Competition and Entrepreneurship as Engines of Growth

Abstract

The thesis aims to bridge topics traditionally belonging to different areas of the subject: competition and entrepreneurship coming from microeconomics and industrial organization; and growth, from macroeconomics. It centres around the notion that market structure and conduct affect performance and hence growth. Firms optimize by anticipating changes in consumers' demand and in suppliers' behaviour, which are a function of the market structure and its changes. Market-entry can be explained by the level of competition in a market which can be altered by the implementation of specific policies (for instance, the way a competition authority handles mergers). Failing to have an appropriate antitrust regime will ultimately harm entrepreneurship since it will affect one's ability to understand and to handle the risks associated with launching a new venture.

The thesis also explores how different definitions of entrepreneurship explain varying innovation mechanisms (neck-and-neck and leapfrogging) and how this dovetails with the structure and conduct within a market.

For transition economies, we find that competition policy has played a growth-enhancing role and that this effect may be larger than the impact associated with privatization, and we also find evidence of policies' complementarities. These findings are also echoed by our individual-level analysis. We analyse the determinants of high growth expectations entrepreneurial entry (HGE) using individual data drawn on working age population, based on the Global Entrepreneurship Monitor surveys for the 1998-2004 period. We find that HGE is more likely to occur when the entrepreneur perceives a gap in the market with no other producers supplying the same product. This reinforces the theory that the amount of competition faced by an entrepreneur affects the rate of HGE and also provides a microeconomic foundation for the country-level growth effects described for transition countries.

I, Gian Fazio confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis. Elements of this thesis are the result of work with other authors: Chapter 4 was co-authored with Paul Hutchinson; Chapter 5 is based on a paper which was co-authored with Tomasz Mickiewicz; parts of section 6.1 are based on a paper co-authored with Katherine Lam and Felix Ritchie.

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"We learn ... not in order to know how to behave or how to succeed, but to know who we are."

Leszek Kołakowski

Ai miei genitori: Maria e Antonio

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List of Abbreviations

BP - Buyer Power

BTE - Barriers to Entry

CC - Competition Commission

CEO - Chief Executive Officer

CP - Competition Policy

CR - Concentration Ratios

CRM - Case Review Meeting (within the Office of Fair Trading)

DFID - Department for International Development

DG Comp - Directorate General for Competition

DOJ - Department of Justice

E - Entropy Index

EBRD - European Bank for Reconstruction and Development

EC - European Commission

EU - European Union

FDI - Foreign Direct Investment

FTC - Federal Trade Commission

GCR - Global Competition Review

GDP - Gross Domestic Product

GEM - Global Entrepreneurship Monitor

HGE - High Growth Entrepreneurship

HHI - Herfindahl-Hirschman Index

HMT - Her Majesty's Treasury

ISIC - International Standard Industry Classification

NACE - Nomenclature générale des activités Économiques dans les Communautés européennes

NCA - National Competition Authority

OECD - Organisation for Economic Co-operation and Development

OFT - Office of Fair Trading

OLS - Ordinary Least Squares

ONS - Office for National Statistics

PD - Product Differentiation

PPP - Purchasing Power Parity

R&D - Research & Development

S-C-P - Structure-Conduct-Performance Paradigm

SC - Supply Chain

SIC - Standard Industrial Classification

SLC - Substantial Lessening of Competition

TFP - Total-Factor Productivity

UIL - Undertakings In Lieu

VC - Venture Capitalist or Venture Capital

WDI - World Development Indicators

Introduction

This thesis aims to bridge topics traditionally belonging to different areas of research: competition and entrepreneurship coming from microeconomics and industrial organisation; and growth, from macroeconomics. Although no economist would deny that these areas are all ultimately intertwined, relatively little effort has been dedicated to map out the mechanisms through which individuals' and firms' micro-actions determine the macro-performance of countries. Obviously, the understanding of a specific process (e.g. entrepreneurship) requires, above all, a detailed study of its "direct" determinants, participants and its effects. The next step, however, is to take this forward and consider how these specific findings fit within the wider picture of the macroeconomy.

Our main research hypothesis is that a relationship exists between the level of competition in markets, the rate of entrepreneurship and growth. To prove this unequivocally and across various levels of disaggregation we consider the following research questions: is there a relationship between competition policy and entrepreneurship? Has the implementation of competition policy aided growth in transition countries? And, how does competition determine different patterns of innovation?

