapter 6 suggested that expectations of white and Black Caribbean pupils were at a lower level relative to those of their South Asian peers. At age 15, there was a further slump in the expectations of Black Caribbean pupils followed by a rise at age 16. Given that both white and Black Caribbean pupils' engagement with homework decreases at age 15, it seems plausible that low expectations at age 14 drive low homework engagement at age 15.

In sum, higher expectations at age 14 appear to promote better parent-child relations at age 15. This is evidenced by lower parent-child conflict in white pupils' homes ($\boldsymbol{\beta}_W$ = 0.198, p = 0.005, see Table 7.2) and in Black Caribbean pupils' (statistically insignificant however, under both ML and bootstrapped significance, see Table 7.3). That is in sharp contrast to their South Asian peers' homes where parent-child conflict is generally much lower relative to their white and Black Caribbean peers, and falling over time (see chapter 6). In South Asian families however, pupils' expectations are already much higher at age 14 relative to their white and Black Caribbean peers and seem to develop independently of parent-child conflict which is much lower anyhow, particularly in the Bangladeshi and Pakistani families. A similar effect is observed for the Pakistani group but only between ages 15 to 16. Pakistani pupils' higher expectations at age 15 promote lower parent-child conflict at age 16 ($\boldsymbol{\beta}_P$ = 0.170, p = 0.005, see Table 7.2). This was consistent with the large drop in average parent-child conflict seen in the latent means for parent-child conflict for the Pakistani group at age 16 (see Tables 6.7a-b, chapter 6).

7.3 Discussion and concluding remarks

This chapter has presented the findings which appertain to the central focus of the thesis summarised as research questions 3 and 4. Research question 3 concerned the role parent-child relations, pupils' engagement with homework, feelings about school and assessments of teachers' effectiveness at ages 14 and 15 play in impacting on pupils' educational expectations at age 16. Research question 4, asked whether this role is moderated by maternal ethnicity. A number of directional hypotheses were attached to the above two research questions. I formed these hypotheses on the basis of the present state of knowledge about the expectations of UK minority adolescents as discussed in the literature review.

I studied the role of the hypothesised mediators in three longitudinal mediational routes, named type 1, 2 and 3, only the first of which is typically referred to in the literature of longitudinal mediation (Cole and Maxwell, 2003; Gollob and Reichardt, 1987). I argued that the other two types also represented valid longitudinal mediational routes that may operate concurrently with the first. In what follows, I summarise the findings regarding the three types of longitudinal mediation that addressed research questions 3 and 4 and the associated hypotheses.

Regarding type 1 mediation, the analysis failed to reject the null hypothesis that the above four factors were not mediators of the longitudinal effect of parental social position at pupils' age 14 on pupils' expectations at age 16. Contrastingly, parental social position at pupils' age 14 was shown to exert in most cases a small to moderate but highly significant positive longitudinal effect on pupils' expectations at age 16 in most of the groups when all hypothesised intervening prior influences were included in the model. This is consistent with previous research that has pointed to a similar positive influence of parental social class on adolescent expectations (Anders and Micklewright, 2013; 2010a; Chowdry, Crawford and Goodman, 2010b; Crozier and Davies, 2006; Goodman, Gregg and Washbrook, 2011; Rothon, 2005; 2007; Schoon and Parsons, 2002; Strand, 2010; 2008). However, none of these studies involved a systematic mediation analysis that subjected this hypothesis to more rigorous tests. Further, contrary to previous research, this analysis showed that the effect of parental social position on expectations was far from being uniform across minority groups. This effect was found to be minimal in the white and Indian groups, considerable in the Pakistani, modest in the Black Caribbean and insignificant in the Bangladeshi groups. As a result, hypothesis (i) was partially supported. The longitudinal effect of parental social position was not stronger in the white and the Black Caribbean pupils, as hypothesised. However, the longitudinal effect of parental social position at age 14 on Indian and Bangladeshi pupils' expectations at age 16 groups was minimal, as expected while this effect was considerable only in the case of the Pakistani pupils. Cross-group structural invariance tests were consistent with the hypothesis that the effect of parental social position at pupils' age 14 on their expectations at age 16 is moderated by maternal ethnicity. Thus, with the possible exception of the Pakistani group, expectations in minority and the white ethnic groups are not influenced by parental social position to any considerable extent. This in turn suggests that development of educational expectations about continuing to university particularly in the most disadvantaged of minority groups such as the Bangladeshi in England, is not class-bound. In this sense, the predictions suggested by 'weak' rational action theory (Breen and Goldthorpe, 1997; Goldthorpe, 1996b; Goldthorpe and Breen, 2000) find little to no support. By the same token, neither do the predictions of social and cultural reproduction theory (Bourdieu, 1986). Educational expectations do not seem to have developed among pupils from minority families bound by a 'class-determined habitus'. Indeed, one could argue that parental social position matters *less* for pupils' educational expectations among the most advantaged groups such as the white and Indian than it does for the relatively more disadvantaged minority pupils such as the Pakistani. Lower expectations for the white and Black Caribbean and higher expectations for the Indian and Bangladeshi pupils cannot be explained by their differences in parental social position. This finding is also consistent with quantitative and qualitative studies on ethnicity in the United Kingdom that have pointed to an inverse relationship between class disadvantage and adolescent educational and occupational expectations (Bhavnani and PTI, 2006; Cassidy, O'Connor and Dorrer, 2006; Francis, 2005; Francis *et al.*, 2003; Modood, 2005; Strand, 2007; 2008).

Nor does parental social position at age 14 exert significant direct influences on parent-child conflict, pupils' feelings about school or assessments about teachers' effectiveness at age 15 or 16. Only pupils' engagement with homework at age 15 is positively affected by parental social position at age 14 across all groups. The longitudinal influence of parental social position on all hypothesised mediators except homework engagement was insignificant. In that respect hypothesis (ii) is not supported by the findings. However, engagement with homework exerts significant direct effects on pupils' expectations between ages 14 to 15 but not so between ages

15 to 16 when all prior measures of the latent construct are controlled for. Thus, the indirect effect of parental social position at pupils' age 14 on pupils' educational expectations at age 16, controlling for all prior influences is negligible lending no support to hypothesis (ii). In short, the null hypothesis of no longitudinal mediation of the effect of parental social position on expectations at age 16 via any of the above four mediators could not be rejected.

To shed more light on the role of the four hypothesised mediators, I systematically decomposed effects into direct and indirect and total indirect effects into specific indirect effects. Further cross-group structural invariance tests suggested that moderation by maternal ethnicity of these effects was likely to be in operation. The hypothesised mediators at age 14 and 15 exerted complex direct and indirect effects on pupils' expectations at age 16 that were captured under type 2 and 3 mediation. I summarise those moderated direct and indirect influences below.

Parent-child conflict at age 14 does not have any significant direct effect on pupils' expectations at age 15 in any group, but it affects pupils' expectations at age 16 indirectly. That indirect effect is large and positive in the Pakistani but much weaker in the white group. This suggests that good parent-child relations evidenced by low parent-child conflict indirectly promote pupils' expectations at age 16 for those two groups. Most interestingly, the same indirect effect was medium-sized, significant but negative in the Bangladeshi group, indicating that *worse* parent-child conflict (lower score on the PAR latent construct) at age 14 is associated with *higher* expectations (higher score on the YPEX latent construct) at age 16. Thus, although both Pakistani and Bangladeshi mothers reported very low rates of parent-child conflict in line with Scott *et al*'s (2010) observations, it is risky to generalise as to its effect on pupils' expectations. Higher educational expectations in Bangladeshi pupils at year 11 (age 16) may involve some degree of family pressure that is not present in other groups. In this regard, it is also quite interesting that Indian and Black Caribbean pupils' expectations remain completely unaffected by parent-child conflict either directly between ages 14 to 15 or indirectly between ages 14 to 16. Having an Indian ethnicity fosters higher expectations whilst being of Black Caribbean ethnicity appears to be associated with lower expectations in adolescents relative to their Indian peers but higher relative to their white peers. Indian and Black Caribbean adolescents interact in proximal processes with levels of parent-child conflict similar to those of the white families at ages 15 and 16 as suggested by the insignificant difference in their latent means. Thus, while they experience similar levels of parent-child conflict, other proximal processes foster quite different levels of expectations in the Indian and Black Caribbean groups. The above evidence suggests that hypothesis (iii) is partially supported. While the indirect effect of parent-child conflict at age 14 was indeed stronger in Pakistani and Bangladeshi pupils' expectations at age 16 than in their white peers, it was positive in the first and negative in the second case. Further, Indian and Black Caribbean pupils' expectations appeared impervious to parent-child conflict, which was exactly the opposite of what hypothesis (iii) stated.

Engagement with homework at age 14 has large significant positive indirect effects on pupils' expectations at age 16. This indirect effect is largest in the Pakistani and Bangladeshi but insignificant in the Indian and Black Caribbean groups. Interestingly, Indian and Black Caribbean pupils who represent the two extremes in engagement with homework are not influenced by it in their expectations at age 16 directly or indirectly. Hypothesis (iv) is therefore only partially supported. While the indirect longitudinal effect of homework engagement on Pakistani and Bangladeshi pupils' expectations at age 16 was indeed stronger as compared to their white and Black Caribbean peers, such effect was insignificant in their Indian peers. Thus, lower engagement with homework of white pupils at age 15 relative to that of the other groups seems to be associated with even *lower* expectations at age 16 as suggested by the medium-sized but *positive* and significant direct effect of homework at age 15 on their expectations at age 16.

Feelings about school exert both direct and indirect positive effects in the case of the white pupils and a positive direct effect in the case of their Pakistani peers. This evidence suggests that hypothesis (v) predicting that the longitudinal effect of feelings about school on expectations will be stronger among the South Asian pupils and weaker among their white and Black Caribbean peers, cannot be supported. While such longitudinal influence was stronger in the Pakistani pupils, it was just as strong in their white peers. But this similar positive association may have different meanings for the two groups of pupils. Given that white pupils have the least positive feelings about school at ages 14 to 16, even lower than those of their Black Caribbean peers at ages 15 and 16, the consequences of these less positive effects are alarming. The strong positive association between feelings about school at age 14 and pupils' expectations at age 15 suggests that lower feelings about school at age 14 tend to promote even *lower* expectations at age 15. The same is the case with the large positive indirect effect on their expectations at age 16. The opposite is the case for the Pakistani pupils who maintain significantly higher latent means in their feelings about school relative to their white, Black Caribbean and Bangladeshi peers. The large positive direct effect here between feelings about school at age 15 and Pakistani pupils' expectations at age 16 suggests that their *more* positive feelings about school promote *higher* expectations in year 11 (age 16).

Pupils' assessments about their teachers' effectiveness in enforcing discipline, i.e., how strict pupils think their teachers are in their school, have both direct and indirect effects but only in the white and the Pakistani groups. In this sense, hypothesis (vi) suggesting that this longitudinal effect on expectations was expected to be stronger in the South Asian pupils as compared to their white and Black Caribbean peers was only partially supported. In both white and Pakistani groups, the stricter pupils think their teachers are at age 14, the lower their expectations are at age 15 but this association was insignificant in any other group. Similarly, the indirect influence of this factor on pupils' expectations at age 16 is significant and negative but only for the same two groups. In any case, the finding runs contrary to the initially hypothesised positive association between teacher effectiveness and pupils' expectations. Pupils' impressions about more effective teachers were hypothesised to promote pupils' expectations. The opposite seems to be the case, at least for the white and Bangladeshi pupils, and no association between the two for the other pupils. However, this dampening effect on expectations must be interpreted in terms of the evidence for a white-Pakistani gap in the level of expectations. The negative effect of teachers' strictness on Pakistani pupils' expectations would be less severe compared to the effect the same factor has on white pupils' expectations. In the Pakistani case, expectations are much higher relative to their white peers, thus it is likely that this negative influence has a milder impact on them. For the white group however, expectations are the lowest relative to all the other groups, so a negative influence is likely to be even more devastating because it tends to decrease already low expectations.

To gain a fuller understanding of the longitudinal contribution of each mediator in influencing pupils' expectations at age 16, I also estimated and used latent means and intercepts in models 1-6 across all ethnic groups in addressing research questions 3 and 4. This estimation was part of the prerequisite analytic stage presented in chapter 6, on which the main analysis rested. It provided the necessary context against which to interpret the longitudinal change in structural parameter estimates and their cross-lagged effects. By and large, hypothesis (vii) was supported. There were significant longitudinal associations between the four mediators between ages 14 to 15. There was a strong positive association between Black Caribbean pupils' assessments of teachers' effectiveness at age 14 and their engagement with homework at age 15. But Black Caribbean pupils' latent means suggest that these pupils have the lowest assessments about their teachers' effectiveness as well as the lowest engagement with homework relative to the other ethnic groups. The strong positive association can therefore be interpreted as suggesting that the first factor at age 14 contributes to the maintenance of *lower*-level engagement with homework at age 15. Similarly, Pakistani pupils' engagement with homework at age 14 is also positively associated with assessments about teachers' effectiveness. But because in both factors Pakistani pupils rank higher relative to their white peers, the positive association suggests that more homework enhances those pupils' ideas about their teachers. The observed positive association between feelings about school at age 14 and engagement with homework at age 15 in the white, Pakistani and Bangladeshi pupils must be interpreted in a similar manner. The *lower* feelings about school at age 14 of the white pupils are likely to be significantly associated with *lower* levels of homework engagement at age 15. But Pakistani and Bangladeshi pupils' higher feelings about school at age 14 are similarly likely to promote greater homework engagement at age 15. So, although the association may appear similarly strong in several groups of pupils, it means quite different things depending on the average level of the latent constructs involved. The analysis demonstrated therefore that using latent means and intercepts can help us interpret longitudinal associations more meaningfully.

Type 2 mediation explored whether early influences from the four hypothesised mediators at age 14 on pupils' expectations at age 16 were mediated via their cross-lagged effects at age 15. In terms of ecological systems theory, significant cross-lagged effects between home-related factors such as parent-child conflict or engagement with homework and school-related factors like feelings about school or assessments about teachers signify influences between the home and school microsystems that exist in a mesosystem (Bronfenbrenner, 2005). In this respect, the analysis pointed to the case of the Bangladeshi pupils where engagement with homework and feelings about school affected each other positively and significantly between ages 14 and 15. However, in most other cases, the hypothesised cross-lagged influences turned out to be only unidirectional. For example, feelings about school at 14 affected engagement with homework at 15 in the white and Pakistani groups, but engagement with homework at 14 did not affect feelings about school at age 15 in those ethnic groups. However, these unidirectional relationships changed both direction and magnitude across groups. Thus, higher parent-child conflict at age 14 was associated with lower feelings about school at age 15 in the white and Pakistani pupils. However, lower feelings about school at age 14 were associated with higher parent-child conflict at age 15 in Black Caribbean families only. In this sense, hypothesis (vii) predicting strong moderation of these cross-lagged influences by maternal ethnicity is supported.

Generally, the four mediators appear to mediate only a small part of their earlier effects at age 14 on pupils' expectations at age 16 through each other at age 15. Instead, the earlier influences of a mediator at age 14 on pupils' expectations at age 16 seem to be mediated mainly via that mediator's occasion at age 15, rather than via another mediator at that time point. In this sense, hypothesis (viii) suggesting that the four factors at age 15 will mediate prior effects of these factors at age 14 to pupils' expectations at age 16 is not supported. Parent-child conflict and feelings about school at age 14 for example, exert considerable positive indirect effects on the expectations of Pakistani and Black Caribbean pupils' expectations at age 16 but only via their own occasions at age 15. However, the small sample size of Black Caribbean group probably did not allow these sizeable indirect effects to achieve significance. The analysis however, pointed to significant direct cross-lagged effects among all mediators. In some ethnic groups, lower parent-child conflict at age 14 was associated with more positive feelings about school (white, Pakistani), greater engagement with homework (white) and better assessments about teachers (white) at age 15. In turn, more positive feelings about school at age 14 were associated with greater engagement with homework at age 15 in the white, Pakistani and Bangladeshi families. The analysis of cross-lagged effects therefore suggests that good relations at home, as evidenced by lower incidence of parent-child conflict and home environments conducive to learning and greater homework engagement are associated with overall more positive feelings about school and teachers. That in itself was the expected relationship which was highlighted by previous studies (Hallam, 2006; Sharp, Keys and Benefield, 2001). The present analysis however went a step further and pointed to parallel routes of direct and indirect effects associated with the development of pupils' educational expectations to pursue university study. Apart from the cross-lagged direct and indirect effects, important parts of these routes involved direct and indirect feedback effects.

Feedback effects were studied under type 3 mediation and complemented the insights gained from the study of type 1 and 2 mediation regarding the role of the four mediators in influencing pupils' expectations at age 16. Feedback mechanisms reflect the ways the outcome may affect the process that has brought it about (Bronfenbrenner, 2001). The analysis showed that there are important direct and indirect feedback routes via which pupils' expectations at age 14 impact on their expectations at age 16. Most of the direct feedback effects were found to be significant in the white group. White pupils' expectations at age 14 positively affect homework engagement, parent-child conflict and assessments about teachers at age 15. There is a negative direct feedback effect from Pakistani pupils' expectations at age 14 on their assessments about teachers at age 15 but the same direct effect is positive and marginally significant for the Black Caribbean pupils. The evidence is consistent with the hypothesis that feedback effects are likely to be moderated by maternal ethnicity, lending support to hypothesis (ix). The analysis therefore suggests first, that adolescent educational expectations at age 14 are important influences in themselves and affect homework engagement, parent-child conflict and assessments about teachers at age 15 longitudinally. Second, tests of cross-group structural invariance in these parameter estimates are consistent with what we would expect to see if moderation by maternal ethnicity of these effects was in force.

But the largest *indirect* feedback effect is exerted from expectations at age 14 on expectations at age 16 across all groups, lending full support to hypothesis (x). While indirect effects from parental social position at age 14 on expectations at age 16 were negligible, earlier expectations exerted very large indirect feedback effects on later expectations. One might argue that the indirect influences from prior expectations on later expectations are to be expected both on theoretical and statistical grounds. Specifically modelling the effect of prior expectations on later expectations was a direct application of Cole and Maxwell's (2003) main argument for including prior occasions of the outcome (as well as of the predictor and mediator) in longitudinal mediation modelling. While this is true, the analysis showed that the indirect feedback effects from expectations at age 14 on expectations at age 16 were only part (albeit a big one) of the story. Expectations develop between ages 14 to 16 as a complex function of both direct and indirect effects over and above those of prior expectations. Thus, the decomposition of total indirect effects pointed to earlier expectations as being the most critical factor in affecting later expectations. Additionally however, pupils' expectations at age 16 were positively affected indirectly by parent-child conflict, homework engagement and feelings about school and negatively by pupils' assessments at age 14. These findings suggest that in addition to prior expectations, each mediator exerts unique indirect influences on pupils' expectations at 16 as well.

In sum, as regards research questions 3 and 4 and their associated directional hypotheses, the analysis suggested that the four factors were mainly important in playing a part in the direct and indirect routes via which the longitudinal effects on expectations at age 16 were exerted. Expectations between ages 14 to 16 are likely to develop as a complex function of direct and indirect longitudinal influences from the home and school which are uniquely moderated by maternal ethnicity. Pupils' early expectations at age 14 affect later expectations at age 16 via a variety of mediational routes, the most important of which appeared to be via expectations at age 15. Ethnicity appears to moderate the development of adolescent educational expectations. However, its role appears to be heterogeneous and unique for each ethnic group.

I discuss the findings, the contribution and the limitations of the thesis in the concluding chapter.

Chapter 8 Discussion and Concluding Remarks

Introduction

This thesis addressed the paradox of high expectations of minority pupils from disadvantaged family backgrounds. Analytic attention was focused on how maternal ethnicity impacted on the role home- and school-related factors played in influencing pupils expectations about university study at age 16. The analysis studied the role of parent-child conflict, pupils' engagement with homework, feelings about school and assessments of teachers' effectiveness in influencing white, Indian, Pakistani, Bangladeshi and Black Caribbean pupils' expectations for university study between ages 14-16, drawing on panel data from the LSYPE waves 1-3. The four factors were studied as mediators at age 15 between three types of prior influences at age 14 and pupils' expectations at age 16. These three prior influences at pupils' age 14 were parental social position, prior influences of the four factors, and pupils' prior educational expectations. A central research focus of the thesis was to measure the extent to which the above mediational relationships were moderated by maternal ethnic group membership. These research interests were captured in four research questions (RQ) presented in chapter 1 while specific directional hypotheses were presented and addressed in chapters 6 and 7. In section 8.1 of this final thesis chapter, I first summarise the findings pertaining to each research question and relate them to past research. I then organise the findings per each ethnic group in section 8.2 to highlight how moderation by maternal ethnicity affects pupils' expectations at age 16. This is followed by a brief discussion of the strengths and limitations of the modelling in section 8.3. In section 8.4, I discuss the implications of the analysis via-à-vis the paradox of high expectations of minority pupils from disadvantaged parental backgrounds. In section 8.5, I discuss the possibility that parental SES and education may not be good proxies of minority parental achievement. Finally in section 8.6, I discuss potential policy interventions in relation to the findings and directions of future research.

8.1 Answering the research questions

RQ1: *Do parental social position and family material circumstances, parent-child conflict, engagement with homework, feelings about school, assessment of teachers effectiveness and adolescent expectations change between ages 14 and 16?*

In general, the findings indicated that there was not significant longitudinal change in parental social position, pupils' homework engagement, feelings about school and assessments of teachers' effectiveness over ages 14-16. However, there was significant change in parent-child conflict and pupils' educational expectations over the same time window. In that respect, the present findings did not generally support Paikoff and Brooks-Gunn's (1991) assertion that parent-child conflict is likely to increase during adolescence. The present study showed that by contrast, in Muslim families, parent-child conflict was much lower than in white and Black Caribbean families and tended to decrease further over time. Fumagalli's (2012) observation that adolescent expectations about applying to university changed most between ages 14 to 15 however receives some support. The present research has also however pointed to a fall in expectations at age 15 from which all but the white pupils recover at age 16. This fall becomes readily observable when cross-group differences in factor means are estimated. A similar fall in pupils' feelings about school was also observed at age 15, from which only South Asian groups recovered at age 16.

RQ2: *Is this change different across the white, Indian, Pakistani, Bangladeshi and Black Caribbean pupils? In other words, are changes in these trajectories moderated by maternal ethnicity?*

South Asian groups maintained consistently lower parent-child conflict (signifying better parent-child relations), higher homework engagement, more positive feelings about school and higher assessments about their teachers and educational expectations relative to their white and Black Caribbean peers. This generally confirms earlier evidence that Muslim parents of Turkish and Moroccan descent also exhibited less parent-child conflict compared to the mainstream population (Wissink, Dekovic and Meijer, 2006) . The present study however showed that there were significant cross-group differences in the longitudinal change in parent-child conflict. South Asian groups generally maintained better parent-child relations over time relative to their white peers in whose case these relations seemed to deteriorate between ages 14 to 16. Resembling their white peers, Black Caribbean pupils maintained the lowest homework engagement, the least positive feelings about school and assessments about teachers' effectiveness relative to their South Asian peers, dropping them even further at year 11. In that respect, this study confirmed Modood's (2003; 2004) and Sharp, Keys and Benefield's (2001) findings that UK South Asian minority pupils generally spent greater amounts on homework as compared to their white and Black Caribbean peers. Earlier UK qualitative research pointing to the disaffection of adolescent Black Caribbean pupils with school and teachers (Furlong, 1985; Gillborn and Mirza, 2000; Gillborn and Youdell, 2000; Rhamie and Hallam, 2002) also received some support. The present research however went one step further and provided a reliable indication as to how pupils' engagement with homework changed over time and across groups, filling a gap in the literature. It showed that in general, earlier patterns of pupils homework engagement at age 14 persisted at age 15. In this study however, variation in the longitudinal change in the amount of homework engagement across ethnic groups was interpreted in the light of the unbiased factor means for each ethnic group. This provided both more precise and more reliable estimation of cross-group differences in longitudinal change. Thus, there was little longitudinal change in both the Indian and Black Caribbean pupils' homework engagement between ages 14 to 15. But no change in the first group meant persistence of the highest homework engagement over time while for the second, it meant persistence of the lowest homework engagement. The same patterns of change were observed in pupils' feelings about school and assessments of teachers' effectiveness. Indian pupils maintained the highest expectations between ages 14 to 16, followed by their Pakistani and Bangladeshi peers. This pattern was typically brought into attention by other studies using the same LSYPE data (Anders and Micklewright, 2013; Chowdry, Crawford and Goodman, 2009; Strand, 2007; Strand, 2008). But the present study showed that both the South Asian and the Black Caribbean groups were significantly different from their white peers in that longitudinal change in expectations meant even higher expectations for the Indian, Pakistani and Bangladeshi pupils. By contrast, white and Black Caribbean pupils' expectations dropped at age 15 but only Black Caribbean pupils' expectations rose again at age 16. White pupils by contrast were the least likely to change their expectations which remained the lowest between ages 14 to 16.

RQ3: *What are the potential interrelations of parent-child conflict, engagement with homework, feelings about school, assessment of teachers' effectiveness and adolescent expectations? Do they impact on adolescent expectations at age 16 by mediating at age 15 (a) the effects of parental social position at age 14; (b) their own prior effects at age 14 or (c) the feedback effects of prior expectations at age 14? Are these potential influences exerted on the outcome, directly or indirectly?*

There are four basic findings regarding the role of parent-child conflict, pupils' homework engagement, feelings about school and assessments about teachers' effectiveness. First, the four factors are not mediators of the effect of parental social position at age 14 on expectations at age 16. Parental social position exerts large direct longitudinal positive effects on expectations in the Black Caribbean and Pakistani groups, small effects in the white and Indian groups and no effects in the Bangladeshi group. This finding generally confirmed the weak longitudinal effect of parental SES on adolescent expectations also observed by other UK studies (Goodman, Gregg and Washbrook, 2011; Kintrea, 2009; Strand, 2007). But the present study went further by actually decomposing this effect across ethnic groups. Second, there are important cross-lagged effects among the four factors between ages 14 to 15. For Bangladeshi pupils for example, engagement with homework and feelings about school affected each other positively between ages 14 to 15. This offered support to previous UK research also pointing to this connection (Hallam, 2006; Keys and Fernandes, 1993; Keys, Harris and Fernandes, 1995; Sharp, Keys and Benefield, 2001). But the present research showed that actually very few of the hypothesised cross-lagged relationships among the four factors represented reciprocal influences. In this respect, the relation among parent-child conflict, amount of homework and feelings about school was argued to be reciprocal (Rogers and Hallam, 2006; 2010). But this was not confirmed in the present analysis which subjected these relationships to rigorous tests. Feelings about school at 14 affected homework engagement at 15 in the white and Pakistani groups, but engagement with homework at age 14 did not affect feelings about school at age 15 in these groups. Also, higher parent-child conflict at age 14 was associated with lower feelings about school at age 15 in white and Pakistani families, confirming previous research (Hallam, 2004; Hoover-Dempsey, Bassler and Burrow, 1995; Toomey, 1989; Xu and Corno, 1998). But the present research pointed out that lower feelings about school at age 14 were associated with higher parent-child conflict at age 15 as well, but only in Black Caribbean families.

The present research contributed to past UK research by showing that the four factors at age 15 do not generally mediate each other’s prior effect at age 14 to pupils’ expectations at age 16. When a mediator at age 14 exerts significant indirect effects on expectations at age 16 this mediation occurs mainly via its own occasion at age 15. This was the case in the Pakistani group where feelings about school at age 15 mediated a significant positive effect of feelings about school at age 14 on their expectations at age 16. Parent-child conflict at age 15 also mediates a considerable positive effect of parent-child conflict at age 14 on Black Caribbean pupils’ expectations at age 16. Third, the four mediators at age 14 affect expectations at age 16 indirectly, mainly via expectations at age 15, and pupils’ expectations at age 15 directly across almost all ethnic groups. In this connection, the original contribution of the present thesis to past UK research on expectations is to show that parent-child conflict, pupils’ homework engagement, feelings about school and assessments about teachers effectiveness at age 14 affect pupils’ expectations at age 15 directly and expectations at age 16 indirectly. The exception is Indian pupils’ expectations which remain consistently unaffected by either direct or indirect effects. On the contrary, white and Bangladeshi pupils’ assessments about the strictness of their teachers at age 14 have significant negative indirect effects while their engagement with homework at age 14 has positive indirect effects on their expectations at age 16. White and Pakistani pupils’ feelings about school and parent-child conflict at age 14 have positive and significant indirect effects on their expectations at age 16. By contrast, the latter indirect effect is significant and negative in the case of Bangladeshi pupils. Fourth, the present thesis pointed to significant feedback effects from pupils’ expectations at age 14 to expectations at age 16 which were exerted mainly via expectations at age 15. Earlier expectations at age 14 positively affected homework engagement, lowered parent-child conflict and increased pupils’ assessments about their teachers' effectiveness at age 15. This suggested that earlier expectations at age 14 were of critical importance to later expectations at age 16 in every ethnicity group.

RQ4: *Does the potential impact of parent-child conflict, pupils' engagement with homework, feelings about school, and assessment of teachers' effectiveness on adolescent pupils' educational expectations change over time as a function of white, Indian, Pakistani, Bangladeshi and Black Caribbean maternal ethnicity?*

The magnitude, direction and significance of the longitudinal impact on expectations at age 16 captured under the three types of mediation varied widely by ethnic group. For example, Pakistani pupils' expectations at age 14 affected their assessments about teacher effectiveness negatively but the same effect was positive and of the same magnitude in the Black Caribbean group. By and large, many of the findings of the thesis were consistent with what we would expect to find if the relations between parental social position, parent-child conflict, feelings about school, assessments about their teachers' effectiveness and expectations between ages 14 to 16 were moderated by maternal ethnic group membership. In that respect, the findings of the present study offer general support to studies which have also pointed to the impact of culture on parent-child conflict (Fuligni, 1998; Smetana, Campione-Barr and Metzger, 2006), homework engagement (Dandy and Nettelbeck, 2002; Keith and Benson, 1992), feelings about school (Hallam, 2004) and pupils' assessments of their teachers' effectiveness (Furlong, 1985; Maughan, 2005). But going beyond these studies, the present research has shown that white, Indian, Pakistani, Bangladeshi and Black Caribbean pupils' expectations developed as a function of their exposure to the effects of the studied home- and school-related proximal processes and provided precise measurement of these influences. Earlier expectations are themselves potent influences on pupils' later expectations. However, the pathways via which these effects were exerted on their expectations and the manner expectations in turn affected these processes varied widely in magnitude, significance and direction in each ethnicity group. These differences support the hypothesis that maternal ethnic group membership moderated the above pathways.

The present analysis subjected this hypothesis to rigorous tests under a CFA/SEM latent variable framework. Testing moderation of longitudinal relations under this framework specifically addressed the central measurement assumptions required to detect longitudinal moderated mediation (temporal asymmetry; longitudinal and cross-group measurement invariance; trait and method variance; omitted variables; stationarity; equilibrium). As a result, the followed measurement methodology provided more precise and reliable estimates of moderated relationships. Because more than one fit index was involved in most of the cases, the statistical tests offered greater statistical power in the assessment of moderated mediational relationships. However, the suggested evidence of moderation is tentative pending validation in a future study with different panel data but the same measurement approach. Below, I organise the findings by ethnicity group to show this moderation by maternal ethnicity on young people's expectations more clearly.

8.2 Findings by ethnicity group

White pupils

White pupils belong to families that on average are more advantaged than the families of their South Asian peers. The exception to this is the Black Caribbean pupils who are most similar in that respect to their white peers. However white pupils' parental social position at age 14 has only a small positive influence on their expectations at age 16. Further, while parental social position has a positive influence on white pupils' homework engagement at age 15, white pupils have the lowest factor means in homework engagement at age 14 and 15. They also have the lowest factor means in parent-child conflict, indicating that parent-child conflict was much more likely in white families, as well as the lowest means in their feelings about school and teachers. Homework engagement at age 14 is highly and positively associated with feelings about school. So, having significantly lower factor means in both of these dimensions, white pupils tend to perpetuate those feelings longitudinally. Given also that both parent-child conflict and homework engagement have significant positive direct and indirect effects on their expectations at age 16, having low factor means in those two dimensions makes it more likely for white pupils to maintain lower expectations longitudinally. In fact, white pupils are the least likely to change the level of their expectations from age 14 to 16, which is an alarming sign since those expectations tend to remain persistently lower relative to those of all their minority peers. The much lower expectations of white youth relative to those of their minority peers have been well documented in past research using the LSYPE (Chowdry, Crawford and Goodman, 2009; 2010b; Strand, 2007; 2008).

But the present analysis has shown that white pupils' lower expectations are further reduced by their assessments about teachers' effectiveness. This factor exerts significant negative direct and indirect effects on white pupils' expectations at age 16. The more white pupils think their teachers are stricter in enforcing discipline at age 14 and 15, the less their expectations are at age 16. Although white pupils are not the only ones to experience this dampening effect on their expectations by their impressions about stricter teachers, all their peers, including the Black

Caribbean pupils, have significantly higher expectations at ages 14-16, so this influence has less negative impact in their case.

White pupils' expectations at age 14 directly affect their homework engagement, parent-child conflict and assessments about teachers at age 15 positively and significantly. In return, homework engagement and feelings about school at age 14 exert significant positive indirect effects on their expectations at age 16, which were however partly offset by the significant negative indirect effect of assessments about their teachers at age 14.

Indian pupils

Indian pupils belonged to families who are much better off relative to their Pakistani and Bangladeshi peers. Higher parental position at age 14 exerts a moderate positive effect on Indian pupil's homework engagement at age 15 but only a small effect on their expectations at age 16. However, neither parental social position nor engagement with homework exerts any other direct or indirect influence on Indian pupils' expectations at age 16. Indian pupils maintain the highest expectations relative to all their peers and are significantly different among their peers in raising their expectations even further particularly at age 16. But Indian pupils are also unique in that their high expectations seem to develop independently from any direct or indirect influence from any of the four mediators studied in this thesis. For example, their factor means in parent-child conflict at age 14 are significantly higher relative to those of their white peers, signifying much better parent-child relations that tend to improve even further at age 15. Indian pupils have the highest engagement with homework at age 14 relative to all their peers that also tends to increase at age 15. Those pupils also maintain significantly higher factor means in their feelings about school at 14, which decrease at age 15 like those of all others. Compared to their peers however, Indian pupils experience the least drop in their feelings about school at age 15 and at age 16 raise them again significantly higher relative to all their peers. However, none of these factors has any direct or indirect effect on their expectations. In turn however, their expectations at age 14 are powerful indirect positive influences on their expectations at age 16 mainly via their expectations at age 15.

Pakistani pupils

Pakistani pupils are likely to come from families which are disadvantaged relative to the families of their white, Black Caribbean and Indian peers but relatively more advantaged than their Bangladeshi peers. Parental social position at age 14 exerts one of the strongest positive effects on Pakistani pupils' expectations at age 16, suggesting that better family material circumstances in Pakistani families are much more likely to directly raise expectations than is the case in any other South Asian group. However, the strong positive association also means that Pakistani pupils are among the few pupils to see their expectations severely restricted by their parental social position. Nevertheless, Pakistani pupils have significantly higher average expectations relative to their white, Black Caribbean and Bangladeshi peers and manage to maintain them at ages 15 and 16. Their higher expectations are further promoted by their much better parent-child relations shown by the higher factor means in parent-child conflict which tend to further improve at age 16. Parent-child conflict at ages 14 and 15 exerts large positive direct as well as indirect effects on their expectations at age 16. Pakistani pupils also have significantly higher homework engagement relative to their white and Black Caribbean peers. Because Pakistani pupils have significantly higher homework engagement and expectations relative to their white and Black Caribbean peers, higher homework engagement is more likely to promote higher expectations at age 15 directly and expectations at age 16 indirectly than in their white and Black Caribbean peers.

The same is the case with their feelings about school at age 14. While their feelings mark a drop at age 15, like those of their peers, Pakistani pupils soon recover at age 16 as attested to by their significantly higher factor means. These feelings affect positively and directly their expectations at age 15 and indirectly at age 16. A second route of positive influence starts with the effect of feelings about school at 14 on Pakistani pupils' homework engagement at age 15 and via that, on their expectations at age 16. Pakistani pupils are the only case where their higher homework engagement at age 14 has a positive effect on their assessments about teachers at age 15 and parent-child conflict at age 14 has a similar positive effect on their feelings about school at age 15.

Pakistani pupils are also the only case where their expectations at age 14 have a significant negative effect on their feelings about school at age 15 and a positive effect on parent-child conflict at age 15. Expectations at 15 also have a significant positive effect on parent-child conflict at age 16. Thus, higher expectations at age 15 facilitate good parent-child relations at age 16 and good parent-child relations at age 15 promote higher expectations at age 16. Yet, higher expectations at age 14 appear to deteriorate their feelings about school at age 15. Pakistani pupils' assessments of their teachers' effectiveness at age 14 also decreases their feelings about school at age 15 but does not have any significant indirect effect on their expectations at age 16. These negative effects may suggest that higher expectations at age 14 are seen as relatively incompatible with the impressions they have about their school causing less positive feelings about school at age 15 but not family friction. Finally, Pakistani pupils' expectations at age 14 affect their expectations at age 16 as was the case in any other group.

Bangladeshi pupils

Bangladeshi pupils come from the most disadvantaged families relative to all their peers. However, they are the only group where parental social position at age 14 has no effect on their expectations at age 16. Their expectations are consistently significantly higher than those of their white peers at age 14 and tend to increase at ages 15 and 16. This argues in favour of the hypothesis that in their case, expectations are not class-bound. Bangladeshi pupils have the best parent-child relations at age 14 relative to all other groups as suggested by their very high factor means in parent-child conflict (signifying very good parent-child relations), which get even higher at age 15. Their homework at age 14 is at the levels of their Black Caribbean peers' homework and significantly higher than that of their white peers. But Bangladeshi pupils increase their homework relative to their Black Caribbean peers at age 15 basically because Black Caribbean pupils' homework drops even lower than that of their white peers rather than because Bangladeshi pupils raise their factor means in homework relative to that of their other South Asian peers. Bangladeshi pupils have generally higher feelings about school at age 14 relative to their white peers which experience a severe drop at age 15. They however recover at age 16 when their feelings about school reach their age 14-levels despite the fact that at age 15, their assessments about teachers' effectiveness reduced those feelings about school at age 16.

Although parent-child conflict at age 14 is the lowest relative to that of their other peers, it exerts small negative direct and indirect effects on their expectations at age 16 of which only the indirect effect was significant. Hallam (2004) has pointed to specific pressures that Muslim pupils may be subject to due to the fact they have to compromise school and religious commitments. This may explain the above negative effect. By contrast, homework engagement at age 14 exerts positive direct effects on Bangladeshi pupils' expectations at age 15 and significant indirect effects on their expectations at age 16. Bangladeshi pupils are the only group where feelings about school and homework engagement mutually reinforce each other between ages 14 to 15 and via this cross-lagged relationship, their expectations at age 16. However, assessments about teachers at age 14 have a significant negative indirect effect while homework engagement at age 14 a positive indirect effect on expectations at age 16 which cancel each other out.

Black Caribbean pupils

Black Caribbean pupils along with their white peers come from more advantaged families relative to those of their South Asian peers (Strand, 2010). Parental social position at age 14 affects Black Caribbean pupils' expectations at age 16 significantly and positively. Black Caribbean pupils are the only group where parental social position at age 15 positively affects parent-child conflict and feelings about school at age 16. At age 14, Black Caribbean pupils have indeed significantly higher expectations relative to their white and Bangladeshi peers. At age 15 however, their expectations drop considerably, remaining significantly higher than those of their white peers but much lower than those of all their South Asian peers. Most importantly however, Black Caribbean pupils raise their expectations again at age 16 slightly higher than they were at age 14. But by that time, all their South Asian peers, whose parental social position is much lower relative to that of Black Caribbean and white peers, have raised their factor means in expectations significantly higher.

Black Caribbean pupils show higher homework engagement at age 14 relative to their white peers but much lower relative to all their South Asian peers which is positively affected by their higher parental social position at age 14. But at age 15, Black Caribbean pupils drop their homework engagement even lower than that of their white peers. They also share with their white peers the lowest level of positive feelings about school, which is also a factor that at age 16 is positively influenced by parental social class at age 15. Contrary to their white peers, Black Caribbean pupils drop their feelings about school at age 15 and 16 even lower than those of their white peers. Similarly, their assessments about teachers' effectiveness are at age 14, along with those of their white peers, the lowest relative to those of all their South Asian peers. At age 15, these assessments drop significantly lower even compared to those of their white peers. Although Black Caribbean pupils share with their white peers a disaffection for school and teachers, they are the only group in whose case this disaffection appears to grow rapidly within the 2-year period examined in the thesis. In this connection, the present analysis has confirmed earlier qualitative work that has pointed to Black Caribbean pupils' disaffection with school and teachers (Furlong, 1985; Gillborn, 1995; Gillborn and Youdell, 2000). Thus, by year 11, Black Caribbean pupils appeared to be the most disaffected pupils.

The present research has made a contribution to past UK research on expectations by pointing to particular mechanisms affecting expectations in each ethnic group. For Black Caribbean pupils in particular, the analysis has shown that parent-child conflict at age 14 exerts a positive direct effect on Black Caribbean pupils' expectations at age 15, and a positive indirect effect on their expectations at age 16. Better parent-child relations promote expectations both directly and indirectly in Black Caribbean homes. However, both of these effects were marginally significant probably because of small sample size (n=324). Contrary to the case of their South Asian peers, feelings about school at age 14 do not affect Black Caribbean pupils' homework engagement but do affect parent-child conflict negatively. That negative effect was very large and significant. Thus, it is possible that those pupils' relatively higher disaffection with school at age 14, creates more parent-child conflict and family friction in Black Caribbean homes at age 15. Instead, their homework engagement at age 15 is positively affected by their assessments about teachers at age 14. But since Black Caribbean pupils tend to have the lowest latent means in both of these factors relative to those of their South Asian peers, lower assessments about teachers at 14 are more likely to be associated with lower homework engagement at age 15.

Finally, Black Caribbean pupils' expectations at age 14 positively and significantly affect their assessments about teachers, feelings about school and engagement with homework at age 15. Their expectations also positively affect parent-child conflict at age 15, but this last effect was not significant although it was similar in size to the others. These longitudinal associations suggest the ways that Black Caribbean pupils' lower expectations will tend to perpetuate lower assessments, feelings about school and homework engagement. These factors also mediated a considerable portion of the effect of expectations at age 14 on their expectations at age 16. But by far, the main mediator of this effect was Black Caribbean pupils' expectations at age 15.

8.3 Strengths and limitations of my modelling approach

The specific strengths of the mediation model estimated in this thesis can be summarised as follows:

i. Model 7 was a complex but more realistic latent variable autoregressive mediation SEM with good fit to data. Model 7 was the first to demonstrate a practical application of the Cole and Maxwell's (2003), Maxwell and Cole's (2007) and Maxwell, Cole and Mitchell's (2011) longitudinal mediation modelling framework. However, it extended their work to study three alternative mediational routes simultaneously on real three-wave panel data with four rather than one mediator.
ii. Models 1-7 took full advantage of the added capabilities of estimating structural relations within a CFA framework. This permitted more rigorous tests of hypotheses regarding mediational structural relationships because several important assumptions associated with the mediational process were explicitly addressed. These were measurement error, temporal asymmetry, 'third variable confounders', stationarity and equilibrium.

iii. The analysis demonstrated the usefulness of decomposing total indirect effects which was recommended in the literature (Alwin and Hauser, 1975; Cole and Maxwell, 2003; Gollob and Reichardt, 1991) but not used so far with complex longitudinal mediation SEM containing four mediators. This decomposition of total indirect effects pointed to the various indirect routes of influence to pupils' educational expectations that remain hidden if only direct effects are considered.

iv. Model 7 operationalized a process-person-context-time ecological systems theoretical framework. Evidence was consistent with the predictions of Bronfenbrenner's (1998) ecological systems theory discussed in chapter 3. Earlier proximal processes associated with the home and school affect each other directly via their cross-lagged influences. Home-related processes like parent-child conflict and pupils' homework engagement at ages 14 and 15 positively affect expectations at age 16 both directly and indirectly. Prior expectations at age 14 affect later expectations at age 16 indirectly mainly via expectations at age 15. But during that two-year period, pupils' expectations at age 16 are also shaped directly and indirectly by the above home- and school-related processes. The magnitude, direction and significance of these effects varied widely by ethnic group, which constitutes the evidence we would expect to see if significant moderation of these effects by maternal ethnicity was in operation.

Turning now to the limitations of the present modelling approach, these can be outlined as follows:

i. The time lag of one year that was imposed on the LSYPE panel data and separated measurement occasions in the present study may not be the ideal time lag for all of the phenomena under investigation in this analysis to unfold. The ideal time lag for each phenomenon is a study in each own right (Cole and Maxwell, 2003; Gollob and Reichardt, 1987; Reichhardt, 2011). But such study was impossible in the secondary analysis of the LSYPE panel data. Yet, the direct test of the assumptions of stability, stationarity and equilibrium identified at least when the models were less likely to be stationary and in equilibrium.

ii. It is possible that three waves of data are not enough to test the interrelated hypotheses regarding mediation to adolescent educational expectations (Reichhardt, 2011). On the other hand, three waves of data containing repeated measures of the predictor, the mediator and the outcome were argued by Cole and Maxwell (2003) to be the absolute minimum to study longitudinal mediation.

iii. The present analysis has not included in the model variables such as pupils' grades that past research has shown to be associated with pupils' educational expectations. In past research grades were treated both as indexes of pupils' performances as well as of their ability (Bond and Saunders, 1999). The present analysis acknowledged in chapter 2 that the four mediators are associated with educational performance and sought to explore whether they could account for educational expectations as well. It would have been desirable if repeated measures of pupils' grades could be included in the model. But pupils' grades at age 14 (Key stage 3) and grades during GCSE exams were not comparable while raw KS3 and GCSE grades could hardly be considered repeated measures[13].

iv. The present study made a concerted effort to minimise measurement error and to address explicitly specific measurement assumptions associated with mediation. Although the size of the smallest ethnic group (Black Caribbean) was well within the minimum suggested by some scholars of 5-10 cases per observed variable (Kline, 2005), it is possible that model 7 that included 44 manifest variables might have been too complex for certain samples of ethnic groups. This fact may have reduced statistical power. To make up for this possibility, this analysis performed systematic bootstrapping and applied a Bonferroni adjustment in multiple comparisons to reduce Type I error rates.

v. The present analysis has treated data only at the individual level. It thus has ignored possible variation due to clustering of pupils under schools or families. However, we must not lose sight of the fact that multilevel mediation SEM are a rather recent addition to the methodological literature. These typically involve a single mediator on cross-sectional data only (see Kline, 2011; Pituch and Stapleton, 2011). Although extensions with longitudinal data and multiple mediators are theoretically possible, model 7 could not incorporate four second-level mediators in 1-2-2 or 1-2-1 multilevel designs and remain manageable.

vi. The thesis was based on observational data which by their nature preclude reaching conclusions about causality. Although mediation models have been conceived of as *causal* models (Hayes, 2012), researchers may *not* claim their results provide causal conclusions (Pearl, 2000). Two widely used randomised experimental designs that can allow causal statements are the Rubin Causal Model (RCM) (Rubin, 1974; 1977) and Holland's (1988a; 1988b) causal mediation model. However neither of these designs can be applied within a secondary analysis framework of observational panel data like the LSYPE. Further, all these designs are based on observed, not latent variables. Therefore the issue of measurement error remains open. Applying the Cole and Maxwell (2003) modelling framework offered an

[13] The main reason was that English, maths and science in Key Stage 3 were represented by a single grade, while English, maths and science in GCSE exams were assessed on the basis of several papers with different grading schemes. Most importantly, the timing between a pupil's KS3 exam grade and final GCSE exam grades was not fixed because pupils could resit exams several times to improve grades. This creates problems even if we assume that the two exams were standardised. Finally, not all schools participating in the LSYPE opted for the same exam boards. Ignoring all these problems and simply averaging grades to arrive at 'approximate' triple GCSE grades similar to those at KS3 would invite trouble in interpreting the influence of this mediator on expectations.

opportunity to explicitly test central assumptions associated with mediation and moderation. In that respect, the design is superior to all cross-sectional mediation models (Shrout, 2011) and it is ideal for longitudinal panel data (West, 2011). However, it does *not* allow causal statements. It can offer *tentative* but more *confident* indications of moderated mediational processes pending validation in a future study.

vii. The analysis did not control for gender, ability or family structure. All these are arguably potential moderators of the relations described in this thesis. However, controlling for them would have made the estimation of model 7 impossible as the samples would have been much reduced. Also, the analysis did not include potentially important mediators such as parental educational expectations. The LSYPE included these measures only at waves 1 and 4 but not waves 2 and 3 which were required in this analysis.

viii. An implicit assumption of the present analysis was that moderation by maternal ethnicity captured all possible moderation from factors that are associated with maternal ethnic membership, notably maternal education and social class. It is true that maternal ethnic membership is likely to capture possible moderation from the educational profiles of most Pakistani and Bangladeshi mothers. There is little variation in these profiles as more than four fifths of these mothers are clustered under the low or no qualifications category. The same holds for the low NS-SEC categories (see chapter 5). At least for those two ethnic groups, mother's ethnicity largely defines maternal level of education and family social position. This might not be the case with white, Indian and Black Caribbean mothers whose range of educational qualifications and social class categories is much wider. Maternal education in those groups may exert independent moderating influences. This potential moderation could be over and above the moderation exerted by maternal ethnic group membership alone. This is certainly a promising line for future research.

The above consideration impinges upon an important wider issue regarding the relationship between education and social class and how this differs across ethnic groups. I take issue with this relationship in more detail below.

8.4 Parental social class, education and achievement across minority ethnic groups

It is well-known that even well-qualified first generation migrants had to take jobs that did not reflect their true qualifications (Modood, 2003; 2004). The low returns to their educational level are typically blamed on the non-transferability of qualifications acquired at origin (Dustmann and Glitz, 2011) and their relative lack of English language fluency on arrival (Maughan, 2005). This argues in favour of the argument that parental education is not a good proxy for parental social class for the UK (Modood, 2005) and most US (Kao and Thompson, 2003; Kao and Tienda, 1998) ethnic groups. The paradox of lower social class minority parents maintaining and transferring high educational expectations to their children is therefore explained by minority parents' unfulfilled desire for achievement (Modood, 2004).

However, low-educated parents might fall back on their cultural and social capitals to define what success is in their wider families and communities. As a result, standards of parental 'success' may include acquisition of income, education, status and property, but they may not necessarily be restricted to nor defined by those. The limited socioeconomic achievement of many first generation UK minority parents does not explain how, despite severe disadvantage, they maintained a healthy self-esteem able to inspire a drive for success in the next generation.

As explained in chapter 2, most of those immigrants, particularly Muslim women, came to the UK with very low or no qualifications and hardly acquired any afterwards (Dex, Ward and Lindley, 2007). Despite improvements, post-migration Pakistani and Bangladeshi women still overwhelmingly occupy the bottom category of the typical qualification scale and the lowest employment probabilities (Dale, Lindley and Dex, 2006). Yet, it is these minority parents that inculcate much higher educational expectations in their children and promote a stronger pro-education ethos in their families than do white parents (Strand, 2007; 2008). Proportions of university entrants from these families well exceed their share in the population (Modood, 2006).