These questions necessitate a more holistic approach which involves considering how the notion that competition and entrepreneurship affect growth may exist within different levels of an economy: individual; sector and country. This in itself is an innovative way to structure a thesis in that we are aiming to prove the existence of a relationship across various levels of disaggregation of an economy, whereas, traditionally, economists tend to operate either at the individual level (micro) at the country level (macro; international economics; institutional economics), or at the sector/market level (industrial/competition economics).

The emergence of entrepreneurs in a society is a result of individuals' actions and even in countries at similar levels of development the rate of entrepreneurial entry can be very different (see, for instance, the strong presence of entrepreneurs in India compared to its relative absence in China). This thesis hence considers what the drivers of high growth entrepreneurship and what individual's characteristics which

would push (or pull) her into this decision are. These considerations, of course, require the study of data collected from surveys aimed at understanding emerging entrepreneurs' motivations and aspirations.

At the individual level, we consider what causes some ventures to grow faster than others by analysing responses given by nascent entrepreneurs. We use individual level data collected in 41 countries from the Global Entrepreneurship Monitor surveys merged with country level variables. This includes factors such as the respondent's gender, age and level of education. We also construct a sector level variable which captures the perceived level of competition in the market the entrepreneur is about to enter. This variable is particularly interesting in that it describes a market feature but is constructed using individuals' responses.

However, the analysis of individuals and of the performance of countries is ultimately dictated by market forces: the market is the unequivocal cornerstone of the study of economics. It is at this level that we consider basic elements like the roles of supply and demand and the existence of equilibriums. In particular, it is at this level that we consider the notion of competition by looking at the existence of barriers to entry, the number of suppliers, and any other features which affect the way supplier and consumers interact in a market. Considerable attention has hence been given (in chapter 2) to how we define markets since this has a direct impact on the amount of suppliers' concentration and competition. One challenged often faced in international studies is that the market for a particular good can have very different levels of competition in different countries. For instance, it could be that a particular technology is being used by several suppliers in an economy operating on the technological frontier while the exact same technology is only available to one producer in a developing country. We tackled this difficulty by considering the level of competition in the market an entrepreneur is about to enter. We hence manage to obtain realistic proxies for competition which we use in chapters 2 and 5.

While both market forces and people's actions are invaluable to answer our research questions, we are also interested in what the role played by a country's institutions is. For instance, we hypothesise that the decision to enforce a stringent and consistent competition policy is likely to result in economic growth. We test this theory using

country level data from transition economies in chapter 3. Similarly, in chapter 2, we use country level data to prove that superior competition policy regimes encourage entrepreneurship. Finally, when considering the determinants of high growth entrepreneurship in chapter 5 we also control for a series of country level characteristics like GDP growth, GDP per capita and the extent of financial freedom in an economy.

In all three cases, we find strong evidence suggesting that the level of competition in a market and the extent of entrepreneurial endeavours are both conducive to economic growth.

The overall structure of the thesis and the relationship between its various chapters is depicted in Figure 1 below. This draws heavily on Bain's (1956) theorization of how the market process operates. In a nutshell, his theory is anchored to the standard notion that the structure of a market will determine the way agents operate and this will ultimately affect its performance. Industrial organisation often refers to Bain's approach as the Structure-Conduct-Performance paradigm (S-C-P). This approach is very similar to the prediction generated by the Bertrand and Cournot models which fundamentally see prices, quantities and profits as determined by the number of firms, by demand functions and by cost structures (Tirole, 1997). The S-C-P model has also contributed to cementing the foundations of competition laws around the notion that more concentrated markets tend to produce outcomes characterised by higher profits and higher prices, suggesting that antitrust laws should focus mainly on markets' structures (Bishop and Walker, 2002).

The mechanism described by the S-C-P paradigm is not dissimilar from the understanding offered by the institutional economics approach. Williamson (1998, 2000) differentiates between the rules of the game (institutional environment) and the play of the game (governance).

Although Bain's approach is seen as a relatively universal framework that can be applied to any analysis of the development of markets over time (and, it may also have great explanatory power in analyzing the workings of centrally planned economies pre-1989 (Roman, 1986)), it has also been criticised. The main problem with Bain's original approach is that while in the short run there may be a causal

relationship in how structure and conduct determine performance and the rate of innovation, in the long run a market structure and its level of concentration will be co-determined by the level of technology, the nature of capital markets and demand conditions (Dasgupta and Stiglitz, 1980). Figure 1 highlights the existence of this additional feedback relationship with the curved arrow. Similarly, Bishop and Walker (2002) raise the question of what the structure actually derives from: are there more basic conditions like cost and demand structures which determine the S in the paradigm? This greatly depends on what we believe to be the relevant structure of the market. Within this work, we have somewhat expanded the concept of market structure as it is generally understood by industrial organisation theory to include not only market specific factors but also country level conditions (while we recognise that the former are likely to be a function of the latter). Of course, some factors determining a market's structure will be exogenous as is, for instance, in the case of natural monopolies.