This fact suggests that the association of education, social class and adolescent expectations is atypical in minority families. Despite disadvantage, no 'cycle of poverty' seems to operate that perpetuates low expectations in children (Neuman, 2009). An alternative explanation may be found in an extension of the so-called 'family mobilisation thesis' (Heath and Li, 2008). According to this thesis, migrant parents might view their own achievements and the level of educational expectations they pass on to their children 'based on their relative standing in their country of origin rather than on their standing in the country of destination' (Heath, Rothon and Kilpi, 2008 p. 223). Thus, what could be viewed as socioeconomic failure and limited vertical mobility in the UK, could be seen as success and higher status in terms of that person's origin. According to the family mobilisation thesis, this explains why minority parents were content with low status jobs. But this rationalisation may be part of a much deeper process that helped both parents in South Asian minority families to withstand prolonged disadvantage successfully.

Despite their disadvantage, first generation minority parents may have developed and maintained a high self-esteem for what they have achieved in terms of their broader obligations, as they defined and understood them. These obligations may have included money transfers in support of extended kin or investments in property holdings in their country of origin. But they also emphasised proper parenting and upbringing, a value for education, homework, respect for and obedience to teachers that Modood (2004) suggests is the case for Muslim minority families. Parents maintaining high self-esteem for having fulfilled these obligations would then be more likely to transmit an achievement motivation to their children. Even with little education and surrounded by disadvantage, minority parents show their children that they persevered and eventually fulfilled their obligations successfully. Their children would be more likely to internalise this achievement motivation and value for education because their parents became role models to them. This home-based mechanism is argued to break the cycle of poverty (Gofen, 2009). The link of parental self-esteem to adolescent expectations has broadly been confirmed in past research (Chan and Koo, 2011; Coleman and Karraker, 1998; Furnham and Cheng, 2000; Kaplan, Liu and Kaplan, 2001; Small, 1988). However, it has not been studied quantitatively for UK ethnic groups. We know however that high parental self-esteem tends to remain stable across the lifespan (Robins and Trzesniewski, 2005) and is unaffected by social class (Chan and Koo, 2011). We might therefore hypothesise that despite their disadvantage, minority parents are more likely to build higher self-esteem over time, initiate higher adolescent educational expectations sooner and maintain them over time longer than their similarly disadvantaged white counterparts. These are certainly leads for future research.

This feeling of success and parental self-esteem is lost in typical measures of parental social class or educational qualifications. Minority post-immigration ‘disadvantage’, seen under the strict terms of traditional class analysis, misses the psychological dimension that defines parental achievement in some minorities. Minority parents’ subjective feeling of personal achievement may be key to their children’s higher academic expectations, performances and ‘educational resilience’ (Sacker and Schoon, 2007; Sacker, Schoon and Bartley, 2002; Schoon, Sacker and Bartley, 2003) and higher drive and ambition (Heath, Rothon and Kilpi, 2008). The LSYPE does not provide such information on parental qualifications or measures of subjective achievement. This is certainly a limitation that future research should address. The subjective dimension in parental achievement may better explain the association between education, social class and adolescent expectations for university study in minority families.

8.5 Implications for the paradox of minority pupils' high expectations from disadvantaged homes, and directions for further study

The analysis has important implications regarding the paradox of minority pupils' high expectations from disadvantaged parental backgrounds. First, the direct effect of parental social position on white and Indian pupils' expectations is generally limited. While we would have expected a much stronger effect of parental social position in the most disadvantaged ethnic groups, the opposite is the case. For the Bangladeshi pupils who are the most disadvantaged relative to all others[14], its effect is insignificant while for the more advantaged white and Indian pupils, it is very small. For Pakistani and Black Caribbean pupils, higher expectations will be a stronger function of parental social class and thus harder to maintain in the presence of family disadvantage.

Second, the significant direct and indirect longitudinal pathways affecting pupils' expectations operate independently of parental social class across all groups. This implies that expectations develop in relative independence of parental social class and can thus be promoted despite family disadvantage. By the same token however, low expectations may perpetuate even in the absence of disadvantage.

Third, home- and school-related processes do not operate in a vacuum but are interdependent. Each proximal process is longitudinally associated with expectations directly and indirectly. These findings broadly indicate the operation of an *ecological interdependence between home and school* regarding the development of expectations. The magnitude, direction and significance of these mutual influences are moderated by maternal ethnic group membership. This moderation has different implications for pupils in different ethnic minorities. White and Black Caribbean pupils will tend to maintain the lowest educational expectations relative to those of their minority peers. South Asian pupils by contrast will maintain much higher expectations that increase over time.

Regarding home-related factors, better parent-child relations are associated with higher prior expectations in almost all ethnic groups. Prior expectations at age 14 are in turn associated with

[14] It could be argued that this insignificant effect is due to the fact that there is low variance in the Bangladeshi measure for parental social position. Examination of Table A6.1, Appendix 6, shows that the variance of FAMCIRC1 for the Bangladeshi is indeed the lowest (σ_B^2= 0.961) while still sizeable and highly significant (σ_B^2/SE_B=6.96 > 1.96). A fact that argues against this explanation however is that the same weak and marginally significant effect was also obtained in the White (σ_W^2= 1.656) and Indian (σ_I^2= 1.690) groups where the variance of the same latent construct was almost double in size. Although a statistical explanation for the low effect cannot be completely ruled out, the alternative explanation offered in section 8.4 above is also likely.

better parent-child relations at ages 15 and 16. Both of these findings imply that higher expectations tend to develop in well-functioning homes. Since these associations are observed net of parental social class, we may speculate that high expectations are also protective factors.

Pupils' engagement with homework at age 14 is positively associated with expectations directly at age 15 and indirectly at age 16. It is the only variable to be consistently positively associated with parental social position across all ethnicity groups. But homework engagement does not mediate the effect of parental position to pupils' expectations. This finding implies that first, higher parental social position associated with better material circumstances in the family is also likely to be associated with more homework engagement. Hallam (2004; 2006) has shown that this is generally related to better home learning environments which we should expect to find with higher parental social positions. Second, homework engagement tends to be associated with expectations regardless of family disadvantage but this association works differently for every pupil. For white and Black Caribbean pupils who are the most advantaged relative to all others, their relatively lower engagement with homework will tend to be associated with lower expectations at age 16. For the less advantaged Pakistani and Bangladeshi pupils, their higher homework engagement at age 14 is likely to be associated with higher expectations at ages 15 and 16. Indian pupils' expectations are unlikely to be related to homework engagement as there is no association between the two. Indian pupils appear to follow traditions of high homework engagement while white and Black Caribbean pupils' expectations are likely to be associated with traditions of lower homework engagement. I discuss this in more detail in section 8.6.

Regarding school-related factors, more positive feelings about school are associated with higher expectations but are independent of parental social position (except in the Black Caribbean families). But the strong positive association between such feelings and expectations means that feelings about school at earlier ages will be related to higher expectations at later ages only if pupils are high in both of these factors. If pupils are low in both factors, as in the case in the white and the Black Caribbean pupils, the positive longitudinal association means that less positive feelings will be associated with lower expectations further. For these pupils, disadvantage will tend to crystallise low feelings about school early on.

In general, schools perceived to be well-functioning by the pupils are associated with higher pupils' expectations, particularly at age 16. However higher expectations were not necessarily associated with higher feelings about school, particularly in the Pakistani group. More ambitious Pakistani pupils with higher expectations for university study at age 14 may develop more critical attitudes about their school a year later. Thus, higher expectations might be associated with pupils' increased demands for better quality schools and thus fuel their dissatisfaction for their current school arrangements.

A puzzling and unexpected finding was the negative association between pupils' ideas about teachers' effectiveness in discipline and their feelings about school and expectations. Pupils' earlier assessments about their teachers' effectiveness at age 14 are negatively associated with the expectations of all but the Black Caribbean pupils' one or two years later. But for Black Caribbean pupils who are low in both factors relative to their South Asian peers, the sizeable (but insignificant) positive partial correlation means that low assessments about teachers will be associated with even lower expectations at age 16. Since low parent-child conflict is likely to be associated with higher expectations, the evidence appears to point to a vicious cycle in the case of Black Caribbean pupils where influences between the home and school combine to keep those pupils' expectations low. For every other South Asian and white pupil in the analysis, the greater the number of teachers they perceived as effective in enforcing discipline at age 14, the higher those pupils' negativity about their school a year later. For Indian, Pakistani and Bangladeshi pupils, this negative association was also observed between ages 15 to 16. For Indian pupils moreover, higher feelings about school at age 14 were associated with lower numbers of discipline-enforcing teachers at age 15. For those pupils, impressions about their teachers at age 14 were also negatively associated with their expectations at age 16 indirectly. Apparently, in those adolescents' minds, good schools are associated with *fewer* teachers who are efficient at enforcing discipline. A possible explanation for this seemingly counterintuitive finding follows.

Although theoretically, all four observed measures of the construct 'teachers' effectiveness' (see, construct TCH, in Table 4.1) refer to positive dimensions of teaching, pupils may still associate these qualities as teachers' responses to problematic classes. Thus, the more teachers have to exhibit these qualities and the greater the number of teachers who are perceived to do so, the more degraded the school quality is perceived, and less prone to fostering high expectations. This suggests that enforcing discipline is a sensitive issue. Pupils might feel negative about schools where discipline is enforced by too many teachers, too often. In pupils' minds, teachers might be ranked as highly efficient in enforcing discipline. But seeing discipline enforced too often in class, good or aspiring pupils might feel they are getting less help they deserve because much time is wasted on controlling unruly classes. So the flip side of teachers' effectiveness in discipline could be higher need for discipline skills. Committed and experienced teachers who have earned the respect and acceptance of their pupils might rarely resort to discipline. This implies that schools that are perceived as requiring higher proportions of effective disciplinarians are also schools that have more discipline problems. In short, in the pupils' subjective impressions, higher proportions of discipline-prone teachers may be associated with lower overall school quality. Evidence suggests lower-quality schools with less experienced teachers are associated with less optimal in-class climates (Micklewright *et al.*, 2014). This would explain the observed negative association between pupils' feelings about school and their assessments about teacher effectiveness.

Such schools are likely to be associated with lower expectations. The analysis showed that the higher the proportion of teachers perceived as effective in maintaining discipline at pupils' age 14 is, the lower those pupils' expectations at age 15 are, at least for the white and Bangladeshi pupils. Possibly, pupils who perceive greater proportions of their teachers are enforcing discipline, are also pupils who are less committed, maintain lower expectations and are more prone to receive discipline. Further, those pupils might be in low-performing schools where discipline needs to be enforced more often. Recent evidence supports this association (Connelly, Sullivan and Jerrim, 2014).

But why should pupils' higher expectations at age 14 be negatively associated with their impressions about teacher effectiveness at age 15, as was the case with the Bangladeshi pupils or feelings about school as in the case of their Pakistani peers? Two related explanations could be offered. First, fewer discipline-enforcing teachers may be associated with better-performing schools, where teachers do not need to exercise their disciplinary skills very often. Findings support this hypothesis. The lower the perceived proportion of disciplinarians in white and South Asian pupils' schools was at age 15, the more positive their feelings about their school were at age 16. If feelings about schools are negatively associated with teachers' discipline but positively associated with expectations, then teachers' discipline will also be negatively associated with expectations. As discussed in chapter 7, this was the direction of these associations in most of the cases (see Table 7.2). Second, higher proportions of teachers perceived to be more effective in discipline, might also signify higher proportions of stricter assessors. If this is the case, pupils feel more positive towards schools where less discipline is needed, more quality work is done and better grades are earned. Pupils with higher expectations at age 15 will tend to be at schools where all of these conditions are likely to be met at age 16. For the same reason, pupils with lower expectations at age 15 will tend at age 16 to be associated with lower-performing schools with more generalised discipline enforcement.

More generalised discipline enforcement at school is negatively associated with expectations for university study. This association appears to be linked to a complex vicious cycle. Generalised discipline enforcement is associated with greater friction at home which is in turn associated with lower expectations. Low expectations are associated with low homework engagement and greater family friction which are likely to further reduce expectations. Lower expectations are likely to be associated with greater discipline at schools and the cycle repeats itself.

In general, the findings strongly imply that expectations develop between ages 14 to 16 as a joint function of earlier expectations and the reciprocal influences between home- and school-related proximal processes. Feelings about school and impressions about disciplinarian teachers are reciprocally related to parent-child conflict and pupils' homework engagement. Pupils who feel positive about their school are likely to have greater homework engagement and better relations with their parents. For the Black Caribbean pupils in particular, problems at school will tend to be associated with greater friction at home and lower feelings about school and teachers. Home environments that promote high expectations, traditions of homework engagement, good parent-child relations and positive feelings about school and teachers are likely to maintain a *virtuous cycle* that crystallises high expectations for university study at age 16. Home environments where the above proximal processes operate less effectively are likely to maintain a *vicious cycle* that perpetuates low expectations. Expectations themselves are potent drivers on both home and school factors. Family disadvantage appears to be a greater risk to expectations if the virtuous cycle fails to operate. Maternal ethnicity as a distal influence moderates these associations. This ecological interdependence of home and school carries important implications for policy interventions that are discussed in the final section.

Addressing the paradox of pupils' high adolescent educational expectations from disadvantaged backgrounds, the present analysis contributed to the present state of knowledge by identifying the virtuous and vicious cycles associated with pupils' expectations for university study. These cycles reflect the interdependence of the home and school. There is tentative indication that they are likely to enhance or retard the development of high expectations and do so independently of family disadvantage. There is also tentative indication that family disadvantage is a potential risk to expectations but its effect is likely to be felt only if the virtuous cycle fails to operate and a vicious cycle commences. Both processes appear to be moderated by maternal ethnicity. Further research is therefore required to validate and build on these findings.

8.6 Implications for policy interventions

It is well known that adolescent educational expectations are significant predictors of young people's future educational attainment (Gutman and Akerman, 2008; Gutman and Schoon, 2012; Gutman, Schoon and Sabates, 2011; Ritchie, Flouri and Buchanan, 2005; Rothon *et al.*, 2011). Recent UK research based on the LSYPE has indicated that the overwhelming majority of pupils with high expectations for university study at ages 15 and 16 do apply to university, as reported at ages 21-21 (Anders and Micklewright, 2013; Croll and Attwood, 2013; Fumagalli, 2012). Intervention programs have been at the forefront of UK educational policies in an attempt to reduce educational inequality (Holloway and Pimlott-Wilson, 2011). Initiatives like *Unleashing Aspiration* (DfBIS, 2009) and others (DfES, 2006) aimed at raising expectations particularly among disadvantaged groups. Such policies have particularly targeted minority ethnic young people attending inner-city schools and living in disadvantaged ethnically-dense neighborhoods (Cuthbert and Hatch, 2011). Judging from the fact that ethnic minorities are overrepresented in university entrants (Modood, 2006), one would tend to think that these policy initiatives are generally effective.

But reviews of policy interventions suggest the opposite. Interventions aiming to raise aspirations do not offer clear evidence that attitudes are causally connected to educational outcomes (Carter-Wall and Whitfield, 2012; Cummings *et al.*, 2012; Gorard, See and Davies, 2012). Moreover, intervention policies have been critiqued as strengthening the 'blame the victim' discourse (St Clair and Benjamin, 2011), and as lacking deeper understanding of the structural causes of educational inequality (Kintrea, 2009; Sibieta, Chowdry and Muriel, 2008). Pertinent evidence also casts doubt on the long-term effectiveness of career advice on educational expectations (Gutman, Schoon and Sabates, 2011) and community-based interventions to raise expectations (Lupton and Kintrea, 2011). Such interventions have also been criticised as acting on a superficial emotional / affective level that falls short of a holistic appraisal of the fuller range of pupils' experiences (Brown, 2011). Educational interventions have had limited success also because initiatives are argued to have failed to address the complex web of influences on educational attainment (Raffo *et al.*, 2007). Thus, as Emmerson *et al* (2006) report, the *Aim Higher: Excellence Challenge* that aimed to raise expectations and further participation in higher education was ineffective.

Educational research has yet to provide definite answers on *how* exactly educational expectations impact on future outcomes or the overall effect of such policy initiatives on young people's expectations (Goodman, Gregg and Washbrook, 2011). Although it is clear that pupils' educational expectations are associated with a plethora of home and school-based factors, the drivers of these developmental outcomes are not yet clearly understood (Ritchie, Flouri and Buchanan, 2005). Knowing for example, that adolescents' and their mothers' educational expectations are important parts of a transmission mechanism of the influence of socioeconomic background on young people's educational attainment (Chowdry, Crawford and Goodman, 2010a; Gutman and Schoon, 2012) is no longer enough and might not even be correct. Parental and adolescent educational expectations were repeatedly found to be high across *all* minority ethnic groups (Chevalier *et al.*, 2009; Chowdry, Crawford and Goodman, 2010a). Therefore, they could only very partially account for the longitudinal changes in the educational attainment gaps among ethnic minority pupils and between them and their white peers (Strand and Winston, 2008). Subjected to the more systematic scrutiny of an autoregressive multiple mediator model, parental social position (including measures of parental socioeconomic status and family disadvantage) was shown in this thesis to be much less powerful than expected in affecting pupils' educational expectations. This casts doubt on the traditional class analytic hypothesis that parental and adolescent educational expectations mediate between parental socioeconomic background and educational attainment (Duncan and Featherman, 1972; Kao and Tienda, 1998). When proper controls are introduced and measurement error is better addressed, a critical part of this assumed mediational model (the *a* effect of parental SES on pupils' expectations) was found in this thesis to be too weak. This fact makes such assumed mediation highly unlikely[15].

Instead, this thesis has brought attention to particular home and school factors that appear to be involved in proximal processes tentatively identified here as 'virtuous and vicious cycles'. These processes, rather than parental social position alone, appear to be much more strongly associated with pupils' expectations. As this thesis has shown, maternal ethnicity clearly moderates these cycles. Therefore the risk of failure of any generalised policy initiative at raising expectations without taking this fact into account is considerable. Below, I make a number of recommendations for policy initiatives to raise expectations based on the implications of the findings discussed above and general practice. However, because this thesis has indicated the presence of longitudinal *associations* rather than *causal* relationships, the interventions suggested below presuppose systematic validation of the observed mediational relationships.

[15] Parental SES is likely to affect pupils' attainment or university attendance *directly*, as has been well-documented in longitudinal studies based on LSYPE data (Anders and Micklewright, 2013; Croll and Attwood, 2013). What this thesis suggests is that such effect is unlikely to be mediated via parental or adolescents' expectations, particularly in minority homes.

i. Given the interdependence of home and school influences that was tentatively demonstrated in this thesis, interventions should target the family and school microsystems simultaneously as both appear to be involved in the development of expectations. For example, less friction at home is likely to be associated with better pupils' feelings about school and better feelings about school are likely to associated with lower family friction. Both factors are associated with higher pupils' expectations. Conversely, pupils' perceptions of increased discipline at school is associated with increased family friction and lower expectations. School-based interventions will therefore need to target discipline issues and raise pupils' feelings about school. There are some grounds for optimism for UK teachers willing to participate in intervention programs designed to raise pupils' achievement and expectations and control disruptive behaviour in class (Cameron, 1998; Flecknoe, 2000). But in general, when such issues arise at school, interventions must extend to the home in an effort to cushion possible negativity as a result of action at school. This will be particularly necessary in the case of white and Black Caribbean pupils who traditionally appear to be most disaffected. Pupils' ideas about teachers' discipline effectiveness and feelings about school are not necessarily associated, but when they are, as in the case of Indian pupils, the association is negative. This might suggest that each factor in the school microsystem can be targeted separately but in full consideration of each factor's association with the pupil's home.

ii. Interventions that reduce parent-child conflict are likely to have positive longitudinal effects on pupils' expectations. Earlier parent-child conflict is associated with later expectations mostly indirectly. This means that its effects will tend to operate under the surface to undermine or foster expectations. In this connection, interventions to decrease family friction as early as possible, but particularly when puberty commences (ages 11-12) are likely to make home environments more conducive to higher expectations for university study. These interventions might be less effective in Pakistani and Bangladeshi homes where parent-child conflicts were reported to be the lowest, or where cultural predispositions might resist such intervention.

iii. Interventions that are successful in establishing traditions of systematic homework engagement are likely to raise expectations. White and Black Caribbean pupils have the lowest homework engagement which is significantly associated with lower expectations at age 16. Since earlier expectations are positively associated with later homework, white and Black Caribbean pupils find themselves in a vicious cycle that will tend to perpetuate low expectations. Interventions aiming to break this vicious cycle typically target a much wider range of risky teenage behaviours and have had some success (Fletcher *et al.*, 2007). Such interventions should enable pupils to resist a street-culture and anti-school sentiment more effectively. Intervention might be all the more necessary if white and Black Caribbean families lack the cultural ingredients and authority structure that is more likely to immunise South Asian pupils against that ethos. The timing of intervention to raise homework engagement in Black Caribbean pupils would be age 15 or earlier. Analysis of the cross-group differences in latent means revealed that Black Caribbean pupils' homework falls off to match that of their white peers at age 15, remaining the lowest ever since. This intervention might be least necessary for Indian pupils. Traditions of homework engagement in their case appear to be deeply ingrained. Such traditions are more likely to be taken for granted in these families and remain unaffected by any variation in expectations. However, to raise pupils' homework engagement, parallel interventions should target the quality of parental monitoring at home as well as the quality of assigned homework at school. Recent studies have shown that unless those dimensions are targeted simultaneously, improvement in pupils' homework engagement is unlikely (Dettmers, Trautwein and Lüdtke, 2009; Dettmers *et al.*, 2010; Heimgartner-Moroni *et al.*, 2012).

iv. The analysis suggests that a pupil's earlier expectations at ages 14 and 15 are strongly associated with that pupil's expectations for university study at age 16. It further suggests that expectations are possible drivers of parent-child conflict, homework engagement, feelings about school and pupils' perceptions of teachers' disciplinary effectiveness. There is a plausible (and possibly reciprocal) link between expectations and attainment (Gorard, 2012). There is also a growing literature however that suggests that higher parental and adolescent expectations could be important protective factors against disadvantage and risky behaviour during adolescence (Chowdry, Crawford and Goodman, 2009; Cowan, 2011; Flouri, 2006; Schoon, Parsons and Sacker, 2004; Strand, 2007). Moreover, a pupil's higher expectations are likely to facilitate smoother home-school relations by simultaneously impacting on home (parent-child conflict) and school (feelings about school, teachers' effectiveness) that were shown to affect one another. Menzies (2013) argues that the real issue associated with the aspirations of white disadvantaged adolescents is not an absence of aspirations *per se* but a lack of knowledge of the ways that need to be followed to actualise their aspirations. But given the relative failure of interventions to directly raise young people's expectations (Carter-Wall and Whitfield, 2012), it might be preferable for future interventions to follow alternative routes to achieve this, as indicated in this thesis. I explain this point further below.

v. Raising educational expectations *per se* as early as possible is likely to have multiple beneficial effects on both the home and school microsystems. However, interventions to raise such expectations *directly* might be less successful and more money, time and energy-consuming than interventions to *improve factors that improve expectations*. Certain studies in the US have shown for example that 'small' social-psychological interventions that were seemingly unconnected to the real target of the intervention were very successful at meeting this target (for a list of such studies see, Yeager and Walton, 2011, Table 1, p. 269-273). As these researchers report, brief exercises targeting students' thoughts, feelings and beliefs in and about school had striking effects on educational achievement. Similarly, Walton and Cohen (2007) managed to raise Black students' grade point average (GPA) by increasing their sense of belonging in an academic setting. In their more recent work, the same authors used an intervention to lessen first-year students' psychological perceptions of threat on campus by framing social adversity as common and transient (Walton and Cohen, 2011). The intervention was most successful at raising African-American and European-American students' GPA over the following 3 years. This thesis points to the factors that can be similarly targeted with the prospect of achieving a long-term raising of expectations. These are interventions to raise pupils' homework engagement and feelings about school. Both interventions can aim at increasing pupils' sense of belonging to school by using subtle attitude-change strategies, as suggested by the above intervention studies.

vi. A critical issue regarding interventions is of course their timing and duration. The mediation model that was estimated in this thesis shows that many earlier influences impact longitudinally on later expectations of UK pupils. This implies first, that interventions must start as early as possible; and second, that they must continue for a considerable extent. Outcomes like expectations as well as the proximal processes that bring them about are cumulative (Bronfenbrenner, 2005). We also know that the effect of family-level disadvantage is not completely fixed in childhood (Sullivan and Brown, 2013; Sullivan, Ketende and Joshi, 2013). Rather, its effect is cumulative causing children to fall behind their peers during the primary and secondary school years (Connelly, Sullivan and Jerrim, 2014). It is plausible to hypothesise therefore that the earlier the timing of the intervention, the greater the probability that it will be effective on the proximal process it aims to change. Yet, early interventions are needed but are clearly not sufficient (Connelly, Sullivan and Jerrim, 2014). To be effective in the long run, interventions in raising young people's expectations have to follow those young people as they develop. Interventions in improving family friction or feelings about school for example, must start early but extend over the period they will be needed most, i.e., middle adolescence.

vii. Interventions must take into consideration the timing of risk factors associated with socioeconomic disadvantage. These are generally related to the developmental stage of the individual, the experience of long-term continuous disadvantage and the overall sociohistorical context (Schoon *et al.*, 2002; Schoon, Martin and Ross, 2007). This implies that the effect of disadvantage on children's educational outcomes is hardly uniform across time. Sacker, Schoon and Bartley (2002) have shown that while family disadvantage affects children's attainment as early as age 7, it becomes stronger at age 11 and then levels off at age 16. At age 16 however, factors associated with the school environment become more important for adolescent educational achievement. This thesis has brought attention to the possible adverse effect school discipline and the positive effect feelings about school may have on pupils' expectations between ages 14-16. While interventions at earlier ages may therefore target home-based proximal processes that counterbalance disadvantage (Schoon, Parsons and Sacker, 2004), interventions at ages 15 and 16 should target school-based proximal processes.

viii. One of the most important in-school interventions appears to be the very sensitive issue of discipline and teacher effectiveness. The findings strongly imply that greater numbers of perceived disciplinarians are associated with lower pupils' expectations. The key to successful interventions may lie in the school's success in involving the family before and after disciplinary action is dispensed. There is some encouraging evidence in such interventions (McDonald *et al.*, 2012) but more rigorous evaluations are needed (Connelly, Sullivan and Jerrim, 2014). Second, it may lie in raising teachers' awareness of adolescent problem behaviour, and in training them to handle disruptive behaviour constructively. Third, and perhaps more importantly, interventions should aim at raising teachers' self-esteem, experience and feeling of self-worth. There is some earlier (Cameron, 1998; Flecknoe, 2000) and more recent (Muijs *et al.*, 2010) hopeful evidence in this direction.

ix. Finally, an issue of concern and relevant to the timing of interventions to raise expectations is the observed universal fall off in expectations (as well as in feelings about school and homework) at age 15. There is no straightforward explanation for this fall off. It could be rooted in pupils' coming to grips with their earlier subject choices made at age 14, some of which may be disappointing, based on the grades they receive at age 15. Age 15 also marks the start of GCSE preparation that generally requires a rather pervasive change of study methodology. It could also be the effect of pupils' placements at the end of year 10. Future study of the probable cause(s) of this fall off might also explain why only white and Black Caribbean pupils do not recover from it at age 16. This fall off in expectations suggests that interventions targeting school-based processes which may raise expectations should commence at or earlier than age 15.

Appendix 1: Comparison of parameter estimates (indicator loadings and intercepts) for models 1-6 under the full (n=7578) and the reduced (n=1000) samples of the white group

Table A1.1 Comparison of indicator loadings for models 1-6 under the reduced and the full sample of white group

	N=1000			n=7578		
Loadings	b	SE	β	b	SE	β
Model 1 (parental social position)						
λ_{11} father's NS-SEC w1	1.000		0.637	1.000		.716
λ_{21} mother's NS-SEC w1	1.008	0.074	0.580	.700	.020	.533
λ_{31} deprivation score w1	0.317	0.026	0.449	.278	.008	.477
λ_{41} gr. family income w1	1.000	0.070	0.679	1.091	.027	.809
λ_{12} father's NS-SEC w2	1.000		0.639	1.000		.697
λ_{22} mother's NS-SEC w2	1.008	0.074	0.586	.700	.020	.519
λ_{32} deprivation score w2	0.317	0.026	0.436	.278	.008	.471
λ_{42} gr. family income w2	1.000	0.070	0.663	1.091	.027	.785
Model 2 (parent-child conflict)						
λ_{11} freq. of arguing with YP w1	1.000		0.823	1.000		.788
λ_{21} how bad relation is with YP w1	0.196	0.017	0.374	.233	.006	.422
λ_{12} freq. of arguing with YP w2	1.000		0.808	1.000		.799
λ_{22} how bad relation is with YP w2	0.196	0.017	0.324	.233	.006	.413
λ_{13} freq. of arguing with YP w3	1.000		0.922	1.000		.868
λ_{33} how bad relation is with YP w3	0.196	0.017	0.370	.233	.006	.426
Model 3 (pupils' engagement with homework						
λ_{11} evenings spent on homework w1	1.000		0.872	1.000		.839
λ_{21} freq. of homework assigned w1	0.433	0.025	0.596	.468	.008	.670
λ_{12} evenings spent on homework w2	1.000		0.836	1.000		.930
λ_{22} freq. of homework assigned w2	0.433	0.025	0.612	.468	.008	.681
Model 4 (pupils' feelings about school)						
λ_{11} *I'm happy when I am at school* w1	1.000		0.590	1.000		.634
λ_{21} *I do not want to go to school* w1	1.346	0.061	0.627	1.292	.020	.666
λ_{31} *I like being at school* w1	1.065	0.054	0.556	1.116	.012	.716
λ_{41} *I'm bored at lessons* w1	1.127	0.036	0.672	.965	.017	.555
λ_{12} *I'm happy when I am at school* w2	1.000		0.604	1.000		.671
λ_{22} *I do not want to go to school* w2	1.346	0.061	0.638	1.292	.020	.702
λ_{32} *I like being at school* w2	1.065	0.054	0.578	1.116	.012	.748
λ_{42} *I'm bored at lessons* w2	1.127	0.036	0.673	.965	.017	.600
λ_{13} *I'm happy when I am at school* w3	1.000		0.651	1.000		.692
λ_{23} *I do not want to go to school* w3	1.346	0.061	0.711	1.292	.020	.735
λ_{33} *I like being at school* w3	1.065	0.054	0.634	1.116	.012	.757
λ_{43} *I'm bored at lessons* w3	1.127	0.036	0.708	.965	.017	.631
Model 5 (pupils assessments about teachers' effectiveness in discipline						
λ_{11} *teach make clear how we should behave* w1	1.000		0.607	1.000		.608
λ_{21} *teachers take action when rules broken* w1	1.026	0.058	0.592	1.075	.021	.624
λ_{31} *I like my teachers* w1	0.759	0.067	0.445	.696	.023	.422
λ_{41} *teachers can keep order in class* w1	1.032	0.078	0.620	1.070	.029	.647
λ_{12} *teach make it clear how we should behave* w2	1.000		0.608	1.000		.627
λ_{22} *teachers take action when rules broken* w2	1.026	0.058	0.596	1.075	.021	.646
λ_{32} *I like my teachers* w2	0.759	0.067	0.460	.696	.023	.432
λ_{42} *teachers can keep order in class* w2	1.032	0.078	0.603	1.070	.029	.665
Model 6 (pupils' educational expectations)						
λ_{11} *How likely to apply to university* w1	0.603	0.015	0.743	.642	.006	.780
λ_{21} *How likely to get in university if apply* w1	1.000		0.903	1.000		.880
λ_{12} *How likely to apply to university* w2	0.603	0.015	0.756	.642	.006	.784
λ_{22} *How likely to get in university if apply* w2	1.000		0.923	1.000		.907
λ_{13} *How likely to apply to university* w3	0.603	0.015	0.781	.642	.006	.824
λ_{33} *How likely to get in university if apply* w3	1.000		0.924	1.000		.938

Note: b=unstandardized loading; β=standardized loading; SE=standard error. 1.000 under (b) refers to loadings which were fixed to unity for identification purposes.

Table A1.2: Comparison of indicator intercepts for models 1-6 under the reduced and the full sample of white group

	N=1000		n=7578	
Intercepts	**τ**	**SE**	**τ**	**SE**
Model 1 (parental social position)				
τ_{11} father's NS-SEC w1	4.861	.063	5.098	.027
τ_{21} mother's NS-SEC w1	4.388	.070	4.888	.023
τ_{31} deprivation score w1	7.383	.026	7.500	.009
τ_{41} gr. family income w1	4.706	.061	4.962	.028
τ_{12} father's NS-SEC w2	4.861	.063	5.098	.027
τ_{22} mother's NS-SEC w2	4.388	.070	4.888	.023
τ_{32} deprivation score w2	7.383	.026	7.500	.009
τ_{42} gr. family income w2	4.952	.063	5.183	.027
Model 2 (parent-child conflict)				
τ_{11} freq. of arguing with YP w1	2.956	.031	2.906	.011
τ_{21} how bad relation is with YP w1	3.672	.013	3.715	.004
τ_{12} freq. of arguing with YP w2	2.956	.031	2.906	.011
τ_{22} how bad relation is with YP w2	3.672	.013	3.715	.004
τ_{13} freq. of arguing with YP w3	3.100	.034	3.081	.012
τ_{33} how bad relation is with YP w3	3.672	.013	3.715	.004
Model 3 (pupils' engagement with homework				
τ_{11} evenings spent on homework w1	2.923	.042	2.865	.017
τ_{21} freq. of homework assigned w1	4.546	.024	4.512	.009
τ_{12} evenings spent on homework w2	2.923	.042	2.865	.017
τ_{22} freq. of homework assigned w2	4.546	.024	4.512	.009
Model 4 (pupils' feelings about school)				
τ_{11} *I'm happy when I am at school* w1	3.127	.016	3.073	.006
τ_{21} *I do not want to go to school* w1	2.894	.021	2.859	.008
τ_{31} *I like being at school* w1	2.574	.019	2.511	.007
τ_{41} *I'm bored at lessons* w1	3.092	.017	3.049	.006
τ_{12} *I'm happy when I am at school* w2	3.127	.016	3.073	.006
τ_{22} *I do not want to go to school* w2	2.894	.021	2.859	.008
τ_{32} *I like being at school* w2	2.574	.019	2.511	.007
τ_{42} *I'm bored at lessons* w2	3.092	.017	3.049	.006
τ_{13} *I'm happy when I am at school* w3	3.127	.016	3.073	.006
τ_{23} *I do not want to go to school* w3	2.894	.021	2.859	.008
τ_{33} *I like being at school* w3	2.574	.019	2.511	.007
τ_{43} *I'm bored at lessons* w3	3.092	.017	3.049	.006
Model 5 (pupils assessments about teachers' effectiveness in discipline				
τ_{11} *teach make clear how we should behave* w1	4.161	.020	4.133	.007
τ_{21} *teachers take action when rules broken* w1	4.060	.021	4.063	.008
τ_{31} *I like my teachers* w1	3.372	.021	3.367	.008
τ_{41} *teachers can keep order in class* w1	3.500	.020	3.504	.008
τ_{12} *teach make it clear how we should behave* w2	4.161	.020	4.133	.007
τ_{22} *teachers take action when rules broken* w2	4.060	.021	4.063	.008
τ_{32} *I like my teachers* w2	3.372	.021	3.367	.008
τ_{42} *teachers can keep order in class* w2	3.500	.020	3.504	.008
Model 6 (pupils' educational expectations)				
τ_{11} *How likely to apply to university* w1	2.944	.019	2.845	.008
τ_{21} *How likely to get in university if apply* w1	2.980	.027	2.835	.011
τ_{12} *How likely to apply to university* w2	2.944	.019	2.845	.008
τ_{22} *How likely to get in university if apply* w2	2.980	.027	2.835	.011
τ_{13} *How likely to apply to university* w3	2.944	.019	2.845	.008
τ_{33} *How likely to get in university if apply* w3	2.980	.027	2.835	.011

Note: τ=intercept; SE=standard error.

Appendix 2: AMOS and SPSS syntax for models 1-7, as well as for data imputation and selection of datasets.

Introduction

Appendix 2 provides the syntax files for the major parts of this analysis. In section A2.1, I present the AMOS syntax for model 7 only, since models 1-6 (FAMCIRC; PAR; HW; SCH; TCH and YPEX) were all nested under model 7, and their specific syntax was repeated under model 7. The full syntax for model 7 is provided for the white (n=1000), Indian (n=751), Pakistani (n=642), Bangladeshi (n=487) and Black Caribbean (n=324) ethnic groups precisely as specified for the multigroup analysis (see, Sem.GroupName () in bold). The goodness of fit and measurement part of this model was discussed in chapter 7. Although the basic syntax for model 7 is repeated in each group, the error covariance structure varies slightly across groups as a result of the effort to maximise group-specific model fit. In section A2.2, I present the SPSS syntax for the conversion of a correlation matrix into an augmented variance-covariance matrix. In section A2.3, I provide the SPSS syntax for the multiple imputation procedure followed by the syntax for the selection of the datasets in section A2.4. Finally, I present the SPSS syntax for the selection of the 1000-case random sample of white mothers in section A2.5.

A2.1 AMOS Syntax: Multigroup FINAL (model7)

```
#Region " FINAL "
Imports System
Imports System.Diagnostics
Imports Microsoft.VisualBasic
Imports AmosEngineLib
Imports AmosGraphics
Imports AmosEngineLib.AmosEngine.TMatrixID
Imports PBayes
#End Region
Module MainModule
Public Sub Main()
Dim Sem As AmosEngine
Sem = New AmosEngine
Sem.TextOutput
AnalysisProperties(Sem)
ModelSpecification(Sem)
Sem.FitAllModels()
Sem.Dispose()
End Sub
Sub ModelSpecification(Sem As AmosEngine)
Sem.ModelMeansAndIntercepts
Sem.GenerateDefaultCovariances(False)
Sem.BeginGroup("G:\New Thesis\multigroup comparisons\FINAL\..\..\covariance_white_new_listwise.sav", "covariance_white_new_listwise")
Sem.GroupName("WHITE")
Sem.AStructure("r_W1nsseccatdad = (i1_aW) + (1) FAMCIRC1 + (1) e1")
Sem.AStructure("r_W1nssecmum = (i1_b) + (1b) FAMCIRC1 + (1) e2")
Sem.AStructure("HHdepW1 = (i1_c) + (1c) FAMCIRC1 + (1) e3")
Sem.AStructure("W1GrssyrHHbands = () + (1d) FAMCIRC1 + (1) e4")
Sem.AStructure("FAMCIRC2 = (0) + FAMCIRC1 + (1) D1")
Sem.AStructure("r_W2nsseccatdad = (i1_aW) + (1) FAMCIRC2 + (1) e5")
Sem.AStructure("r_W2nssecmum = (i1_b) + (1b) FAMCIRC2 + (1) e6")
Sem.AStructure("HHdepW2 = (i1_c) + (1c) FAMCIRC2 + (1) e7")
Sem.AStructure("W2GrssyrHHbands = () + (1d) FAMCIRC2 + (1) e8"
Sem.AStructure("W1parqualMP = () + (1) PAR1 + (1) e9")
Sem.AStructure("r_W1kiddifMP = (i2_bW) + (2b) PAR1 + (1) e10")
Sem.AStructure("PAR2 = (0) + PAR1 + (1) D2 + (a1W) FAMCIRC1 + (m2m1W) HW1 + (d1W) YPEX1 + (m4m1W) TCH1 + (m3m1W) SCH1")
Sem.AStructure("W2parqualMP = (i2_aW) + (1) PAR2 + (1) e11")
Sem.AStructure("r_W2kiddifMP = (i2_bW) + (2b) PAR2 + (1) e12")
Sem.AStructure("PAR3 = (0) + PAR2 + (1) D3 + (a12W) FAMCIRC2 + (d1W2) YPEX2 + (m2m1W2) HW2 + (m3m1W2) SCH2 + (m4m1W2) TCH2")
Sem.AStructure("W3parqualMP = (i2_aW) + (1) PAR3 + (1) e13")
Sem.AStructure("r_W3kiddifMP = (i2_bW) + (2b) PAR3 + (1) e14")
Sem.AStructure("W1hwndayYP = (i3_aW) + (1) HW1 + (1) e15")
Sem.AStructure("r_W1hwdoYP = (i3_b) + (3b) HW1 + (1) e16")
Sem.AStructure("HW2 = (0) + HW1 + (1) D4 + (a2W) FAMCIRC1 + (m1m2W) PAR1 + (m3m2) SCH1 + (d2W) YPEX1 + (m4m2) TCH1")
Sem.AStructure("W2hwnday1YP = (i3_aW) + (1) HW2 + (1) e17")
Sem.AStructure("r_W2hwdoYP = (i3_b) + (3b) HW2 + (1) e18")
Sem.AStructure("r_W1yys1YP = (i4_a) + (1) SCH1 + (1) e19")
Sem.AStructure("W1yys4YP = () + (4b) SCH1 + (1) e20")
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Sem.AStructure("W1yys9YP = (i4_c) + (4c) SCH1 + (1) e21")
Sem.AStructure("r_W1yys6YP = (i4_d) + (4d) SCH1 + (1) e22")
Sem.AStructure("SCH2 = (fi_2W) + SCH1 + (1) D5 + (m2m3W) HW1 + (m4m3W) TCH1 + (d3W) YPEX1 + (a3W) FAMCIRC1 + (m1m3W) PAR1")
Sem.AStructure("r_W2YYS1YP = (i4_a) + (1) SCH2 + (1) e23")
Sem.AStructure("W2YYS4YP = () + (4b) SCH2 + (1) e24")
Sem.AStructure("W2YYS9YP = (i4_c) + (4c) SCH2 + (1) e25")
Sem.AStructure("r_W2YYS6YP = (i4_d) + (4d) SCH2 + (1) e26")
Sem.AStructure("SCH3 = (0) + SCH2 + (1) D6 + (d3W2) YPEX2 + (m4m3W2) TCH2 + (m2m3W2) HW2 + (a3W2) FAMCIRC2 + (m1m3W2) PAR2")
Sem.AStructure("r_W3yys1YP = (i4_a) + (1) SCH3 + (1) e27")
Sem.AStructure("W3yys4YP = () + (4b) SCH3 + (1) e28")
Sem.AStructure("W3yys9YP = (i4_c) + (4c) SCH3 + (1) e29")
Sem.AStructure("r_W3yys6YP = (i4_d) + (4d) SCH3 + (1) e30")
Sem.AStructure("r_W1yys15YP = (i5_a) + (1) TCH1 + (1) e31")
Sem.AStructure("r_W1yys16YP = (i5_b) + (5b) TCH1 + (1) e32")
Sem.AStructure("r_W1yys18YP = (i5_c) + (5c) TCH1 + (1) e33")
Sem.AStructure("r_W1yys19YP = (i5_d) + (5d) TCH1 + (1) e34")
Sem.AStructure("TCH2 = (0) + TCH1 + (1) D7 + (a4W) FAMCIRC1 + (m3m4W) SCH1 + (d4W) YPEX1 + (m1m4W) PAR1 + (m2m4W) HW1")
Sem.AStructure("r_W2yys15YP = (i5_a) + (1) TCH2 + (1) e35")
Sem.AStructure("r_W2yys16YP = (i5_b) + (5b) TCH2 + (1) e36")
Sem.AStructure("r_W2yys18YP = (i5_c) + (5c) TCH2 + (1) e37")
Sem.AStructure("r_W2yys19YP = (i5_d) + (5d) TCH2 + (1) e38")
Sem.AStructure("r_W1hlikeYP = (i6_a) + (1) YPEX1 + (1) e39")
Sem.AStructure("r_W1heposs9YP = (i6_b) + (1) YPEX1 + (1) e40")
Sem.AStructure("YPEX2 = (fi_W2) + YPEX1 + (1) D8 + (b4W) TCH1 + (b3W) SCH1 + (b2W) HW1 + (b1W) PAR1")
Sem.AStructure("r_W2hlikeYP = (i6_a) + (6a) YPEX2 + (1) e41")
Sem.AStructure("r_W2heposs9YP = (i6_b) + (1) YPEX2 + (1) e42")
Sem.AStructure("YPEX3 = (0) + YPEX2 + (1) D9 + (b1W2) PAR2 + (b2W2) HW2 + (b3W2) SCH2 + (b4W2) TCH2 + (cΞ„W) FAMCIRC1")
Sem.AStructure("r_W3hlikeYP = (i6_a) + (6a) YPEX3 + (1) e43")
Sem.AStructure("r_W3heposs9YP = (i6_b) + (1) YPEX3 + (1) e44")
Sem.AStructure("e5 <--> e1")
Sem.AStructure("e6 <--> e2")
Sem.AStructure("e7 <--> e3")
Sem.AStructure("e8 <--> e4")
Sem.AStructure("FAMCIRC1 <--> YPEX1")
Sem.AStructure("e5 <--> e1")
Sem.AStructure("e6 <--> e2")
Sem.AStructure("e7 <--> e3")
Sem.AStructure("e8 <--> e4")
Sem.AStructure("FAMCIRC1 <--> YPEX1")
Sem.AStructure("PAR1 <--> YPEX1")
Sem.AStructure("HW1 <--> YPEX1")
Sem.AStructure("SCH1 <--> YPEX1")
Sem.AStructure("TCH1 <--> YPEX1")
Sem.AStructure("SCH1 <--> TCH1")
Sem.AStructure("HW1 <--> TCH1")
Sem.AStructure("PAR1 <--> TCH1")
Sem.AStructure("FAMCIRC1 <--> TCH1")
Sem.AStructure("HW1 <--> SCH1")
Sem.AStructure("PAR1 <--> SCH1")
Sem.AStructure("FAMCIRC1 <--> SCH1")
Sem.AStructure("PAR1 <--> HW1")
Sem.AStructure("FAMCIRC1 <--> HW1")
Sem.AStructure("FAMCIRC1 <--> PAR1")
Sem.AStructure("e12 <--> e10")
Sem.AStructure("e14 <--> e12")
Sem.AStructure("e18 <--> e16")
Sem.AStructure("e23 <--> e19")
Sem.AStructure("e24 <--> e20")
Sem.AStructure("e25 <--> e21")
Sem.AStructure("e26 <--> e22")
Sem.AStructure("e27 <--> e23")
Sem.AStructure("e28 <--> e24")
Sem.AStructure("e29 <--> e25")
Sem.AStructure("e30 <--> e26")
Sem.AStructure("e35 <--> e31")
Sem.AStructure("e36 <--> e32")
Sem.AStructure("e37 <--> e33")
Sem.AStructure("e38 <--> e34")
Sem.AStructure("e41 <--> e39")
Sem.AStructure("e43 <--> e41")
Sem.AStructure("e14 <--> e10")
Sem.AStructure("e22 <--> e19")
Sem.AStructure("e21 <--> e20")
Sem.AStructure("e26 <--> e23")
Sem.AStructure("e25 <--> e24")
Sem.AStructure("e30 <--> e27")
Sem.AStructure("e29 <--> e28")
Sem.AStructure("e28 <--> e20")
Sem.AStructure("e29 <--> e21")
Sem.AStructure("e32 <--> e31")
```