Bain's approach came under attack in the 1960s and 1970s by exponents of the Chicago School. Demsetz (1973, 1973) proposed that firms become larger because of the exploitation of higher levels of efficiency and better management (competitive heterogeneity) and that size and concentration *per se* cannot be taken as manifestation of negative conducts. This notion that what takes place within a firm is more important than what happens around it (whether in the market or at the institutional level) has been developed further in the 1980s and 1990s and is commonly referred to as the resource-based view (RBV). This approach is in contrast to Bain's paradigm in that it suggest that competition issues arise out of firms utilising resources and abilities in different ways resulting in some obtaining specific competitive advantages which, over time, create competitive barriers (Mahoney and Pandian, 1992).

These theoretical developments resulted in scholars drawing different conclusions as to what the role of regulation and competition policy should be. For instance, Posner (1975) claimed that the social cost of public regulation is probably higher than the social cost of private monopoly. More recently, Posner openly advocated the abolition of the Federal Trade Commission in the USA. Similar views have been put forward by not only Chicago School academics but also by high-ranking civil servants, the

most famous perhaps being Alan Greenspan[1] who openly and repeatedly questioned the value of antitrust policy.

The main problem with the Chicago School and the resource-based view is that it is fundamentally tautological: "only valuable and rare resources can be sources of competitive advantage" (Barney, 2001). Moreover, the main contribution of institutional economics has been to show that the study of institutions is more robust and more likely to be exogenous than firm-based theories which suggests that an approach focusing on the structure, rather than the firms, lends itself more to be tested empirically.

Hence, overall, we think that Bain's approach still provides a better way to consider the relationship between market and firm forces. Also, the notion that structure affects conduct is a bastion of competition economics and competition policy and, given that a large proportion of this thesis centres around competition policy, this represents a good starting point for our analysis.

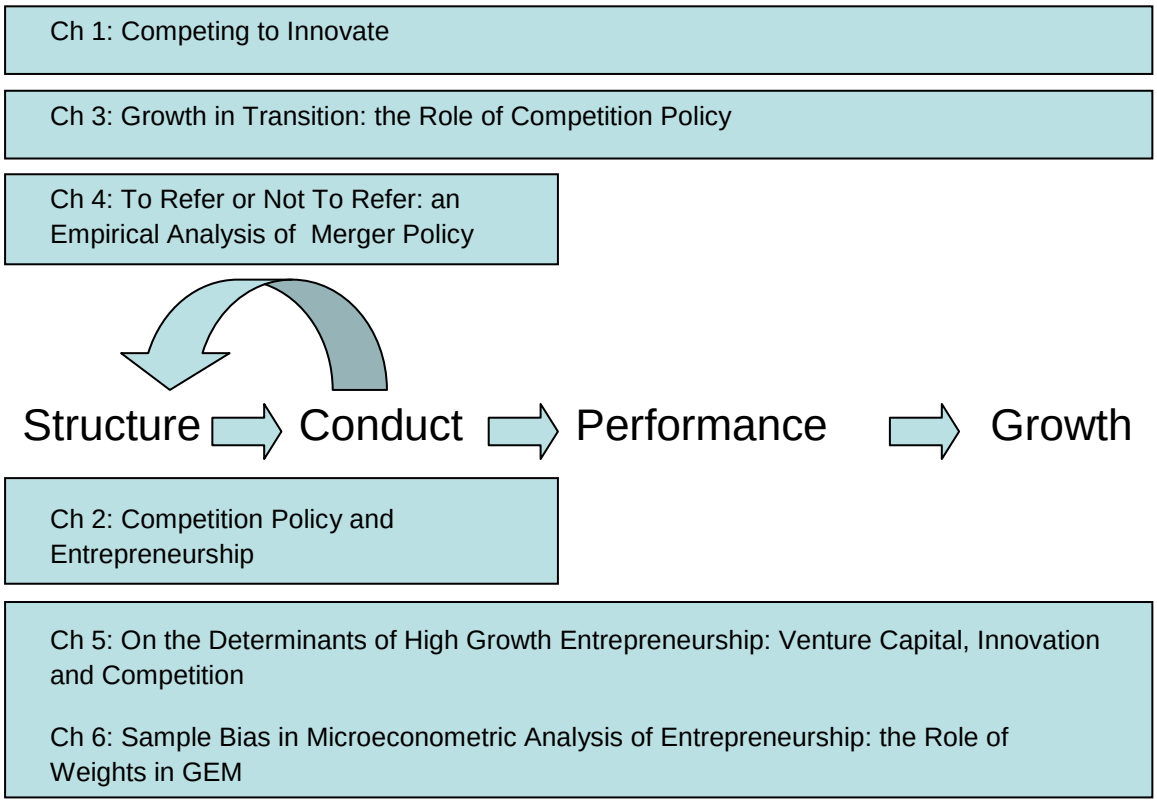
However, apart from acknowledging that, over time, conduct may affect structure (in particular, performance having an impact on structure) in borrowing Bain's paradigm we make two additional adjustments.