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Sem.AStructure("e34 <--> e33")
Sem.AStructure("e36 <--> e35")
Sem.AStructure("e38 <--> e37")
Sem.AStructure("e43 <--> e39")
Sem.AStructure("D7 <--> D5")
Sem.AStructure("D9 <--> D6")
Sem.AStructure("D8 <--> e40")
Sem.AStructure("D5 <--> e37")
Sem.AStructure("D7 <--> e25")
Sem.AStructure("e9 <--> YPEX1")
Sem.AStructure("SCH1 <--> e40")
Sem.AStructure("e40 <--> HW1")
Sem.AStructure("SCH1 <--> e33")
Sem.AStructure("YPEX1 <--> e25")
Sem.AStructure("D8 <--> e18")
Sem.AStructure("e8 <--> e3")
Sem.AStructure("e44 <--> e29")
Sem.AStructure("D4 <--> e16")
Sem.AStructure("D7 <--> e18")
Sem.AStructure("e27 <--> e26")
Sem.AStructure("e37 <--> SCH1")
Sem.AStructure("e29 <--> SCH1")
Sem.AStructure("e18 <--> PAR1")
Sem.AStructure("e18 <--> e5")
Sem.AStructure("D8 <--> e17")
Sem.AStructure("e25 <--> e13")
Sem.AStructure("e10 (v2_b)")
Sem.AStructure("e15 (0,01)")
Sem.BeginGroup("G:\New Thesis\multigroup comparisons\FINAL\..\..\covariance_indian_new_listwise.sav", "covariance_indian_new_listwise")
Sem.GroupName("INDIAN")
Sem.AStructure("r_W1nsseccatdad = () + (1) FAMCIRC1 + (1) e1")
Sem.AStructure("r_W1nssecmum = (i1_b) + (1b) FAMCIRC1 + (1) e2")
Sem.AStructure("HHdepW1 = (i1_c) + (1c) FAMCIRC1 + (1) e3")
Sem.AStructure("W1GrssyrHHbands = () + (1d) FAMCIRC1 + (1) e4")
Sem.AStructure("FAMCIRC2 = (0) + FAMCIRC1 + (1) D1")
Sem.AStructure("r_W2nsseccatdad = (1_a) + (1) FAMCIRC2 + (1) e5")
Sem.AStructure("r_W2nssecmum = (i1_b) + (1b) FAMCIRC2 + (1) e6")
Sem.AStructure("HHdepW2 = (i1_c) + (1c) FAMCIRC2 + (1) e7")
Sem.AStructure("W2GrssyrHHbands = () + (1d) FAMCIRC2 + (1) e8")
Sem.AStructure("W1parqualMP = (i2_a) + (1) PAR1 + (1) e9")
Sem.AStructure("r_W1kiddifMP = (i2_b) + (2b) PAR1 + (1) e10")
Sem.AStructure("PAR2 = (0) + PAR1 + (1) D2 + (a1I) FAMCIRC1 + (m2m1I) HW1 + (d1I) YPEX1 + (m3m1I) SCH1 + (m4m1I) TCH1")
Sem.AStructure("W2parqualMP = (i2_a) + (1) PAR2 + (1) e11")
Sem.AStructure("r_W2kiddifMP = (i2_b) + (2b) PAR2 + (1) e12")
Sem.AStructure("PAR3 = (0) + PAR2 + (1) D3 + (a12I) FAMCIRC2 + (d1I2) YPEX2 + (m2m1I2) HW2 + (m3m1I2) SCH2 + (m4m1I2) TCH2")
Sem.AStructure("W3parqualMP = (i2_a) + (1) PAR3 + (1) e13")
Sem.AStructure("r_W3kiddifMP = (i2_b) + (2b) PAR3 + (1) e14")
Sem.AStructure("W1hwndayYP = (i3_aI) + (1) HW1 + (1) e15")
Sem.AStructure("r_W1hwdoYP = (i3_b) + (3b) HW1 + (1) e16")
Sem.AStructure("HW2 = (0) + HW1 + (1) D4 + (a2I) FAMCIRC1 + (m1m2I) PAR1 + SCH1 + (d2I) YPEX1 + TCH1")
Sem.AStructure("W2hwnday1YP = (i3_aI) + (1) HW2 + (1) e17")
Sem.AStructure("r_W2hwdoYP = () + (3b) HW2 + (1) e18")
Sem.AStructure("r_W1yys1YP = (i4_a) + (1) SCH1 + (1) e19")
Sem.AStructure("W1yys4YP = (i4_b) + (4b) SCH1 + (1) e20")
Sem.AStructure("W1yys9YP = (i4_c) + (4c) SCH1 + (1) e21")
Sem.AStructure("r_W1yys6YP = (i4_d) + (4d) SCH1 + (1) e22")
Sem.AStructure("SCH2 = (0) + SCH1 + (1) D5 + (a3I) FAMCIRC1 + (m2m3I) HW1 + (m4m3I) TCH1 + (d3I) YPEX1 + (m1m3I) PAR1")
Sem.AStructure("r_W2YYS1YP = (i4_a) + (1) SCH2 + (1) e23")
Sem.AStructure("W2YYS4YP = (i4_b) + (4b) SCH2 + (1) e24")
Sem.AStructure("W2YYS9YP = (i4_c) + (4c) SCH2 + (1) e25")
Sem.AStructure("r_W2YYS6YP = (i4_d) + (4d) SCH2 + (1) e26")
Sem.AStructure("SCH3 = (fi_3I) + SCH2 + (1) D6 + (a3I2) FAMCIRC2 + (d3I2) YPEX2 + (m4m3I2) TCH2 + (m1m3I2) PAR2 + (m2m3I2) HW2")
Sem.AStructure("r_W3yys1YP = (i4_a) + (1) SCH3 + (1) e27")
Sem.AStructure("W3yys4YP = (i4_b) + (4b) SCH3 + (1) e28")
Sem.AStructure("W3yys9YP = (i4_c) + (4c) SCH3 + (1) e29")
Sem.AStructure("r_W3yys6YP = (i4_d) + (4d) SCH3 + (1) e30")
Sem.AStructure("r_W1yys15YP = (i5_a) + (1) TCH1 + (1) e31")
Sem.AStructure("r_W1yys16YP = (i5_b) + (5b) TCH1 + (1) e32")
Sem.AStructure("r_W1yys18YP = (i5_c) + (5c) TCH1 + (1) e33")
Sem.AStructure("r_W1yys19YP = (i5_d) + (5d) TCH1 + (1) e34")
Sem.AStructure("TCH2 = (0) + TCH1 + (1) D7 + (a4I) FAMCIRC1 + (m3m4I) SCH1 + (d4I) YPEX1 + (m1m4I) PAR1 + (m2m4I) HW1")
Sem.AStructure("r_W2yys15YP = (i5_a) + (1) TCH2 + (1) e35")
Sem.AStructure("r_W2yys16YP = (i5_b) + (5b) TCH2 + (1) e36")
Sem.AStructure("r_W2yys18YP = (i5_c) + (5c) TCH2 + (1) e37")
Sem.AStructure("r_W2yys19YP = (i5_d) + (5d) TCH2 + (1) e38")
Sem.AStructure("r_W1hlikeYP = (i6_aI) + (6a) YPEX1 + (1) e39")
Sem.AStructure("r_W1heposs9YP = (i6_bI) + (1) YPEX1 + (1) e40")
Sem.AStructure("YPEX2 = (0) + YPEX1 + (1) D8 + (b4I) TCH1 + (b3I) SCH1 + (b2I) HW1 + (b1I) PAR1")
Sem.AStructure("r_W2hlikeYP = (i6_aI) + (6a) YPEX2 + (1) e41")
Sem.AStructure("r_W2heposs9YP = (i6_bI) + (1) YPEX2 + (1) e42")
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Sem.AStructure("YPEX3 = (fi_l) + YPEX2 + (1) D9 + (b1l2) PAR2 + (b2l2) HW2 + (b3l2) SCH2 + (b4l2) TCH2 + (cΞ„Ξ™) FAMCIRC1")
Sem.AStructure("r_W3hlikeYP = (i6_al) + (6a) YPEX3 + (1) e43")
Sem.AStructure("r_W3heposs9YP = (i6_bl) + (1) YPEX3 + (1) e44")
Sem.AStructure("e5 <--> e1")
Sem.AStructure("e6 <--> e2")
Sem.AStructure("e7 <--> e3")
Sem.AStructure("e8 <--> e4")
Sem.AStructure("FAMCIRC1 <--> YPEX1")
Sem.AStructure("PAR1 <--> YPEX1")
Sem.AStructure("HW1 <--> YPEX1")
Sem.AStructure("SCH1 <--> YPEX1")
Sem.AStructure("TCH1 <--> YPEX1")
Sem.AStructure("SCH1 <--> TCH1")
Sem.AStructure("HW1 <--> TCH1")
Sem.AStructure("PAR1 <--> TCH1")
Sem.AStructure("FAMCIRC1 <--> TCH1")
Sem.AStructure("HW1 <--> SCH1")
Sem.AStructure("PAR1 <--> SCH1")
Sem.AStructure("FAMCIRC1 <--> SCH1")
Sem.AStructure("PAR1 <--> HW1")
Sem.AStructure("FAMCIRC1 <--> HW1")
Sem.AStructure("FAMCIRC1 <--> PAR1")
Sem.AStructure("e12 <--> e10")
Sem.AStructure("e14 <--> e12")
Sem.AStructure("e18 <--> e16")
Sem.AStructure("e23 <--> e19")
Sem.AStructure("e24 <--> e20")
Sem.AStructure("e25 <--> e21")
Sem.AStructure("e26 <--> e22")
Sem.AStructure("e27 <--> e23")
Sem.AStructure("e28 <--> e24")
Sem.AStructure("e29 <--> e25")
Sem.AStructure("e35 <--> e31")
Sem.AStructure("e37 <--> e33")
Sem.AStructure("e41 <--> e39")
Sem.AStructure("e43 <--> e41")
Sem.AStructure("e5 <--> e2")
Sem.AStructure("e13 <--> e9")
Sem.AStructure("e14 <--> e10")
Sem.AStructure("e22 <--> e19")
Sem.AStructure("e30 <--> e27")
Sem.AStructure("e27 <--> e26")
Sem.AStructure("e30 <--> e23")
Sem.AStructure("e29 <--> e21 (M2)")
Sem.AStructure("e32 <--> e31")
Sem.AStructure("e36 <--> e35")
Sem.AStructure("e38 <--> e37")
Sem.AStructure("e43 <--> e39")
Sem.AStructure("e43 <--> e40")
Sem.AStructure("D7 <--> D5")
Sem.AStructure("e26 <--> e23")
Sem.AStructure("e37 <--> SCH1")
Sem.AStructure("e33 <--> SCH1")
Sem.AStructure("e41 <--> e26")
Sem.AStructure("e25 <--> e24")
Sem.AStructure("TCH1 <--> e18")
Sem.AStructure("D5 <--> e17")
Sem.AStructure("e11 <--> e8")
Sem.AStructure("SCH1 <--> e5")
Sem.AStructure("SCH1 <--> e8")
Sem.AStructure("e20 <--> e8")
Sem.AStructure("D8 <--> e18")
Sem.AStructure("e42 <--> e12")
Sem.AStructure("D4 <--> e7")
Sem.AStructure("TCH1 <--> e20")
Sem.AStructure("SCH1 <--> e24")
Sem.AStructure("e12 <--> FAMCIRC1")
Sem.AStructure("e12 <--> e11")
Sem.AStructure("D9 <--> e19")
Sem.AStructure("e41 <--> e1")
Sem.AStructure("D9 <--> D6")
Sem.AStructure("e41 <--> e25")
Sem.BeginGroup("G:\New Thesis\multigroup comparisons\FINAL\..\..\covariance_pakistani_new_listwise.sav", "covariance_pakistani_new_listwise"  )
Sem.GroupName("PAKISTANI")
Sem.AStructure("r_W1nsseccatdad = (i1_a) + (1) FAMCIRC1 + (1) e1")
Sem.AStructure("r_W1nssecmum = (i1_bP) + (1b) FAMCIRC1 + (1) e2")
Sem.AStructure("HHdepW1 = (i1_cP) + (1c) FAMCIRC1 + (1) e3")
Sem.AStructure("W1GrssyrHHbands = () + (1d) FAMCIRC1 + (1) e4")
Sem.AStructure("FAMCIRC2 = (0) + FAMCIRC1 + (1) D1")
Sem.AStructure("r_W2nsseccatdad = (i1_a) + (1) FAMCIRC2 + (1) e5")
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Sem.AStructure("r_W2nssecmum = (i1_bP) + (1b) FAMCIRC2 + (1) e6")
Sem.AStructure("HHdepW2 = (i1_cP) + (1c) FAMCIRC2 + (1) e7")
Sem.AStructure("W2GrssyrHHbands = () + (1d) FAMCIRC2 + (1) e8")
Sem.AStructure("W1parqualMP = (i2_a) + (1) PAR1 + (1) e9")
Sem.AStructure("r_W1kiddifMP = (i2_bP) + (2b) PAR1 + (1) e10")
Sem.AStructure("PAR2 = (fi_P2) + PAR1 + (1) D2 + (a1P) FAMCIRC1 + (m2m1P) HW1 + (d1P) YPEX1 + (m3m1P) SCH1 + (m4m1P) TCH1")
Sem.AStructure("W2parqualMP = (i2_a) + (1) PAR2 + (1) e11")
Sem.AStructure("r_W2kiddifMP = (i2_bP) + (2b) PAR2 + (1) e12")
Sem.AStructure("PAR3 = (fi_P3) + PAR2 + (1) D3 + (a12P) FAMCIRC2 + (d1P2) YPEX2 + (m2m1P2) HW2 + (m3m1P2) SCH2 + (m4m1P2) TCH2")
Sem.AStructure("W3parqualMP = (i2_a) + (1) PAR3 + (1) e13")
Sem.AStructure("r_W3kiddifMP = (i2_bP) + (2b) PAR3 + (1) e14")
Sem.AStructure("W1hwndayYP = (i3_a) + (1) HW1 + (1) e15")
Sem.AStructure("r_W1hwdoYP = (i3_b) + (3b) HW1 + (1) e16")
Sem.AStructure("HW2 = (0) + HW1 + (1) D4 + (a2P) FAMCIRC1 + (m1m2P) PAR1 + (m3m2P) SCH1 + (d2P) YPEX1 + TCH1")
Sem.AStructure("W2hwnday1YP = (i3_a) + (1) HW2 + (1) e17")
Sem.AStructure("r_W2hwdoYP = (i3_b) + (3b) HW2 + (1) e18")
Sem.AStructure("r_W1yys1YP = () + (1) SCH1 + (1) e19")
Sem.AStructure("W1yys4YP = (i4_b) + (4b) SCH1 + (1) e20")
Sem.AStructure("W1yys9YP = () + (4c) SCH1 + (1) e21")
Sem.AStructure("r_W1yys6YP = (i4_d) + (4d) SCH1 + (1) e22")
Sem.AStructure("SCH2 = (0) + SCH1 + (1) D5 + (a3P) FAMCIRC1 + (m2m3P) HW1 + (m4m3P) TCH1 + (d3P) YPEX1 + (m1m3P) PAR1")
Sem.AStructure("r_W2YYS1YP = () + (1) SCH2 + (1) e23")
Sem.AStructure("W2YYS4YP = (i4_b) + (4b) SCH2 + (1) e24")
Sem.AStructure("W2YYS9YP = (i4_c) + (4c) SCH2 + (1) e25")
Sem.AStructure("r_W2YYS6YP = (i4_d) + (4d) SCH2 + (1) e26")
Sem.AStructure("SCH3 = (fi_3P) + SCH2 + (1) D6 + (a3P2) FAMCIRC2 + (d3P2) YPEX2 + (m4m3P2) TCH2 + (m1m3P2) PAR2 + (m2m3P2) HW2")
Sem.AStructure("r_W3yys1YP = () + (1) SCH3 + (1) e27")
Sem.AStructure("W3yys4YP = (i4_b) + (4b) SCH3 + (1) e28")
Sem.AStructure("W3yys9YP = (i4_c) + (4c) SCH3 + (1) e29")
Sem.AStructure("r_W3yys6YP = (i4_d) + (4d) SCH3 + (1) e30")
Sem.AStructure("r_W1yys15YP = (i5_a) + (1) TCH1 + (1) e31")
Sem.AStructure("r_W1yys16YP = (i5_b) + (5b) TCH1 + (1) e32")
Sem.AStructure("r_W1yys18YP = (i5_c) + (5c) TCH1 + (1) e33")
Sem.AStructure("r_W1yys19YP = (i5_d) + (5d) TCH1 + (1) e34")
Sem.AStructure("TCH2 = (0) + TCH1 + (1) D7 + (a4P) FAMCIRC1 + (m3m4P) SCH1 + (d4P) YPEX1 + (m1m4P) PAR1 + (m2m4P) HW1")
Sem.AStructure("r_W2yys15YP = (i5_a) + (1) TCH2 + (1) e35")
Sem.AStructure("r_W2yys16YP = (i5_b) + (5b) TCH2 + (1) e36")
Sem.AStructure("r_W2yys18YP = (i5_c) + (5c) TCH2 + (1) e37")
Sem.AStructure("r_W2yys19YP = (i5_d) + (5d) TCH2 + (1) e38")
Sem.AStructure("r_W1hlikeYP = (i6_a) + (6a) YPEX1 + (1) e39")
Sem.AStructure("r_W1heposs9YP = (i6_b) + (1) YPEX1 + (1) e40")
Sem.AStructure("YPEX2 = (0) + YPEX1 + (1) D8 + (b4P) TCH1 + (b3P) SCH1 + (b2P) HW1 + (b1P) PAR1")
Sem.AStructure("r_W2hlikeYP = (i6_a) + (6a) YPEX2 + (1) e41")
Sem.AStructure("r_W2heposs9YP = (i6_b) + (1) YPEX2 + (1) e42")
Sem.AStructure("YPEX3 = (0) + YPEX2 + (1) D9 + (b1P2) PAR2 + (b2P2) HW2 + (b3P2) SCH2 + (b4P2) TCH2 + (cΞ„P) FAMCIRC1")
Sem.AStructure("r_W3hlikeYP = (i6_a) + (6a) YPEX3 + (1) e43")
Sem.AStructure("r_W3heposs9YP = (i6_b) + (1) YPEX3 + (1) e44")
Sem.AStructure("e5 <--> e1")
Sem.AStructure("e6 <--> e2")
Sem.AStructure("e7 <--> e3")
Sem.AStructure("e8 <--> e4")
Sem.AStructure("FAMCIRC1 <--> YPEX1")
Sem.AStructure("PAR1 <--> YPEX1")
Sem.AStructure("HW1 <--> YPEX1")
Sem.AStructure("SCH1 <--> YPEX1")
Sem.AStructure("TCH1 <--> YPEX1")
Sem.AStructure("SCH1 <--> TCH1")
Sem.AStructure("HW1 <--> TCH1")
Sem.AStructure("PAR1 <--> TCH1")
Sem.AStructure("FAMCIRC1 <--> TCH1")
Sem.AStructure("HW1 <--> SCH1")
Sem.AStructure("PAR1 <--> SCH1")
Sem.AStructure("FAMCIRC1 <--> SCH1")
Sem.AStructure("PAR1 <--> HW1")
Sem.AStructure("FAMCIRC1 <--> HW1")
Sem.AStructure("FAMCIRC1 <--> PAR1")
Sem.AStructure("e11 <--> e9")
Sem.AStructure("e12 <--> e10")
Sem.AStructure("e14 <--> e12")
Sem.AStructure("e18 <--> e16")
Sem.AStructure("e35 <--> e31")
Sem.AStructure("e36 <--> e32")
Sem.AStructure("e37 <--> e33")
Sem.AStructure("e41 <--> e39")
Sem.AStructure("e43 <--> e41")
Sem.AStructure("e3 <--> e2")
Sem.AStructure("e13 <--> e9")
Sem.AStructure("e14 <--> e10")
Sem.AStructure("e27 <--> e19")
Sem.AStructure("e28 <--> e20")
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Sem.AStructure("e29 <--> e21")
Sem.AStructure("e30 <--> e22")
Sem.AStructure("e24 <--> e20")
Sem.AStructure("e25 <--> e21")
Sem.AStructure("e28 <--> e24")
Sem.AStructure("e29 <--> e25")
Sem.AStructure("e22 <--> e19")
Sem.AStructure("e21 <--> e20")
Sem.AStructure("e26 <--> e23")
Sem.AStructure("e29 <--> e28")
Sem.AStructure("e30 <--> e27")
Sem.AStructure("e32 <--> e31")
Sem.AStructure("e34 <--> e33")
Sem.AStructure("e36 <--> e35")
Sem.AStructure("e38 <--> e37")
Sem.AStructure("e43 <--> e39")
Sem.AStructure("D7 <--> D5")
Sem.AStructure("D2 <--> e4")
Sem.AStructure("e27 <--> e4")
Sem.AStructure("e11 <--> e1")
Sem.AStructure("D7 <--> D4")
Sem.AStructure("D9 <--> D6")
Sem.AStructure("e33 <--> SCH1")
Sem.AStructure("TCH1 <--> e29")
Sem.AStructure("e38 <--> e29")
Sem.AStructure("e24 <--> e18")
Sem.AStructure("D7 <--> e17")
Sem.AStructure("e38 <--> e11")
Sem.AStructure("e23 <--> e10")
Sem.AStructure("e36 <--> e9")
Sem.AStructure("D3 <--> e8")
Sem.AStructure("e38 <--> e8")
Sem.AStructure("e29 <--> e8")
Sem.AStructure("D8 <--> e4")
Sem.AStructure("SCH1 <--> e37")
Sem.AStructure("e24 <--> e22")
Sem.AStructure("e33 <--> e4")
Sem.AStructure("D7 <--> e7")
Sem.AStructure("e10 <--> e3")
Sem.AStructure("e18 <--> e10")
Sem.AStructure("e4 <--> e1")
Sem.AStructure("D9 <--> e30")
Sem.AStructure("e42 <--> FAMCIRC1")
Sem.AStructure("e23 <--> FAMCIRC1")
Sem.AStructure("e20 <--> e7")
Sem.AStructure("e6 <--> e4")
Sem.AStructure("e8 <--> e2")
Sem.AStructure("e43 <--> e37")
Sem.AStructure("e39 <--> e34")
Sem.AStructure("D9 <--> e26")
Sem.AStructure("e43 <--> e21")
Sem.AStructure("e35 <--> e16")
Sem.AStructure("D1 (0,002)")
Sem.BeginGroup("G:\New Thesis\multigroup comparisons\FINAL\..\..\covariance_bangladeshi_new_listwise.sav", "covariance_bangladeshi_new_listwise")
Sem.GroupName("BANGLADESHI")
Sem.AStructure("r_W1nsseccatdad = (i1_a) + (1) FAMCIRC1 + (1) e1")
Sem.AStructure("r_W1nssecmum = (i1_bB) + (bg_1b) FAMCIRC1 + (1) e2")
Sem.AStructure("HHdepW1 = (i1_cB) + (1c) FAMCIRC1 + (1) e3")
Sem.AStructure("W1GrssyrHHbands = () + (1d) FAMCIRC1 + (1) e4")
Sem.AStructure("FAMCIRC2 = (0) + FAMCIRC1 + (1) D1")
Sem.AStructure("r_W2nsseccatdad = (i1_a) + (1) FAMCIRC2 + (1) e5")
Sem.AStructure("r_W2nssecmum = (i1_bB) + (bg_1b) FAMCIRC2 + (1) e6")
Sem.AStructure("HHdepW2 = (i1_cB) + (1c) FAMCIRC2 + (1) e7")
Sem.AStructure("W2GrssyrHHbands = () + (1d) FAMCIRC2 + (1) e8")
Sem.AStructure("W1parqualMP = (i2_aB) + (1) PAR1 + (1) e9")
Sem.AStructure("r_W1kiddifMP = (i2_bB) + (2b) PAR1 + (1) e10")
Sem.AStructure("PAR2 = (0) + PAR1 + (1) D2 + (a1B) FAMCIRC1 + (m2m1B) HW1 + (d1B) YPEX1 + (m3m1B) SCH1 + (m4m1B) TCH1")
Sem.AStructure("W2parqualMP = (i2_aB) + (1) PAR2 + (1) e11")
Sem.AStructure("r_W2kiddifMP = (i2_bB) + (ban_2b) PAR2 + (1) e12")
Sem.AStructure("PAR3 = (0) + PAR2 + (1) D3 + (a12B) FAMCIRC2 + (d1B2) YPEX2 + (m3m1B2) SCH2 + (m4m1B2) TCH2 + (m2m1B2) HW2")
Sem.AStructure("W3parqualMP = (i2_aB) + (1) PAR3 + (1) e13")
Sem.AStructure("r_W3kiddifMP = (i2_bB) + (2b) PAR3 + (1) e14")
Sem.AStructure("W1hwndayYP = (i3_a) + (1) HW1 + (1) e15")
Sem.AStructure("r_W1hwdoYP = (i3_b) + (3b) HW1 + (1) e16")
Sem.AStructure("HW2 = (0) + HW1 + (1) D4 + (a2B) FAMCIRC1 + (m1m2B) PAR1 + (m3m2B) SCH1 + (d2B) YPEX1 + TCH1")
Sem.AStructure("W2hwnday1YP = (i3_a) + (1) HW2 + (1) e17")
Sem.AStructure("r_W2hwdoYP = (i3_b) + (3b) HW2 + (1) e18")
Sem.AStructure("r_W1yys1YP = (i4_a) + (1) SCH1 + (1) e19")
Sem.AStructure("W1yys4YP = (i4_b) + (4b) SCH1 + (1) e20")
Sem.AStructure("W1yys9YP = (i4_c) + SCH1 + (1) e21")
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Sem.AStructure("r_W1yys6YP = (i4_d) + (4d) SCH1 + (1) e22")
Sem.AStructure("SCH2 = (fi_2B) + SCH1 + (1) D5 + (a3B) FAMCIRC1 + (m2m3B) HW1 + (m4m3B) TCH1 + (d3B) YPEX1 + (m1m3B) PAR1")
Sem.AStructure("r_W2YYS1YP = (i4_a) + (1) SCH2 + (1) e23")
Sem.AStructure("W2YYS4YP = (i4_b) + (4b) SCH2 + (1) e24")
Sem.AStructure("W2YYS9YP = (i4_c) + (4c) SCH2 + (1) e25")
Sem.AStructure("r_W2YYS6YP = (i4_d) + (4d) SCH2 + (1) e26")
Sem.AStructure("SCH3 = (fi_3B) + SCH2 + (1) D6 + (a3B2) FAMCIRC2 + (d3B2) YPEX2 + (m1m3B2) PAR2 + (m2m3B2) HW2 + (m4m3B2) TCH2")
Sem.AStructure("r_W3yys1YP = (i4_a) + (1) SCH3 + (1) e27")
Sem.AStructure("W3yys4YP = (i4_b) + (4b) SCH3 + (1) e28")
Sem.AStructure("W3yys9YP = (i4_c) + (4c) SCH3 + (1) e29")
Sem.AStructure("r_W3yys6YP = (i4_d) + (4d) SCH3 + (1) e30")
Sem.AStructure("r_W1yys15YP = (i5_a) + (1) TCH1 + (1) e31")
Sem.AStructure("r_W1yys16YP = (i5_b) + (5b) TCH1 + (1) e32")
Sem.AStructure("r_W1yys18YP = (i5_c) + (5c) TCH1 + (1) e33")
Sem.AStructure("r_W1yys19YP = (i5_d) + (5d) TCH1 + (1) e34")
Sem.AStructure("TCH2 = (0) + TCH1 + (1) D7 + (a4B) FAMCIRC1 + (m3m4B) SCH1 + (d4B) YPEX1 + (m1m4B) PAR1 + (m2m4B) HW1")
Sem.AStructure("r_W2yys15YP = (i5_a) + (1) TCH2 + (1) e35")
Sem.AStructure("r_W2yys16YP = () + (5b) TCH2 + (1) e36")
Sem.AStructure("r_W2yys18YP = (i5_c) + (5c) TCH2 + (1) e37")
Sem.AStructure("r_W2yys19YP = (i5_d) + (5d) TCH2 + (1) e38")
Sem.AStructure("r_W1hlikeYP = (i6_a) + (6a) YPEX1 + (1) e39")
Sem.AStructure("r_W1heposs9YP = (i6_b) + (1) YPEX1 + (1) e40")
Sem.AStructure("YPEX2 = (0) + YPEX1 + (1) D8 + (b4B) TCH1 + (b3B) SCH1 + (b2B) HW1 + (b1B) PAR1")
Sem.AStructure("r_W2hlikeYP = (i6_a) + (6a) YPEX2 + (1) e41")
Sem.AStructure("r_W2heposs9YP = (i6_b) + (1) YPEX2 + (1) e42")
Sem.AStructure("YPEX3 = (0) + YPEX2 + (1) D9 + (b1B2) PAR2 + (b2B2) HW2 + (b3B2) SCH2 + (b4B2) TCH2 + (c'Ξ’) FAMCIRC1")
Sem.AStructure("r_W3hlikeYP = (i6_a) + (6a) YPEX3 + (1) e43")
Sem.AStructure("r_W3heposs9YP = (i6_b) + (1) YPEX3 + (1) e44")
Sem.AStructure("e5 <--> e1")
Sem.AStructure("e6 <--> e2")
Sem.AStructure("e7 <--> e3")
Sem.AStructure("e8 <--> e4")
Sem.AStructure("FAMCIRC1 <--> YPEX1")
Sem.AStructure("PAR1 <--> YPEX1")
Sem.AStructure("HW1 <--> YPEX1")
Sem.AStructure("SCH1 <--> YPEX1")
Sem.AStructure("TCH1 <--> YPEX1")
Sem.AStructure("SCH1 <--> TCH1")
Sem.AStructure("HW1 <--> TCH1")
Sem.AStructure("PAR1 <--> TCH1")
Sem.AStructure("FAMCIRC1 <--> TCH1")
Sem.AStructure("HW1 <--> SCH1")
Sem.AStructure("PAR1 <--> SCH1")
Sem.AStructure("FAMCIRC1 <--> SCH1")
Sem.AStructure("PAR1 <--> HW1")
Sem.AStructure("FAMCIRC1 <--> HW1")
Sem.AStructure("FAMCIRC1 <--> PAR1")
Sem.AStructure("e12 <--> e10")
Sem.AStructure("e14 <--> e12")
Sem.AStructure("e18 <--> e16")
Sem.AStructure("e23 <--> e19")
Sem.AStructure("e24 <--> e20")
Sem.AStructure("e25 <--> e21")
Sem.AStructure("e27 <--> e23")
Sem.AStructure("e28 <--> e24")
Sem.AStructure("e29 <--> e25")
Sem.AStructure("e35 <--> e31")
Sem.AStructure("e36 <--> e32")
Sem.AStructure("e37 <--> e33")
Sem.AStructure("e38 <--> e34")
Sem.AStructure("e41 <--> e39")
Sem.AStructure("e43 <--> e41")
Sem.AStructure("e3 <--> e2")
Sem.AStructure("e7 <--> e5")
Sem.AStructure("e14 <--> e10")
Sem.AStructure("e28 <--> e20 (M2)")
Sem.AStructure("e22 <--> e19")
Sem.AStructure("e21 <--> e20")
Sem.AStructure("e26 <--> e23")
Sem.AStructure("e25 <--> e24")
Sem.AStructure("e29 <--> e28")
Sem.AStructure("e30 <--> e27")
Sem.AStructure("e32 <--> e31")
Sem.AStructure("e34 <--> e33")
Sem.AStructure("e36 <--> e35")
Sem.AStructure("e38 <--> e37")
Sem.AStructure("D7 <--> D5")
Sem.AStructure("e13 <--> e9")
Sem.AStructure("D8 <--> D7")
Sem.AStructure("D8 <--> e38")
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Sem.AStructure("D8 <--> e12")
Sem.AStructure("e44 <--> e12")
Sem.AStructure("e31 <--> e12")
Sem.AStructure("e31 <--> e9")
Sem.AStructure("e41 <--> e8")
Sem.AStructure("e27 <--> e4")
Sem.AStructure("e13 <--> e1")
Sem.AStructure("e12 <--> e1")
Sem.AStructure("D8 <--> D5")
Sem.AStructure("e22 <--> e14")
Sem.AStructure("TCH1 <--> e21")
Sem.AStructure("e33 <--> SCH1")
Sem.AStructure("D9 <--> e30")
Sem.AStructure("D5 <--> e21")
Sem.AStructure("e40 <--> e20")
Sem.AStructure("D8 <--> e11")
Sem.AStructure("e33 <--> e11")
Sem.AStructure("e27 <--> e8")
Sem.AStructure("e32 <--> e27")
Sem.AStructure("e37 <--> e25")
Sem.AStructure("e34 <--> e14")
Sem.AStructure("e31 <--> e8")
Sem.AStructure("e43 <--> e5")
Sem.AStructure("e9 (v_aB)")
Sem.AStructure("e10 (v_bB)")
Sem.AStructure("e11 (v_aB)")
Sem.AStructure("e12 (v_bB)")
Sem.AStructure("e13 (v_aB)")
Sem.AStructure("e14 (v_bB)")
Sem.AStructure("SCH1 (0,22)")
Sem.AStructure("D1 (0,001)")
Sem.BeginGroup("G:\New Thesis\multigroup comparisons\FINAL\..\..\covariance_blackcaribbean_new_listwise.sav", "covariance_blackcaribbean_new_listwise")
Sem.GroupName("BLACKCARIBBEAN")
Sem.AStructure("r_W1nsseccatdad = (i1_a) + (1) FAMCIRC1 + (1) e1")
Sem.AStructure("r_W1nssecmum = (i1_b) + (1b) FAMCIRC1 + (1) e2")
Sem.AStructure("HHdepW1 = (i1_c) + (1c) FAMCIRC1 + (1) e3")
Sem.AStructure("W1GrssyrHHbands = () + (1d) FAMCIRC1 + (1) e4")
Sem.AStructure("FAMCIRC2 = (0) + FAMCIRC1 + (1) D1")
Sem.AStructure("r_W2nsseccatdad = (i1_a) + (1) FAMCIRC2 + (1) e5")
Sem.AStructure("r_W2nssecmum = (i1_b) + (1b) FAMCIRC2 + (1) e6")
Sem.AStructure("HHdepW2 = (i1_c) + (1c) FAMCIRC2 + (1) e7")
Sem.AStructure("W2GrssyrHHbands = () + (1d) FAMCIRC2 + (1) e8")
Sem.AStructure("W1parqualMP = (i2_a) + (1) PAR1 + (1) e9")
Sem.AStructure("r_W1kiddifMP = (i2_bBC) + (2b) PAR1 + (1) e10")
Sem.AStructure("PAR2 = (0) + PAR1 + (1) D2 + (a1BC) FAMCIRC1 + (m2m1BC) HW1 + (d1BC) YPEX1 + (m3m1BC) SCH1 + (m4m1BC) TCH1")
Sem.AStructure("W2parqualMP = (i2_a) + (1) PAR2 + (1) e11")
Sem.AStructure("r_W2kiddifMP = (i2_bBC) + (2b) PAR2 + (1) e12")
Sem.AStructure("PAR3 = (0) + PAR2 + (1) D3 + (a12BC) FAMCIRC2 + (d1BC2) YPEX2 + (m2m1BC2) HW2 + (m3m1BC2) SCH2 + (m4m1BC2) TCH2")
Sem.AStructure("W3parqualMP = (i2_a) + (1) PAR3 + (1) e13")
Sem.AStructure("r_W3kiddifMP = (i2_bBC) + (2b) PAR3 + (1) e14")
Sem.AStructure("W1hwndayYP = (i3_a) + (1) HW1 + (1) e15")
Sem.AStructure("r_W1hwdoYP = (i3_b) + (3b) HW1 + (1) e16")
Sem.AStructure("HW2 = (fi_bc) + HW1 + (1) D4 + (a2BC) FAMCIRC1 + (m1m2BC) PAR1 + (m3m2BC) SCH1 + (d2BC) YPEX1 + (m4m2BC) TCH1")
Sem.AStructure("W2hwnday1YP = (i3_a) + (1) HW2 + (1) e17")
Sem.AStructure("r_W2hwdoYP = (i3_b) + (3b) HW2 + (1) e18")
Sem.AStructure("r_W1yys1YP = (i4_a) + (1) SCH1 + (1) e19")
Sem.AStructure("W1yys4YP = (i4_b) + (4b) SCH1 + (1) e20")
Sem.AStructure("W1yys9YP = (i4_c) + (4c) SCH1 + (1) e21")
Sem.AStructure("r_W1yys6YP = (i4_d) + (4d) SCH1 + (1) e22")
Sem.AStructure("SCH2 = (fi_2BC) + SCH1 + (1) D5 + (a3BC) FAMCIRC1 + (m2m3BC) HW1 + (m4m3BC) TCH1 + (d3BC) YPEX1 + (m1m3BC) PAR1")
Sem.AStructure("r_W2YYS1YP = (i4_a) + (1) SCH2 + (1) e23")
Sem.AStructure("W2YYS4YP = (i4_b) + (4b) SCH2 + (1) e24")
Sem.AStructure("W2YYS9YP = (i4_c) + (4c) SCH2 + (1) e25")
Sem.AStructure("r_W2YYS6YP = (i4_d) + (4d) SCH2 + (1) e26")
Sem.AStructure("SCH3 = (0) + SCH2 + (1) D6 + (a3BC2) FAMCIRC2 + (d3BC2) YPEX2 + (m4m3BC2) TCH2 + (m1m3BC2) PAR2 + (m2m3BC2) HW2")
Sem.AStructure("r_W3yys1YP = (i4_a) + (1) SCH3 + (1) e27")
Sem.AStructure("W3yys4YP = (i4_b) + (4b) SCH3 + (1) e28")
Sem.AStructure("W3yys9YP = (i4_c) + (4c) SCH3 + (1) e29")
Sem.AStructure("r_W3yys6YP = (i4_d) + (4d) SCH3 + (1) e30")
Sem.AStructure("r_W1yys15YP = (i5_a) + (1) TCH1 + (1) e31")
Sem.AStructure("r_W1yys16YP = (i5_b) + (5b) TCH1 + (1) e32")
Sem.AStructure("r_W1yys18YP = () + (5c) TCH1 + (1) e33")
Sem.AStructure("r_W1yys19YP = (i5_d) + (5d) TCH1 + (1) e34")
Sem.AStructure("TCH2 = (fi_BC2) + TCH1 + (1) D7 + (a4BC) FAMCIRC1 + (m3m4BC) SCH1 + (d4BC) YPEX1 + (m1m4BC) PAR1 + (m2m4BC) HW1")
Sem.AStructure("r_W2yys15YP = (i5_a) + (1) TCH2 + (1) e35")
Sem.AStructure("r_W2yys16YP = (i5_b) + (5b) TCH2 + (1) e36")
Sem.AStructure("r_W2yys18YP = (i5_c) + (5c) TCH2 + (1) e37")
Sem.AStructure("r_W2yys19YP = (i5_d) + (5d) TCH2 + (1) e38")
Sem.AStructure("r_W1hlikeYP = (i6_a) + (6a) YPEX1 + (1) e39")
Sem.AStructure("r_W1heposs9YP = (i6_b) + (1) YPEX1 + (1) e40")
```

```
Sem.AStructure("YPEX2 = (0) + YPEX1 + (1) D8 + (b4BC) TCH1 + (b3BC) SCH1 + (b2BC) HW1 + (b1BC) PAR1")
Sem.AStructure("r_W2hlikeYP = (i6_a) + (6a) YPEX2 + (1) e41")
Sem.AStructure("r_W2heposs9YP = (i6_b) + (1) YPEX2 + (1) e42")
Sem.AStructure("YPEX3 = (0) + YPEX2 + (1) D9 + (b1BC2) PAR2 + (b2BC2) HW2 + (b3BC2) SCH2 + (b4BC2) TCH2 + (cΞ„BC) FAMCIRC1")
Sem.AStructure("r_W3hlikeYP = (i6_a) + (6a) YPEX3 + (1) e43"
Sem.AStructure("r_W3heposs9YP = (i6_b) + (1) YPEX3 + (1) e44")
Sem.AStructure("e5 <--> e1")
Sem.AStructure("e6 <--> e2")
Sem.AStructure("e7 <--> e3")
Sem.AStructure("e8 <--> e4")
Sem.AStructure("FAMCIRC1 <--> YPEX1")
Sem.AStructure("PAR1 <--> YPEX1")
Sem.AStructure("HW1 <--> YPEX1")
Sem.AStructure("SCH1 <--> YPEX1")
Sem.AStructure("TCH1 <--> YPEX1")
Sem.AStructure("SCH1 <--> TCH1")
Sem.AStructure("HW1 <--> TCH1")
Sem.AStructure("PAR1 <--> TCH1")
Sem.AStructure("FAMCIRC1 <--> TCH1")
Sem.AStructure("HW1 <--> SCH1")
Sem.AStructure("PAR1 <--> SCH1")
Sem.AStructure("FAMCIRC1 <--> SCH1")
Sem.AStructure("PAR1 <--> HW1")
Sem.AStructure("FAMCIRC1 <--> HW1")
Sem.AStructure("FAMCIRC1 <--> PAR1")
Sem.AStructure("e12 <--> e10")
Sem.AStructure("e14 <--> e12")
Sem.AStructure("e18 <--> e16")
Sem.AStructure("e24 <--> e20")
Sem.AStructure("e25 <--> e21")
Sem.AStructure("e27 <--> e23")
Sem.AStructure("e29 <--> e25")
Sem.AStructure("e35 <--> e31")
Sem.AStructure("e36 <--> e32")
Sem.AStructure("e37 <--> e33")
Sem.AStructure("e38 <--> e34")
Sem.AStructure("e2 <--> e1")
Sem.AStructure("e6 <--> e5")
Sem.AStructure("e14 <--> e10")
Sem.AStructure("e30 <--> e19")
Sem.AStructure("e22 <--> e19")
Sem.AStructure("e21 <--> e20")
Sem.AStructure("e26 <--> e23")
Sem.AStructure("e30 <--> e27")
Sem.AStructure("e32 <--> e31")
Sem.AStructure("e34 <--> e33")
Sem.AStructure("e36 <--> e35")
Sem.AStructure("e38 <--> e37")
Sem.AStructure("e43 <--> e39")
Sem.AStructure("e43 <--> e41")
Sem.AStructure("e44 <--> e43")
Sem.AStructure("e31 <--> e21")
Sem.AStructure("YPEX1 <--> e14")
Sem.AStructure("e13 <--> e6")
Sem.AStructure("e18 <--> e3")
Sem.AStructure("TCH1 <--> e16")
Sem.AStructure("e33 <--> e21")
Sem.AStructure("e37 <--> SCH1")
Sem.AStructure("e24 <--> e23")
Sem.AStructure("e38 <--> e20")
Sem.AStructure("e33 <--> e19")
Sem.AStructure("e38 <--> e27")
Sem.AStructure("D6 <--> e16")
Sem.AStructure("e15 (0,01)")
Sem.AStructure("e17 (0,01)")
Sem.AStructure("D1 (0,001)")
Sem.AStructure("D2 (0,001)")
Sem.AStructure("D3 (0,001)")
Sem.AStructure("D9 (0,01)")
Sem.Model("Default model", "")
End Sub
Sub AnalysisProperties(Sem As AmosEngine)
Sem.Iterations(50)
Sem.InputUnbiasedMoments
Sem.FitMLMoments
Sem.Standardized
Sem.Smc
Sem.TotalEffects
Sem.Mods( 4)
Sem.Seed(1)
```

```
End Sub
End Module
```

A2.2 SPSS Syntax: Conversion of a correlation matrix into an augmented covariance matrix (in this case for the white n=1000 sample)

```
DATASET ACTIVATE DataSet13.
CORRELATIONS HHdepW1 HHdepW2 r_W1heposs9YP r_W1hlikeYP r_W1kiddifMP r_W1nsseccatdad r_W1nssecmum r_W1parasp1MP r_W1parasp2MP
r_W1plann16YP r_W1plast16YP r_W1yys11YP r_W1yys15YP r_W1yys16YP r_W1yys17YP r_W1yys18YP r_W1yys19YP r_W1yys1YP r_W1yys6YP
r_W2heposs9YP r_W2hlikeYP r_W2kiddifMP r_W2nsseccatdad r_W2nssecmum r_W2parasp1MP r_W2parasp2MP  r_W2plann16YP r_W2plast16YP
r_W2YYS11YP r_W2yys15YP r_W2yys16YP r_W2yys17YP r_W2yys18YP r_W2yys19YP r_W2YYS1YP r_W2YYS6YP r_W3heposs9YP r_W3hlikeYP
r_W3kiddifMP r_W3parasp1MP r_W3parasp2MP r_W3pareveMP r_W3plann16YP r_W3plast16YP r_W3schlifMP r_W3yys11YP r_W3yys1YP r_W3yys6YP
W1parqualMP W1yys9YP W1yys4YP W2YYS4YP W2YYS9YP W2parqualMP W3parqualMP W3yys4YP W3yys9YP W1GrssyrHHbands W2GrssyrHHbands
W1hwndayYP W2hwnday1YP r_W1hwdoYP r_W2hwdoYP r_W1hwdo1YP r_W2hwdo1YP r_W1schlifMP r_W2schlifMP W1advfamYP W2AdvFamYP
/MATRIX=OUT(*)
/MISSING=LISTWISE.
MCONVERT.
SELECT IF ROWTYPE_='COV'.
SAVE OUTFILE='F:\New Thesis\covariance_white_new_listwise.sav'.
EXECUTE.
```

A2.3 Multiple imputation syntax (shown here for the white n=1000 sample)

```
MULTIPLE IMPUTATION HHdepW1 HHdepW2 r_W1heposs9YP r_W1hlikeYP r_W1hwdo1YP r_W1hwdoYP r_W1kiddifMP r_W1nsseccatdad r_W1nssecmum
r_W1parasp1MP r_W1parasp2MP r_W1pareveMP r_W1plann16YP r_W1plast16YP r_W1schlifMP r_W1yys11YP r_W1yys15YP r_W1yys16YP
r_W1yys17YP r_W1yys18YP r_W1yys19YP r_W1yys1YP r_W1yys6YP r_W2heposs9YP r_W2hlikeYP r_W2hwdo1YP r_W2hwdoYP r_W2kiddifMP
r_W2nsseccatdad r_W2nssecmum r_W2parasp1MP r_W2parasp2MP r_W2pareveMP r_W2plann16YP r_W2plast16YP r_W2schlifMP r_W2YYS11YP
r_W2yys15YP r_W2yys16YP r_W2yys17YP r_W2yys18YP r_W2yys19YP r_W2YYS1YP r_W2YYS6YP r_W3heposs9YP r_W3hlikeYP r_W3kiddifMP
r_W3parasp1MP r_W3parasp2MP r_W3pareveMP r_W3plann16YP r_W3plast16YP r_W3schlifMP r_W3yys11YP r_W3yys1YP r_W3yys6YP W1advfamYP
W1GrssyrHHbands W1hiqualgmum W1hiqualmum W1hwndayYP W1parqualMP W1yys4YP W1yys9YP W2AdvFamYP W2GrssyrHHbands W2hiqualgmum
W2hwnday1YP W2parqualMP W2YYS4YP W2YYS9YP W3parqualMP W3yys4YP W3yys9YP wsumfefinW1 wsumfefinW2 wsumfefinW3 wsumfefnW1R
wsumfefnW2R wsumfefnW3R
  /ANALYSISWEIGHT W4Weight_MAIN
  /IMPUTE METHOD=FCS MAXITER= 10 NIMPUTATIONS=10 SCALEMODEL=LINEAR INTERACTIONS=NONE SINGULAR=1E-012
MAXPCTMISSING=NONE  MAXCASEDRAWS=109 MAXPARAMDRAWS=4
  /CONSTRAINTS HHdepW1( MIN=3.0 MAX=8.0)
  /CONSTRAINTS HHdepW2( MIN=2.0 MAX=8.0)
  /CONSTRAINTS r_W1heposs9YP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W1hlikeYP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W1hwdo1YP( MIN=1.0 MAX=2.0)
  /CONSTRAINTS r_W1hwdoYP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W1kiddifMP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W1nsseccatdad( MIN=1.0 MAX=8.0)
  /CONSTRAINTS r_W1nssecmum( MIN=1.0 MAX=8.0)
  /CONSTRAINTS r_W1parasp1MP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W1parasp2MP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W1pareveMP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W1plann16YP( MIN=1.0 MAX=2.0)
  /CONSTRAINTS r_W1plast16YP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W1schlifMP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W1yys11YP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W1yys15YP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W1yys16YP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W1yys17YP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W1yys18YP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W1yys19YP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W1yys1YP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W1yys6YP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W2heposs9YP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W2hlikeYP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W2hwdo1YP( MIN=1.0 MAX=2.0)
  /CONSTRAINTS r_W2hwdoYP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W2kiddifMP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W2nsseccatdad( MIN=1.0 MAX=8.0)
  /CONSTRAINTS r_W2nssecmum( MIN=1.0 MAX=8.0)
  /CONSTRAINTS r_W2parasp1MP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W2parasp2MP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W2pareveMP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W2plann16YP( MIN=1.0 MAX=2.0)
  /CONSTRAINTS r_W2plast16YP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W2schlifMP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W2YYS11YP( MIN=1.0 MAX=4.0)
  /CONSTRAINTS r_W2yys15YP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W2yys16YP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W2yys17YP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W2yys18YP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W2yys19YP( MIN=1.0 MAX=5.0)
  /CONSTRAINTS r_W2YYS1YP( MIN=1.0 MAX=4.0)
```

```
 /CONSTRAINTS r_W2YYS6YP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS r_W3heposs9YP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS r_W3hlikeYP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS r_W3kiddifMP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS r_W3parasp1MP( MIN=1.0 MAX=5.0)
 /CONSTRAINTS r_W3parasp2MP( MIN=1.0 MAX=5.0)
 /CONSTRAINTS r_W3pareveMP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS r_W3plann16YP( MIN=1.0 MAX=2.0)
 /CONSTRAINTS r_W3plast16YP( MIN=1.0 MAX=5.0)
 /CONSTRAINTS r_W3schlifMP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS r_W3yys11YP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS r_W3yys1YP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS r_W3yys6YP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS W1advfamYP( MIN=1.0)
 /CONSTRAINTS W1GrssyrHHbands( MIN=1.0 MAX=8.0)
 /CONSTRAINTS W1hiqualgmum( MIN=1.0 MAX=7.0)
 /CONSTRAINTS W1hiqualmum( MIN=1.0 MAX=20.0)
 /CONSTRAINTS W1hwndayYP( MIN=0.0 MAX=5.0)
 /CONSTRAINTS W1parqualMP( MIN=1.0 MAX=5.0)
 /CONSTRAINTS W1yys4YP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS W1yys9YP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS W2AdvFamYP( MIN=1.0 MAX=5.0)
 /CONSTRAINTS W2GrssyrHHbands( MIN=1.0 MAX=8.0)
 /CONSTRAINTS W2hiqualgmum( MIN=1.0 MAX=7.0)
 /CONSTRAINTS W2hwnday1YP( MIN=0.0)
 /CONSTRAINTS W2parqualMP( MIN=1.0 MAX=5.0)
 /CONSTRAINTS W2YYS4YP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS W2YYS9YP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS W3parqualMP( MIN=1.0 MAX=5.0)
 /CONSTRAINTS W3yys4YP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS W3yys9YP( MIN=1.0 MAX=4.0)
 /CONSTRAINTS wsumfefinW1( MIN=0.0 MAX=5.5)
 /CONSTRAINTS wsumfefinW2( MIN=0.0 MAX=4.8)
 /CONSTRAINTS wsumfefinW3( MIN=0.0 MAX=5.86)
 /CONSTRAINTS wsumfefnW1R( MIN=0.0 MAX=7.74)
 /CONSTRAINTS wsumfefnW2R( MIN=0.0 MAX=8.67)
 /CONSTRAINTS wsumfefnW3R( MIN=0.0 MAX=9.62)
 /MISSINGSUMMARIES NONE
 /IMPUTATIONSUMMARIES MODELS DESCRIPTIVES
 /OUTFILE IMPUTATIONS=NewThesis_covariance_White_new_listwise .
```

A2.4 Selection of datasets containing fully-productive mothers in LSYPE waves 1-3 (shown here only for the white group; identical syntax was used for the other groups)

```
DATASET COPY  NEWproper_109White_mothers.
DATASET ACTIVATE  NEWproper_109White_mothers.
FILTER OFF.
USE ALL.
SELECT IF (W1ethgrpmum = 1 & W2ethgrpmum = 1 & W3ethgrpmum = 1 & w4ethgrpmum = 1).
EXECUTE.
DATASET ACTIVATE  DataSet1.
DATASET ACTIVATE NEWproper_109White_mothers.
SAVE OUTFILE='F:\New Thesis\NewThesis_109_White_mothers.sav'
 /COMPRESSED.
```

A2.5 Selection of 1000 randomly-selected cases of white mothers

```
DATASET COPY  NEWproper_109WhiteR_mothers.
DATASET ACTIVATE  NEWproper_109WhiteR_mothers.
FILTER OFF.
USE ALL.
SAMPLE  1000 from 7578.
EXECUTE.
DATASET ACTIVATE  DataSet1.
DATASET ACTIVATE NEWproper_109WhiteR_mothers.
SAVE OUTFILE='F:\New Thesis\NewThesis_109_White_1000_mothers.sav'
 /COMPRESSED.
```

Appendix 3 Rationale and sequence of tests of invariance

Typically evaluations are carried out under CFA for a multigroup set of comparisons, although latent growth curve and MIMIC models also permit such tests. Testing equivalence in latent means and intercepts requires a means and covariance structures (MACS) framework (Little, 1997). For any number of constructs to be compared, the hypothesis that their unconstrained covariance structures are equivalent (H_o: $\mathbf{\Sigma}_k = \mathbf{\Sigma}$) for *k* groups is tested first. If we fail to reject the null hypothesis of covariance equivalence, then no further tests are warranted (Vandenberg and Lance, 2000, p. 36). For some scholars this omnibus test is uninformative (Byrne, Shavelson and Muthén, 1989) and potentially misleading (Byrne, 2004). For others, it is a prerequisite for all other tests (Alwin and Jackson, 1981; Bagozzi and Edwards, 1998; Horn and McArdle, 1992). However, if we reject the null hypothesis, a series of increasingly restrictive tests are undertaken to isolate the source of noninvariance. These tests typically include those for configural, metric, scalar and other types of factorial invariance. These procedures are described below.

The first of these is a test of *configural invariance*. Configural invariance (also called 'weak' factorial invariance, see Horn and McArdle, 1992; Meredith, 1993) assumes that identical factor patterns of fixed and free factor loadings are specified for each group (Vandenberg and Lance, 2000). Covariance structures of *k* groups must be tested simultaneously for overall model fit. This is done by inputting a single augmented covariance matrix (see chapter 4) that includes all the time-specific covariances or separate covariance matrices for multiple group analysis. The major advantage of the single augmented matrix is that it allows modelling of indicator covariances which cannot be done when separate matrices are used. A disadvantage is that a single matrix runs higher risks of being *nondefinite positive* (see, Wothke, 1993) because of the greater number of elements. Single augmented matrices are generally recommended (Brown, 2006; Byrne, Shavelson and Muthén, 1989; Hertzog and Schaie, 1986; Jöreskog, 1971; Pentz and Chou, 1994; Vandenberg and Lance, 2000) and were adopted in this thesis.

Configural invariance is a test of overall model fit and establishes the unrestricted *baseline* model within which all subsequent sequentially-constricted models are nested. An acceptable fit (assessed by the overall model chi-square) suggests that configural invariance is established. Some methodologists claim that configural invariance should be tested only on the portion of the factorial structure that is commonly shared by different groups or occasions (Byrne, 2001; 2004; Byrne, Shavelson and Muthén, 1989; Stacy, MacKinnon and Pentz, 1993). Thus, further tests can still proceed if longitudinal or cross group equivalence is demonstrated on only the common parameters between two factorial structures. Some studies have followed this method (Ang, Huan and Braman, 2007) but it was not adopted in this thesis because all latent constructs shared identical simplex structures. Because all parameters were common across like latent constructs, invariance could be demonstrated on the complete measurement models.

Metric invariance is the logical sequential step. This is a test of the hypothesis that the regression slopes linking the indicators to the latent construct are invariant longitudinally or across groups (H_o: $\boldsymbol{\lambda}_k = \boldsymbol{\lambda}$) for *k* groups or occasions. If overall model fit is acceptable and the difference in the chi-square ($\Delta\chi^2$) between the baseline and the metric-constricted model insignificant (based on the difference in the degrees of freedom (*df*) between the two models), metric invariance is established. Metric invariance demonstrates that like indicators across occasions or groups are 'explained' by their latent constructs in a similar manner, i.e., exhibiting the same relationships to their latent constructs. Once this level of invariance is established, comparisons of structural estimates, i.e., relations between factors, can be compared across groups (Byrne, Shavelson and Muthén, 1989; Steenkamp and Baumgartner, 1998; Vandenberg and Lance, 2000; Wolfle, 1985). In this sense it is possible to test the cross-group equivalence of direct time-dependence paths (i.e., the stationarity assumption), *a*, *b* and *c′* oblique paths (moderated mediation) as well as cross-lagged and feedback oblique paths contained in model 7 (chapter 4). Based on nested model comparisons, the equivalence of indirect effects sizes can also be compared.

Comparisons can proceed even in cases of *partial metric invariance,* that is where some but not all of the loadings are longitudinally or cross-group invariant. Partial metric invariance is considered more realistic in longitudinal research that models developmental change (Pentz and Chou, 1994, p 451). There is some debate as to what proportion of noninvariant/invariant loadings is acceptable. Millsap and Kwok (2004) and Dimitrov (2010) suggest that 25-50% noninvariant loadings are acceptable for partial metric invariance. Byrne, Shavelson and Muthén (1989, p. 461) and Steenkamp and Baumgartner (1998, p 81) suggest that as long as the loadings of the *metric indicator* (i.e., the indicator whose loading was fixed to unity) and that of an additional indicator are invariant, partial metric invariance is acceptable and comparisons in the structural model can proceed as well as further tests of invariance. Modification Indices (MI) are typically used to identify the noninvariant indicator. However when the number of noninvariant indicator loadings is large, this procedure can be tedious because it involves multiple tests during which each loading is fixed to unity one at a time. Other methods to do this exist (Little, Slegers and Card, 2006; Millsap, 2011; Yoon and Millsap, 2007) but they were not needed in the present thesis. Since there were a maximum of only four indicators per construct, the invariance of the metric indicator was easily tested by alternatively fixing all sets of like indicators across occasions to unity, one set at a time.

Once full or partial metric invariance is established, the next step involves a test of *scalar invariance*. This tests the hypothesis that the intercepts of like indicators over time or across groups are statistically equivalent (H_o: $\boldsymbol{\tau}_k = \boldsymbol{\tau}$) for *k* groups or occasions. Scalar invariance is argued to represent a 'strong' form of factorial invariance (Meredith, 1993). The constraints for metric invariance imposed on the previous step are retained and additional equality constraints are placed on the indicator intercepts (Byrne, 2001). If both the overall model chi-square is acceptable and the $\Delta\chi^2$ test small or nonsignificant, scalar invariance is established. Because the indicator intercept signifies how much the indicator is affected when the effect of its predictor (the latent construct) is zero, it marks the *origin* of its slope.

When scalar invariance is established like indicators exhibit not only the same relation to their latent construct but also share the same origin. It is possible to interpret all items (indicators) in the same way by each group in the analysis and are said *not* exhibit *differential item functioning* (DIF) (Millsap, 2011). Raw scores among like indicators can therefore be directly compared. This test is superior to ANOVA or *t-test* for group differences (Brown, 2006; Vandenberg and Lance, 2000) since autocorrelated errors or other types of shared variance are controlled (Cole and Maxwell, 2003; Hoyle and Smith, 1994). When both metric and scalar invariance hold, group differences stem only from the different latent means across *k* occasions or groups (Little, 1997, p. 56; Millsap and Kwok, 2004, p. 101). Moderation due to time (*t*) or group membership (*k*) can therefore be assessed much more reliably as being due *only* to differences in the latent construct means. Put in this way, scalar and metric invariance are prerequisites for the comparison of latent means and intercepts which are considered error-free (Little, 1997; Millsap, 2011; Millsap and Kwok, 2004). Of course, it is still possible to have a degree of *partial scalar invariance* (Millsap and Kwok, 2004; Vandenberg and Lance, 2000) but rules to assess what is acceptable are less clear (Byrne, Shavelson and Muthén, 1989; Steenkamp and Baumgartner, 1998; Vandenberg and Lance, 2000). Millsap and Kwok's (2004, p 108) sensitivity tests suggest that a 20% to 25% noninvariance in indicator intercepts is tolerable to allow a comparison of latent means and intercepts. This norm was adopted in the analysis that follows.

Additional tests can be carried out beyond this stage. The hypotheses that the indicator uniquenesses (H_o: $\boldsymbol{\theta}_k = \boldsymbol{\theta}$) and factor variances and covariances are equivalent across occasions or groups (H_o: $\boldsymbol{\Phi}_k = \boldsymbol{\Phi}$) can be tested for *k* groups. The test for equivalence of indicator uniquenesses is a precondition for the test of factor variance and covariance equivalence. These represent tests of 'strict' factorial invariance (Meredith, 1993). They are useful in cases of construct validation (Dimitrov, 2010) because they are interpreted as tests of equivalence in reliabilities or factorial consistency of a multi-factorial test instrument, none of which were the concern of this thesis. Such tests were not conducted because they did not affect the relationships in the structural model nor were they a prerequisite for comparisons of latent means and intercepts (Brown, 2006; Byrne, 2001; 2004; Byrne, Shavelson and Muthén, 1989).

Whilst tests of structural invariance in latent means (H_o: $\boldsymbol{\mu}_k = \boldsymbol{\mu}$) and intercepts ($H_o$: $\boldsymbol{\kappa}_k = \boldsymbol{\kappa}$) for k groups are less common in the literature (Byrne, 2010; Guttmannova, Szanyi and Cali, 2008; Vandenberg and Lance, 2000), both hypotheses were tested in this study. They were carried out in this analysis because they were of critical substantive interest and because the psychometric preconditions for such tests were met, as shown in chapter 6. Differences in latent means and intercepts were conducted because scalar cross-group invariance was achieved. A Bonferroni adjustment (Green and Babyak, 1997; Kaplan, 1989) controlling for Type I error due to the multiple comparisons involving the same reference groups has also been applied (see chapter 6).

Appendix 4: Discussion of Differential Item Functioning (DIF)

Differential item functioning (DIF) is an important area of concern in tests of cross-group invariance (Millsap, 2011). DIF is revealed when the measurement models achieve full configural, full metric but only partial scalar measurement invariance, indicating that a proportion of the indicator intercepts remained cross-group non-invariant. In this analysis, this proportion was ≤ 20%, thus justifying comparison of latent means and intercepts (Millsap and Kwok, 2004). DIF can be used to evaluate Brofenbrenner's (2005) first principle that subjective interpretations of the objective environment are critical to human development (see chapter 3). Noninvariant intercepts suggest different perceptions, raters' bias, or leniency in grading (Millsap, 2011). In case of socioeconomic information contained in model 1 (FAMCIRC), such as parental NS-SEC and family level of deprivation, cross-group noninvariant intercepts indicate cross-group differences in perceptions regarding the sensitivity of such information. Such item noninvariance may also reveal the differential effects of ethnic concentration, neighbourhood effects, educational levels and migration histories. Table A4.1 presents the estimated intercepts for models 1-6[16].

Table A4.1 suggests that the intercepts of mother's and father's NS-SEC ($\boldsymbol{\tau}_1$ and $\boldsymbol{\tau}_2$), family income ($\boldsymbol{\tau}_4$) and level of deprivation ($\boldsymbol{\tau}_3$) were cross-group noninvariant in the Bangladeshi, Pakistani and the Indian groups at pupils' age 14. This noninvariance suggested that parents in Bangladeshi and Pakistani groups perceived the release of information on their socioeconomic situation differently. The intercepts of maternal NS-SEC in Black Caribbean and Bangladeshi mothers ($\boldsymbol{\tau}_6$) and Pakistani gross family income ($\boldsymbol{\tau}_8$) were cross-group noninvariant at pupils' age 15.

Noninvariant intercepts in models 2-6 revealed differences in perceptions, as these were moderated by culture (Palich, Horn and Griffeth, 1995; Riordan and Vandenberg, 1994; Widaman, Ferrer and Conger, 2010). In model 2 (parent-child conflict), the intercepts for '*how bad is the relation with YP*' and '*frequency of arguments with YP*' ($\boldsymbol{\tau}_1$, $\boldsymbol{\tau}_2$, $\boldsymbol{\tau}_5$, $\boldsymbol{\tau}_6$) were cross-group noninvariant in Bangladeshi mothers at pupils' ages 14 and 16 and in Pakistani mothers at pupils' ages 14 and 15 ($\boldsymbol{\tau}_1$, $\boldsymbol{\tau}_2$, $\boldsymbol{\tau}_3$, $\boldsymbol{\tau}_4$). DIF indicated that such information was considered sensitive and private in Pakistani and Bangladeshi families. Maternal ethnicity, to the extent it represented different cultural perceptions regarding parent-child conflict, moderated Pakistani and Bangladeshi mothers' responses. However, we still need to know whether the latent intercepts of parent-child conflict are statistically different across groups. This question is addressed in section 6.3.

Some of the manifest intercepts in model 3 (pupils' engagement with homework) were also cross-group non-invariant in the case of the white ($\boldsymbol{\tau}_1$) and Indian ($\boldsymbol{\tau}_1$, $\boldsymbol{\tau}_2$) pupils at age 14; white pupils at 15 ($\boldsymbol{\tau}_3$, $\boldsymbol{\tau}_4$) and Black Caribbean pupils at age 15 ($\boldsymbol{\tau}_4$). The manifest intercepts of white and Black Caribbean pupils on *evenings spent on homework* were lower than those of their Indian peers. These differences reflected differential attitudes on homework engagement among those pupils. Maternal ethnicity appeared to moderate these responses to the extent ethnic group membership captured different family values regarding homework. As explained above, more information will be obtained when the latent intercepts and means of homework engagement will be analysed in section 6.3.

Practically all the items in model 4 (feelings about school) exhibited some degree of DIF but each group differed only in few of these items. White and Black Caribbean pupils lower manifest intercepts in the items '*I like being at school*' and '*I'm happy when I am at school*' at age 14 and 15 ($\boldsymbol{\tau}_1$, $\boldsymbol{\tau}_3$, $\boldsymbol{\tau}_5$, see Tables 6.6a-b), and Indian and Pakistani pupils' higher manifest intercepts in the

[16] As explained in chapter 4, partial scalar invariance in this thesis meant that more than 80% of indicator intercepts were cross-group invariant. The noninvariant items exhibiting DIF were always freely estimated in multigroup analysis. At no point was any level of measurement invariance *imposed* on the model if the data did not support it.

reverse-coded items '*I do not want to go to school*' and '*I'm bored at lessons'* (**τ_2, τ_4**) were noninvariant at age 14. Bangladeshi and Pakistani pupils' higher and Black Caribbean pupils' lower manifest intercepts in the latter item were also noninvariant at age 16 (**τ_{10}**). Thus, the concepts of 'feeling well when at school' or 'willing to remain and participate in class' were interpreted differently by young people belonging to different ethnic minorities. However, as already referred to, the cross-group noninvariant

Table A4.1: Estimated intercepts for models 1-6 by ethnic group

	White		Indian		Pakistani		Bangladeshi		B Carib	
Model 1: FAMCIRC										
	τ	SE	τ	SE	τ	SE	τ	SE	τ	SE
τ_1Father's NC-SEC w1	4.861	0.063	4.611	0.074	4.100	0.077	3.090	0.084	4.478	0.154
τ_2Mother's NS-SEC w1	4.388	0.070	3.958	0.079	1.921	0.080	1.429	0.064	5.087	0.117
τ_3Deprivation score w1	7.383	0.026	7.415	0.025	6.982	0.031	6.617	0.045	7.214	0.048
τ_4Family income w1	4.706	0.061	4.434	0.070	3.360	0.080	2.872	0.085	4.414	0.120
τ_5Father's NC-SEC w2	4.861	0.063	4.611	0.074	4.100	0.077	3.090	0.084	4.478	0.154
τ_6Mother's NS-SEC w2	4.388	0.070	3.958	0.079	1.921	0.080	1.429	0.064	5.087	0.117
τ_7Deprivation score w2	7.383	0.026	7.415	0.025	6.982	0.031	6.778	0.043	7.214	0.048
τ_8Family income w2	4.952	0.063	4.625	0.071	3.360	0.080	2.872	0.085	4.414	0.120
Model 2: PAR										
τ_1Freq. of arguing with YP w1	2.956	0.031	3.171	0.033	3.202	0.048	3.847	0.063	2.998	0.048
τ_2How bad relation is with YP w1	3.672	0.013	3.671	0.013	3.578	0.016	3.715	0.021	3.736	0.024
τ_3Freq. of arguing with YP w2	2.956	0.031	3.171	0.033	3.350	0.040	3.863	0.059	2.998	0.048
τ_4How bad relation is with YP w2	3.672	0.013	3.671	0.013	3.578	0.016	3.715	0.021	3.665	0.024
τ_5Freq. of arguing with YP w3	3.100	0.034	3.171	0.033	3.350	0.040	3.887	0.060	2.998	0.048
τ_6How bad relation is with YP w3	3.672	0.013	3.671	0.013	3.680	0.021	3.715	0.021	3.665	0.024
Model 3: HW										
τ_1Evenings spent on homework w1	2.923	0.042	3.436	0.041	3.141	0.043	3.196	3.196	3.151	0.070
τ_2Freq. of homework assigned w1	4.546	0.024	4.689	0.017	4.545	0.020	4.566	4.566	4.505	0.030
τ_3Evenings spent on homework w2	2.923	0.042	3.436	0.041	3.141	0.043	3.196	3.196	3.151	0.070
τ_4Freq. of homework assigned w2	4.546	0.024	4.689	0.017	4.545	0.020	4.566	4.566	4.505	0.030
Model 4: SCH										
τ_1 *I'm happy when I am at school* w1	3.127	0.016	3.286	0.016	3.343	0.019	3.311	0.019	3.123	0.030
τ_2 *I do not want to go to school* w1	2.894	0.021	3.090	0.022	3.029	0.028	2.981	0.027	2.871	0.042
τ_3 *I like being at school* w1	2.574	0.019	2.764	0.019	2.871	0.023	2.709	0.023	2.667	0.034
τ_4 *I'm bored at lessons* w1	3.092	0.017	3.269	0.016	3.312	0.019	3.302	0.020	3.115	0.031
τ_5 *I'm happy when I am at school* w2	3.127	0.016	3.286	0.016	3.343	0.019	3.311	0.019	3.123	0.030
τ_6 *I do not want to go to school* w2	2.894	0.021	3.090	0.022	3.029	0.028	2.981	0.027	2.871	0.042
τ_7 *I like being at school* w2	2.574	0.019	2.764	0.019	2.871	0.023	2.709	0.023	2.667	0.034
τ_8 *I'm bored at lessons* w2	3.092	0.017	3.269	0.016	3.312	0.019	3.155	0.029	3.115	0.031
τ_9 *I'm happy when I am at school* w3	3.127	0.016	3.286	0.016	3.343	0.019	3.311	0.019	3.123	0.030
τ_{10} *I do not want to go to school* w3	2.894	0.021	3.090	0.022	3.146	0.029	2.981	0.027	2.871	0.042
τ_{11} *I like being at school* w3	2.574	0.019	2.764	0.019	2.871	0.023	2.709	0.023	2.667	0.034
τ_{12} *I'm bored at lessons* w3	3.092	0.017	3.269	0.016	3.312	0.019	3.302	0.020	3.115	0.031
Model 5: TCH										
τ_1 *teach make clear how we should behave* w1	4.161	0.020	4.260	0.022	4.362	0.025	4.268	0.026	4.232	0.036
τ_2 *teachers take action when rules broken* w1	4.060	0.021	4.153	0.022	4.232	0.029	4.196	0.028	4.038	0.037
τ_3 *I like my teachers* w1	3.372	0.021	3.439	0.023	3.518	0.028	3.393	0.034	3.101	0.037
τ_4 *teachers can keep order in class* w1	3.500	0.020	3.589	0.023	3.688	0.029	3.593	0.028	3.373	0.034
τ_5 *teach make it clear how we should behave* w2	4.161	0.020	4.260	0.022	4.362	0.025	4.268	0.026	4.232	0.036
τ_6 *teachers take action when rules broken* w2	4.060	0.021	4.153	0.022	4.232	0.029	4.196	0.028	4.038	0.037
τ_7 *I like my teachers* w2	3.372	0.021	3.439	0.023	3.518	0.028	3.393	0.034	3.101	0.037
τ_8 *teachers can keep order in class* w2	3.500	0.020	3.589	0.023	3.688	0.029	3.593	0.028	3.373	0.034
Model 6: YPEX										
τ_1 *How likely to apply to university* w1	2.944	0.019	3.276	0.017	3.204	0.018	3.146	0.021	3.132	0.026
τ_2 *How likely to get in university if apply* w1	2.980	0.027	3.513	0.020	3.307	0.022	3.238	0.026	3.216	0.035
τ_3 *How likely to apply to university* w2	2.944	0.019	3.276	0.017	3.204	0.018	3.146	0.021	3.132	0.026
τ_4 *How likely to get in university if apply* w2	2.980	0.027	3.513	0.020	3.307	0.022	3.238	0.026	3.216	0.035
τ_5 *How likely to apply to university* w3	2.944	0.019	3.276	0.017	3.204	0.018	3.146	0.021	3.132	0.026
τ_6 *How likely to get in university if apply* w3	2.980	0.027	3.513	0.020	3.307	0.022	3.238	0.026	3.216	0.035

intercepts were only a small proportion of all the intercepts in model 4. Therefore, although young people from certain minorities demonstrated different perceptions in some of the dimensions of their feelings about school, in general the school environment was perceived and interpreted similarly by all pupils. Maternal ethnicity appeared to moderate only some of the indicators of the latent construct representing pupils' feelings about school. Latent and means and intercepts will offer more information on the levels of disaffection with school per minority group.

Black Caribbean pupils exhibited the most consistent DIF in model 5 (assessments of teachers' efficiency). The manifest intercepts of the items '*I like my teachers*' and '*my teachers keep order in class*' were the lowest at ages 14 and 15 ($\boldsymbol{\tau}_{3}$, $\boldsymbol{\tau}_{4}$, $\boldsymbol{\tau}_{7}$, $\boldsymbol{\tau}_{8}$). In contrast, the manifest intercepts for the item '*teachers take action when rules are broken*' were the highest in Pakistani and Bangladeshi pupils ($\boldsymbol{\tau}_{6}$). Black Caribbean pupils maintained different impressions about some dimensions of their teachers' collective effectiveness as compared to their Pakistani and Bangladeshi peers. Maternal ethnicity appeared to moderate pupils' perceptions and understandings of these dimensions. The extent to which young people differed systematically in the levels of their latent construct will be examined in section 6.3.

The only items exhibiting DIF in model 6 (pupils' expectations) was '*how likely to apply to university*' in white pupils and '*how likely to get in if apply*' in the Indian pupils at age 14 ($\boldsymbol{\tau}_{2}$, $\boldsymbol{\tau}_{1}$). The manifest intercepts of the white pupils were lower than those of their Indian peers suggesting different perceptions regarding their likelihood to enter university after year 11. This is hardly surprising considering that Indian pupils had the highest while white pupils the lowest proportions among those who regarded their university study 'very likely' (see chapter 5). Examination of latent means and intercepts will confirm this fact.

Appendix 5: Tests of longitudinal structural invariance (stationarity) and equilibrium over time for models 2, 4 and 6

Tests of stationarity and equilibrium were conducted for models 2 (parent-child conflict); 4 (pupils' feelings about school) and 6 (pupils' educational expectations). This was because only these models had more than one longitudinal path (included both paths p_{21} and p_{32}), enabling examination of the null hypothesis that they were equal (H_0: $p_{21} = p_{32}$). Similarly, equilibrium was tested on those models because I wanted to compare whether stationarity also assumed equilibrium. Explanation of the results for the tests of stationarity and equilibrium in the dependence paths of models 1-6 appear in Tables A5.1 and A5.2.

Table A5.1: Tests of equilibrium over time for models 2, 4 and 6

	Factor variance at each occasion			Hypothesis	χ^2	df	p	$\Delta\chi^2$	df	p	Decision
Model 2 (parent-child conflict	PAR1	PAR2	PAR3								
White	.815	.860	.982	v1 ≠ v2 ≠ v3	21.1	8	.00	-	-	-	-
				v1 = v2 = v3	23.9	10	.00	2.8	2	ns	NR
Indian	.743	.728	.770	v1 ≠ v2 ≠ v3	13.5	8	ns	-	-	-	-
				v1 = v2 = v3	13.6	10	ns	.01	2	ns	NR
Pakistani	.800	1.044	1.196	v1 ≠ v2 ≠ v3	10.1	6	ns	-	-	-	-
				v1 = v2 = v3	16.0	8	.04	5.9	2	.05	R
Bangladeshi	1.966	1.119	1.943	v1 ≠ v2 ≠ v3	19.9	8	.01	-	-	-	-
				v1 = v2 = v3	21.9	10	.01	2	2	ns	NR
Black Caribbean	.206	.150	.215	v1 ≠ v2 ≠ v3	15.5	8	.05	-	-	-	-
				v1 = v2 = v3	20.0	10	.03	4.5	2	ns	NR
Model 4 (pupils' feelings about school)	SCH1	SCH2	SCH3								
White	.194	.209	.241	v1 ≠ v2 ≠ v3	115.3	46	.00	-	-	-	-
				v1 = v2 = v3	128.0	48	.00	12.7	2	.00	R
Indian	.095	.088	.115	v1 ≠ v2 ≠ v3	101.6	49	.00	-	-	-	-
				v1 = v2 = v3	110.7	51	.00	9.1	2	.01	R
Pakistani	.105	.125	.097	v1 ≠ v2 ≠ v3	91.5	47	.00	-	-	-	-
				v1 = v2 = v3	95.3	49	.00	3.8	2	ns	NR
Bangladeshi	.090	.078	.101	v1 ≠ v2 ≠ v3	78.4	49	.00	-	-	-	-
				v1 = v2 = v3	81.0	51	.00	2.6	2	ns	NR
Black Caribbean	.115	.185	.192	v1 ≠ v2 ≠ v3	85.7	54	.00	-	-	-	-
				v1 = v2 = v3	89.3	56	.00	3.6	2	ns	NR
Model 6 (pupils' educational expectations	YPEX1	YPEX2	YPEX3								
White	.784	.895	.945	v1 ≠ v2 ≠ v3	15.1	9	ns	-	-	-	-
				v1 = v2 = v3	39.1	11	.00	24	2	.00	R
Indian	.290	.381	.384	v1 ≠ v2 ≠ v3	2.3	7	ns	-	-	-	-
				v1 = v2 = v3	15.0	9	ns	12.7	2	.00	R
Pakistani	.345	.363	.429	v1 ≠ v2 ≠ v3	14.5	8	ns	-	-	-	-
				v1 = v2 = v3	21.3	10	.02	6.8	2	.03	R
Bangladeshi	.369	.432	.395	v1 ≠ v2 ≠ v3	11.2	10	ns	-	-	-	-
				v1 = v2 = v3	14.1	12	ns	2.1	2	ns	NR
Black Caribbean	.409	.377	.449	v1 ≠ v2 ≠ v3	18.6	9	.02	-	-	-	-
				v1 = v2 = v3	19.0	11	ns	.04	2	ns	NR

Note: **χ^2 =chi-square; df=degrees of freedom; p=significance; $\Delta\chi^2$= chi-square difference; CFI=comparative fit index (>0.95); RMSEA=Root mean square error or approximation (<0.05); R=reject H_o; NR=fail to reject the H_o;**

Tables A6.1 and A6.2 suggest that while in most cases the models with three occasions were stationary, they were not necessarily in equilibrium. For example, parent-child conflict was not stationary in the Bangladeshi group, which was due to the fact that such conflict tended to get significantly lower in that group between ages 14-16. It was however in equilibrium. White pupils' feelings about school were neither stationary nor in equilibrium because feelings about school in that group also decreased considerably relative to those of their South Asian peers. By contrast, Pakistani pupils' feelings about group were stationary but not in equilibrium. Finally, Pakistani pupils' expectations were neither stationary nor in equilibrium probably because they kept rising relative to those of their white and Black Caribbean peers. However, white and Indian pupils' expectations were stationary but not in equilibrium but for different reasons. Indian pupils' expectations kept rising between ages 14-16 while those of their white peers kept falling to remain consistently the lowest over time relative to their other peers.

Table A5.2: Tests of longitudinal structural invariance (stationarity) for models 2, 4 and 6

Hypothesis	χ2	df	p	Δχ2	df	p	CFI	ΔCFI	RMSEA	ΔRMSEA	Decision
Model 2: PAR (parent-child conflict)											
White											
$p_{21} \neq p_{32}$	21.1	9	.012	-	-	-	.992	-	.037	-	-
$p_{21} = p_{32}$	22.2	10	.014	1.1	1	ns	.992	.00	.035	.002	NR
Indian											
$p_{21} \neq p_{32}$	14.1	9	.120	-	-	-	.994	-	.027	-	-
$p_{21} = p_{32}$	14.9	10	.133	.8	1	ns	.994	.00	.026	.001	NR
Pakistani											
$p_{21} \neq p_{32}$	10.3	7	.022	-	-	-	.987	-	.046	-	-
$p_{21} = p_{32}$	16.8	8	.032	.05	1	ns	.988	.001	.042	.004	NR
Bangladeshi											
$p_{21} \neq p_{32}$	24.8	9	.00	-	-	-	.950	-	.060	-	-
$p_{21} = p_{32}$	30.4	1	.00	5.6	1	.017	.936	.014	.065	.005	R
Black Caribbean											
$p_{21} \neq p_{32}$	18.1	10	.053	-	-	-	.979	-	.050	-	-
$p_{21} = p_{32}$	21.2	11	.031	3.1	1	ns	.974	.003	.054	.004	NR
Model 4 SCH (pupils' feelings or affect about school)											
White											
$p_{21} \neq p_{32}$	743.4	49	.00	-	-	-	.981	-	.043	-	-
$p_{21} = p_{32}$	762.6	50	.00	19.2	1	.00	.981	.00	.043	.00	R
Indian											
$p_{21} \neq p_{32}$	101.6	49	.00	-	-	-	.980	-	.038	-	-
$p_{21} = p_{32}$	101.8	50	.00	.02	1	ns	.981	.001	.037	-.001	NR
Pakistani											
$p_{21} \neq p_{32}$	98.5	48	.00	-	-	-	.972	-	.041	-	-
$p_{21} = p_{32}$	98.57	49	.00	.01	1	ns	.973	.001	.040	-.001	NR
Bangladeshi											
$p_{21} \neq p_{32}$	78.5	50	.00	-	-	-	.977	-	.034	-	-
$p_{21} = p_{32}$	80.4	51	.00	1.9	1	ns	.976	-.001	.035	.001	NR
Black Caribbean											
$p_{21} \neq p_{32}$	79.2	54	.014	-	-	-	.981	-	.038	-	-
$p_{21} = p_{32}$	79.2	55	.018	.00	1	ns	.981	.00	.037	-.001	NR
Model 6 YPEX (pupils' educational expectations)											
White											
$p_{21} \neq p_{32}$	15.1	1	.089	-	-	-	.998	-	.026	-	-
$p_{21} = p_{32}$	15.8	10	.104	.07	1	ns	.998	.00	.024	-.002	NR
Indian											
$p_{21} \neq p_{32}$	5.36	8	.718	-	-	-	1.000	-	.000	-	-
$p_{21} = p_{32}$	5.95	9	.745	.59	1	ns	1.000	.00	.000	.00	NR
Pakistani											
$p_{21} \neq p_{32}$	14.6	9	.103	-	-	-	.996	-	.031	-	-
$p_{21} = p_{32}$	33.7	10	.00	19.1	1	.00	.982	-.014	.061	.03	R
Bangladeshi											
$p_{21} \neq p_{32}$	12.8	11	.307	-	-	-	.998	-	.018	-	-
$p_{21} = p_{32}$	13.5	12	.336	.67	1	ns	.999	.001	.016	-.002	NR
Black Caribbean											
$p_{21} \neq p_{32}$	20.3	10	.026	-	-	-	.984	-	.056	-	-
$p_{21} = p_{32}$	20.3	11	.041	.00	1	ns	.986	.002	.051	.005	NR

Appendix 6: The measurement part (variances) of model 7

Table A6.1 shows the estimated indicator error, factor and disturbance term variances. Indicator intercepts can be inspected in Appendix 4 (Differential Item Functioning). They were identical to those obtained under model 7 (within the second or third decimal).

Table A6.1: Indicator error, factor and disturbance term variances and their standard errors in model 7 by ethnic group

	White		Indian		Pakistani		Bangladeshi		BCaribbean	
	σ²	S.E.	σ²	S.E.	σ²	S.E.	σ²	S.E.	σ²	S.E.
FAMCIRC1	1.656	.135	1.690	.149	1.215	.132	.961	.138	2.448	.308
PAR1	.774	.072	.645	.087	.775	.111	1.440	.155	.370	.070
HW1	1.829	.082	1.133	.098	1.182	.115	1.021	.132	1.550	.123
SCH1	.170	.012	.126	.010	.102	.010	.220		.162	.020
TCH1	.168	.014	.183	.016	.175	.018	.205	.021	.192	.025
YPEX1	.454	.025	.295	.022	.379	.029	.374	.033	.374	.044
D1	.021	.021	.104	.020	.002		.001		.001	
D2	.214	.052	.186	.073	.361	.080	.937	.152	.001	
D4	.983	.102	.370	.074	.703	.098	.527	.106	1.095	.092
D5	.041	.007	.034	.005	.027	.007	.047	.008	.032	.010
D7	.068	.011	.089	.012	.104	.014	.063	.012	.060	.019
D8	.385	.027	.175	.018	.266	.024	.231	.026	.165	.032
D3	.414	.065	.107	.079	.462	.102	.989	.164	.001	
D6	.062	.009	.038	.008	.060	.010	.037	.010	.051	.014
D9	.250	.023	.162	.016	.201	.022	.219	.025	.010	
e10	.204	.010	.196	.011	.208	.012	.375	.015	.167	.013
e15	.010		.574	.075	.510	.090	.747	.117	.010	
e1	2.512	.142	2.585	.163	2.939	.188	3.035	.217	5.967	.522
e2	3.521	.182	3.031	.181	3.422	.213	1.071	.132	3.324	.319
e3	.689	.033	.599	.033	.829	.048	.867	.057	.924	.076
e4	1.849	.128	1.599	.129	3.488	.216	4.810	.343	2.641	.309
e5	2.486	.142	2.673	.168	3.084	.205	3.763	.266	6.715	.576
e6	3.505	.182	3.138	.189	3.616	.230	1.059	.134	3.864	.352
e7	.757	.036	.447	.025	.589	.035	.790	.053	.769	.064
e8	2.066	.139	1.627	.131	2.827	.199	4.146	.301	2.027	.257
e9	.491	.060	.593	.081	.695	.107	.518	.112	.799	.073
e11	.444	.042	.624	.080	.664	.078	.518	.112	.354	.067
e12	.268	.012	.213	.012	.217	.013	.375	.015	.208	.017
e13	.229	.062	.560	.082	.299	.095	.518	.112	.653	.072
e14	.241	.011	.203	.011	.235	.014	.375	.015	.219	.018
e16	.473	.021	.215	.013	.301	.019	.317	.023	.365	.029
e17	.236	.092	.637	.075	.331	.084	.621	.101	.010	
e18	.536	.025	.218	.013	.286	.018	.247	.018	.339	.027
e19	.280	.015	.223	.013	.253	.016	.180	.017	.305	.028
e20	.449	.024	.353	.022	.508	.031	.436	.033	.422	.040
e21	.368	.019	.309	.017	.387	.024	.473	.032	.407	.036
e22	.250	.014	.197	.012	.234	.015	.125	.015	.230	.023
e23	.289	.015	.277	.016	.280	.018	.294	.021	.290	.025
e24	.456	.024	.388	.023	.526	.032	.498	.035	.506	.044
e25	.361	.018	.312	.018	.342	.021	.371	.026	.358	.031
e26	.257	.014	.245	.014	.243	.016	.328	.023	.298	.027
e27	.256	.014	.222	.014	.214	.015	.222	.018	.286	.026
e28	.363	.022	.326	.021	.364	.026	.480	.035	.360	.035
e29	.321	.018	.276	.017	.361	.024	.362	.026	.295	.028
e30	.254	.015	.208	.014	.256	.018	.182	.016	.313	.029
e31	.385	.020	.361	.022	.375	.025	.322	.026	.380	.034
e32	.440	.023	.430	.026	.526	.034	.397	.031	.402	.036
e33	.460	.025	.379	.023	.462	.030	.505	.036	.450	.040
e34	.335	.022	.292	.021	.330	.026	.330	.030	.355	.037
e35	.401	.021	.368	.023	.366	.025	.413	.030	.406	.037
e36	.460	.024	.432	.026	.423	.028	.379	.028	.434	.040
e37	.424	.023	.391	.026	.415	.029	.521	.037	.503	.049
e38	.379	.024	.301	.023	.342	.027	.294	.027	.248	.033
e39	.057	.015	.206	.012	.184	.013	.210	.016	.213	.020
e40	.436	.024	.117	.015	.121	.019	.128	.021	.236	.032
e41	.220	.012	.196	.012	.188	.013	.222	.016	.179	.018
e42	.160	.016	.115	.014	.158	.019	.101	.018	.219	.029
e43	.199	.012	.192	.012	.172	.012	.203	.016	.296	.026
e44	.213	.020	.074	.014	.128	.018	.106	.021	.301	.030

Note: Missing SE denote cases where the variance was fixed following Kline (2005)

Appendix 7 Personal Communication referenced in the thesis

Apart from finding support in the methodological literature, I also sought the advice of a number of scholars with whose work on mediation and other methodological issues I am well acquainted. Those scholars are

1. Professor Roger Millsap, Department of Psychology State University of Arizona
2. Professor Irini Moustaki, Department of Statistics, London School of Economics
3. Professor Scott Maxwell, Department of Psychology, University of Notre Dame
4. Professor David P. MacKinnon, Department of Psychology, University of Arizona

I have sought their opinion on the following five issues:
(a) the optimal order of measurement invariance tests (longitudinal versus cross-group)
(b) the comparison of bootstrapped to asymptotic standard errors for structural parameter estimates
(c) the formula for the standard errors for total indirect effects
(d) the feasibility of model 7
(e) possible bias from sample discrepancy in multigroup comparisons and the decision to reduce the white sample of mothers from 7578 to 1000. I will present my personal communications with the above scholars by issue. In their responses to me, I show the relevant parts that address the specific issue in bold.

A7.1. Order of measurement invariance tests: communication with Roger Millsap

Roger Millsap (Millsap, 2013)

Roger Millsap <millsap@asu.edu>
Fri 04/01/2013 17:20
To:Michael Tzanakis <mtzanakis@ioe.ac.uk>;
Hi Michael,
To answer your questions:

1. If invariance is not empirically supported (if the chi-square diff between the unrestricted or the compatively less restricted and the more restricted model is significant, or changes in fit indices appear large), should I impose constraints or stop right there and then and proceed with the leeway offered by whatever level of invariance has been achieved up to that point (configural or better) even if that means that no further analysis of structural comparisons can be attempted?

My answer: You should not, in my view, impose constraints that the data show are inappropriate. So, if you don't do that, you still have several options. One clear one is to try to track down the source of the lack of invariance, and then drop that measure. That is not always possible, and it may not be that easy to track down the source, depending on the situation. If it is not possible, another course of action is to do something that Dave mentioned, which is to do what amounts to a sensitivity analysis. Your real interest is in the structural coefficients. Then see how much these coefficients change as you add or delete invariance constraints. For example, suppose the model falters at metric invariance, so some of the loadings are not invariant. You could find a partial invariance model that fits, and then see what happens to the structural coefficients when you have invariance constraints on the loadings, versus no constraints on the loadings. If there are substantial changes in structural estimates, you will know that the invariance constraints are important, and the lack of invariance may also be important.

2. If one may or should impose invariance (rather than let the data speak of what invariance they actually have) , what level of invariance would you consider necessary before one could proceed with comparison of structural estimates across groups or time (considering that my research is trying to estimate mediation and moderation of the effects of family background on young people's time-lagged development of educational expectations - the outcome - via time-lagged chains of latent mediators (representing home-based mediators) measured concurrently at three occasions just as the outcome is, across groups that differ in mother's ethnicity, educational level and young people's gender?

My answer: There is no context-free answer to this question. It depends on the data, and on the nature of the variables and what you are trying to do. Here I am assuming you are asking about structural coefficients linking latents to otheer latents. The above "sensitivity analysis" idea is one way to approach the question that takes into account the data. **Again, I would not "impose" invariance that the data does not support. These tests of invariance are model-based tests. If the models don't fit, the tests cannot work properly.**

3. Is the same level of metric invariance (or stronger) required for both cross-group comparisons and time comparisons? The literature seems to follow two paths, either first securing invariance across time of a baseline model and then proceed to test for cross-group invariance, or first satisfy that cross-group invariance is achieved and then test for group-specific invariance across time.

My answer: If invariance really holds both across groups and over time**, I don't think it matters much which of the above two paths is followed**. **Both should work.** But if invariance does not hold, it is not clear which is the optimal strategy. Of course, one could start with a grand strategy of making parameters invariant across both groups and time. If that fits, you are done. In the likely event that this does not fit, you will need to back up and go systematically, but the local fit indices may give clues about how to proceed.

I hope these answers help.

Roger

A7.2. Comparison between bootstrapped and asymptotic standard errors for structural parameter estimates: communication with Irini Moustaki

Irini Moustaki (Moustaki, 2013a)

Dear Irini,

Using Likert scales as continuous has been done routinely in the literature, but I would like to have your expert opinion on this, if possible. Also what is your opinion about the necessity to use bootstrapped standard errors.

Best,

Michael

Dear Michael

I agree with your strategy not to include 0/1 variables and treat them as normal.
Treating 4point scales as normal would not be a sensible thing to **do however it is used a lot in the literature. I will personally treat them as ordinal but in some cases the results will look very close, if categories > or = 4**. **if you can compute bootrstrap s.e. will be good since the asymptotic ones are not very trustworthy kind regards**
kind regards
Irini

A7.3. Formula for the standard errors of the total indirect effect: communication with Scott Maxwell

Scott Maxwell (Maxwell, 2013a)

-----Original Message-----
From: Michael Tzanakis [mailto:mtzanakis@ioe.ac.uk]
Sent: Monday, June 03, 2013 4:31 AM
To: Scott Maxwell
Subject: ΑΠ: Extension of the Maxwell, Cole and Mitchell (2011) autoregressive SEM

Dear Scott,

Thanks again for your extremely useful advice. May I also ask you what can be done to estimate SE of the overall indirect effect? In your Cole and Maxwell (2003) seminal article you suggest that none of the known formulas (e.g. Sobel, or its extensions) address the multi-wave (summed) overall indirect effect and that therefore there is not as yet a formula to estimate it.

Therefore the only option is to use the standardized estimate of the summed overall indirect effect to get a measure of effect size.

As there was no particular mention of estimating SE for these overall indirect effects in your recent Maxwell Cole and Mitchell (2011) article, may I take this opportunity to ask you if this is still largely the case
Best,

RE: Extension of the Maxwell, Cole and Mitchell (2011) autoregressive SEM
Scott Maxwell <Scott.E.Maxwell.1@nd.edu>
Sat 08/06/2013 17:43
Michael,

You have once again raised a great question. Unfortunately, I am afraid that I don't really have a better answer than was alluded to in Cole and Maxwell (2003). **To the best of my knowledge, no one has pursued this question.** In particular, neither Cole nor I pursued it, mainly because we got so focused on comparing cross-sectional designs to longitudinal designs.

Sorry I can't be more definitive.

Regards,

Scott

A7.4. Feasibility of model 7: communication with Scott Maxwell (reference in the thesis: Maxwell (2013b;c) and David MacKinnon (reference in the thesis: MacKinnon (2013)

Scott Maxwell (Maxwell, 2013b)

-----Original Message-----
From: Michael Tzanakis [mailto:mtzanakis@ioe.ac.uk]
Sent: Wednesday, May 01, 2013 5:32 AM

Dear Professor Maxwell

I am doing a direct extension of the models discussed in the Maxwell, Cole and Mitchell (2011) article, as well as the Cole and Maxwell (2003) and Maxwell and Cole (2007) articles.

Could I possibly ask you, as an expert on multivariate longitudinal mediation modeling to comment on the following two intended strategies of analysis?

Strategy I
1. My intention is first to test each presumed mediator autoregressive model separately first (P-M-O) and study the patterns of observed partial / complete mediation for each hypothesized mediator. Since there are 4 separate autoregressive mediator models, this will involve 4 separate P-M-O models. This will allow separate estimation of potential mediation of the effect of the predictor on the outcome via each presumed mediator.

2. Once the separate models produce estimates for each mediator, all mediators are included step-wise in the final model testing hypotheses regarding cross-lagged effects among presumed mediators.

Strategy II
1. Include all mediators (each separately-developed autoregressive SEM) in the final model.

2. Then constrain certain structural paths to zero to test hypotheses about the effects of each presumed mediator in a series of nested models.

I would very much appreciate your comments as to which strategy you think would be more suitable as well as any other comments that you might think would help me.

Thank you very much for your time,

Best,

Michael Tzanakis,
Department of Quantitative Social Science, Institute of Education, University of London

____
From: Scott Maxwell [Scott.E.Maxwell.1@nd.edu]
Sent: Saturday, 4 May 2013 7:34 pm

Michael,

Thanks for your email message, and congratulations on reaching this stage of your PhD studies. Your study sounds very interesting, and of course I am glad to see you investigate possible longitudinal mediation mechanisms.

One of the most misunderstood aspects of mediation is the typical disregard that researchers may pay to anything beyond a simple single mediator model. For most psychological and educational phenomena, it seems unlikely that only a single mediator exists. However, researchers seem not to pay attention to the fact that leaving out a relevant mediator generally biases estimates of most if not all parameters in any oversimplified model. So I am glad to see you taking seriously the idea that multiple mediators are likely to exist.

From this perspective, I lean toward favoring your Strategy II, because it acknowledges the importance of including M1 in the model while assessing the role of M2 (for example). However, in my experience it is sometimes helpful to build up from simpler models to more complex models. Thus, I can see a possible role for Strategy I. However, I would suggest not relying on any results from Strategy I as you undertake Strategy II. In particular, using the same data to fit simpler models and then using these preliminary results to guide model building in a later stage raises serious questions about how seriously to take any

results found in the later stage.

Another way to look at this is to hope that you can come up with clear interpretations based on the complex models you fit in Strategy II. From this perspective, the possible value of fitting simpler models (such as in Strategy I) is that it may help you better understand the more complex models of Strategy II.

I hope this is helpful.

Regards,

Scott

Scott Maxwell (Maxwell, 2013c)

From: Michael Tzanakis [mtzanakis@ioe.ac.uk]
Sent: Wednesday, March 13, 2013 2:32 AM
To: David Mackinnon
Cc: Roger Millsap
Subject: Extension of the Maxwell, Cole and Mitchell (2011) autoregressive SEM

Dear Professor Maxwell,

Thank you very much for your email, your encouragement and advice. I also believe that all four mediators should be tested simultaneously. I would therefore would like to list my reasons for doing so (which I will also support in the thesis) and kindly ask you to read them and let me know if you agree.

A. Substantive reasons

1. The four mediators to be included in the final model (parent-child relations; amount of homework; young people's feelings about school; feelings about teachers) were selected for inclusion on theoretical reasons based on the literature. However, as you very well point out in your last email, it is assumed that all four mediators act simultaneously on the outcome (all have simultaneous b effects). It is also assumed that all four mediators reveal their effect in the same time lag (at t+1) on the outcome at t+2. So, 2. I believe there is no point in building the final model in a step-wise exploratory mode (introducing one mediator at a time) since I am actually testing the hypothesis that all 4 mediators act on the outcome simultaneously. In other words, once all preliminary analyses have been completed, the final model is a confirmatory model that includes all 4 mediators.
3. Building the model in a step-wise fashion necessarily uses an arbitrary rule of inclusion of each mediator. Since there is no way to determine which mediator should be included first and which last, all results from such a step-wise model building rest on one's arbitrary decision to follow a particular rule of step-wise inclusion. Therefore, I believe that results from such a step-wise inclusion may even be potentially misleading because estimates from each partial inclusion will be biased (since each partial inclusion would have omitted a potentially important mediator).

B. Methodological reasons

1. I believe that the Cole and Maxwell (2003), Maxwell and Cole (2007) and Maxwell, Cole and Mitchell (2011) longitudinal models, are essentially confirmatory (given the convincing mathematical reasoning that cross-sectional mediation would be misleading and should therefore remain unexplored). Provided that the assumptions outlined in the first article are plausible (regarding longitudinal invariance, omitted variables, trait and method variance, equilibrium), the researcher confirms the extent to which the null hypothesis of no longitudinal mediation of the relation between the predictor at t and the outcome at t+2 is mediated via one (or more) mediators at t+1 (for 3-wave data, for example), can be rejected.
2. The models can become exploratory if, in cases with more than 3 waves, a researcher may want to explore whether mediation takes longer time lags than originally assumed. But this exploration is not possible with just 3 waves of data.
3. Apart from mediation, my final model also tests for longitudinal cross-lagged effects among mediators as well as feedback effects between the outcome and each mediator. Testing for the presence of these effects requires that all 4 mediators be included in the final model simultaneously (to control for the prior occasions of all mediators). So, I believe it is reasonable for a researcher to be consistent in requiring that all 4 mediators be included simultaneously to test for all 3 types of effects (mediation, cross-lagged, feedback).
4. The final model will also be tested on five different UK groups (White British, Indian, Pakistani, Bangladeshi and Black Caribbean) to test for cross-group differences that may tentatively indicate moderation (possibly in all types of effects outlined above) by ethnic group membership. I believe that it would be exceedingly tedious and unnecessary to build the model step-wise in each of these groups separately. Instead, the complete model should be tested across groups in multigroup analysis.

I would very much appreciate it if you kindly let me know whether the above line of reasoning seems plausible, in your expert opinion.

Best,

Michael Tzanakis,
Department of Quantitative Social Science, Institute of Education, London

From: Scott Maxwell [Scott.E.Maxwell.1@nd.edu]
Sent: Saturday, 18 May 2013 6:44 pm

Michael,

I basically agree with all of your points, both substantive and methodological. You have very nicely articulated multiple reasons for testing all four mediators simultaneously. The only real counterarguments I see are (1) the combined model might be too complex--unless you have a sufficiently large sample, parameter estimates could be very unstable, and (2) the mediators might be highly intercorrelated, weakening your power to detect the unique effects of any particular mediator. However, I think your arguments outweigh these possible concerns.

Regards,

Scott

Scott E. Maxwell
Past Editor, Psychological Methods
Department of Psychology
University of Notre Dame
Notre Dame, IN 46556

Eirini Moustaki (Moustaki, 2003b)

From: I.Moustaki@lse.ac.uk <I.Moustaki@lse.ac.uk>
Sent: 19 May 2013 23:11
To: Michael Tzanakis
Subject: RE: Latent variable mediation modeling

Dear Michael,

I do not have muh experience on the literature on mediators but **what you are suggestings under 1) looks sensible.**
The constraints you put on the structural part of the model are mainly for testing your research hypothesis and therefore **you do not need to put anything a priori unless it is supported by your hypothesis**.
kind regards
Irini

David MacKinnon (MacKinnon, 2013)

Dear David,

I am sending you attached a mediation SEM that extends the Maxwell-Cole-Mitchell (2011) autoregressive mediation model for multiple mediators.
Could I possibly ask you, as an expert on mediation modeling and invariance, to take a look at the attached model and let me have your valuable feedback? In particular, (a) I have included cross lag effects (mm) between occasions 1 and 2 as well as 2 and 3 as I am mainly interested in the effects of the predictor (age 14) and mediators (ages 14 and 15) on the outcome (young people's educational expectations at age 16 - just before they complete the compulsory stay in school limit), is that OK? (b) The data may permit only two occasions in some mediators (e.g., repeated measures for age 14 and age 15, but not age 16) but all 3 occasions in others. What do you think the consequences for drawing conclusions will be if in some mediators the last dependence path cannot be estimated (i.e., between age 15 and age 16)? (c) As it stands, path c´ in the model (attached) is a path that can serve to measure potential partial mediation of every single mediator if all other paths from other mediators are constrained to zero. Alternatively, when all mediators are measured simultaneously, path c´ will represent partial mediation from all mediators. Do you consider this strategy of testing a series of nested models, monitoring changes in the c´ path one at a time, a viable option?
Thank you very much for your time in advance,

Best,

Michael Tzanakis,

David Mackinnon <davidpm@asu.edu>
Fri 14/06/2013 22:16
Hello Michael,

Sorry for responding so late. **Your model is comprehensive with plenty of effects. It is most helpful to outline theoretical reasons for different paths to exist. Here are a few comments:**
a. In my experience with real data the cross lagged effects are often needed. It sounds like you have a theoretical reason for doing it.
b. Estimate the model with two waves of data as that is all you have. **it would be convincing if the chage between two earlier waves in the mediator predicts change from waves 2 to 3 in the outcome**.

c. With SEM models the idea of monitoring the c' path does not make that much sense to me. **It is interesting but it seems easier and wiser to specify a comprehensive model and test its adequacy.**
One other option would be to estimate a **latent difference score** or latent growth model for these data. The autoregressive model assumes that all persons change in the same way while the LDS or LGM models allow for differential change.
Regards,
Dave

A7.5. Possible bias from sample discrepancy in multigroup comparisons and the decision to reduce the white sample of mothers from 7578 to 1000: communication with Irini Moustaki (Moustaki, 2013c) and Scott Maxwell (Maxwell, 2013d)

Irini Moustaki (Moustaki, 2013c)
I.Moustaki@lse.ac.uk

Dear Michael

I will try to answer your questions but I am not an expert in some of the things you are asking me. I will give you my personal view on those.

1. Bias

There were 5 groups in my analysis (based on LSYPE waves 1-3). White = 7578, Indian = 751; Pakistani = 642; Bangladeshi = 484; Black Caribbean = 324. The literature suggests that in such cases the multigroup model chi-square will be biased towards the chi-square of the largest sample (Brown, 2006, p. 279).More importantly, modification indices, standard errors, power to detect parameter estimates as significantly different from zero and error variances will be differentially impacted by the unbalanced group sizes (Kaplan and George, 1995). Simulation studies (Chen, 2007; 2008) have shown that fit indices in addition to chi-square (CFI, RMSEA, RMSR, gamma hat) were severely biased if the sample size ratio between the reference and comparison group was greater than or equal to 4/1. Since the smallest size was 324, I took a random sample of 1000 cases of the original 7578 cases using the SPSS SAMPLE command. This reduced the original maximum sample size ratio from 23.4 to 3.1 and the minimum from an original 10.1 to 1.3.
Could you please comment on whether this procedure was a good and necessary thing to do for longitudinal CFA/SEM in multigroup analysis?
That's reasonable to do.

Thank you very much indeed in advance for your response.

Michael

Scott Maxwell (Maxwell, 2013d)

From: Scott Maxwell [Scott.E.Maxwell.1@nd.edu]
Sent: 14 September 2013 17:17
To: Michael Tzanakis
Subject: RE: Latent variable mediation modeling

Dear Michael,

I am not very familiar with any of the literature on bias with multigroup SEM**. My intuition is that it makes sense that larger groups would be weighted more heavily, which strikes me as appropriate under the null hypothesis that the groups do not differ. It also makes sense that power will be affected by sample sizes.**

Sorry I can't be of more help.

Regards,

Scott

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