Firstly, we address the issue of market-entry by explaining the level of competition in a market as being interrelated with entrepreneurship and innovation. Firms optimise by anticipating changes in consumers' demand and in suppliers' behaviour; firms' conduct being a function of the market structure and its changes. But, within this context, firms would be wise to monitor the behaviour of potential entrants and firms operating in contiguous markets (indirect competition) (Drucker, 2001).[2] In chapter 1 we will consider how existing theories on this could be harmonised under a unified understanding on a market's competitive structure and its innovation pattern.

[1] In a lecture delivered in September 1961 Greenspan stated: "the very existence of those indefinable statutes and contradictory case law [antitrust laws] inhibits businessmen from undertaking what would otherwise be sound productive ventures. No one will ever know what new products, processes, machines, and cost-saving mergers failed to come into existence, killed by the Sherman Act before they were born."

[2] Obviously this is intimately related to the concept of entry barriers.

Figure 1. Structure - Conduct - Performance paradigm revisited and mapping of the thesis



Secondly, we expand Bain's approach by adding a final step in the diagram since, *ceteris paribus*, performance improvement will ultimately result in economic growth. This allows us to relate our analysis back to country-level conclusions (the dependent variable in chapter 3 being change in GDP).

A consequence of this somewhat eclectic approach based on both micro and macro theories can also be seen, as mentioned, in the variety of data used. A macroeconomist will typically not observe the behaviour of entrepreneurs directly and, similarly, an industrial economist would rarely look at how countries as a whole may behave. The analysis described in the following chapters however, draws from a wide variety of sources using both individual, sector and country level data. This eclectic approach is somewhat similar to the methodological blueprint described in Wennekers (2006) which spans across three levels: the individual level of nascent entrepreneurs, the firm level and the national entrepreneurship rate.

Following the mapping presented by Figure 1 above, the remainder of the thesis is structured as follows.

Chapter 1 is an introductory chapter which contributes towards an overarching theory linking entrepreneurship with innovation (and, as a consequence, growth). It aims to fill a gap which has emerged between theoretical and empirical studies by considering entry (and entrepreneurship) and innovation together. In particular, we suggest that the two main theories of entrepreneurship (the one advocated by the Austrian school and by Schumpeter) may be describing the behaviour of individuals and firms acting in markets with different competitive structures which result in different modes of innovation emerging in different markets: neck-and-neck and leapfrogging. We show the existence of a non-monotonic relationship between competition and innovation.

Chapter 2 develops further the analysis of relationship between competition and entrepreneurship. We also address how failing to have an appropriate competition policy will ultimately harm entrepreneurship since it will affect one's propensity to understand and to handle the risks associated with launching a new venture. Approaching this subject necessitates an understanding of what we actually mean by the key concepts, hence a part of the chapter is also devoted to unpacking definitions of who an entrepreneur is and what we mean by competition and competition policy. Here we also consider more fully the various definitions initially cited in chapter 1. In this chapter we demonstrate that a country's rate of entrepreneurship and new firm formation depends on the quality of the competition policy implemented.

Chapter 3 explores the mechanism through which antitrust laws aimed at promoting competition have promoted growth in former command economies. Within the context of transition economies, the beneficial role of having introduced market-oriented economic policies has been widely recognised; however, little has been written on the specific contribution made by the implementation of competition policy.[3] A review of the relevant literature highlights a serious incongruence between theoretical findings and results of empirical studies. This chapter uses indicators available from the European Bank of Reconstruction and Development to demonstrate that competition policy has played a positive and significant role in fostering growth. We also propose that this effect may be larger than the impact associated with privatisation and find evidence of policies' complementarities in transition economies.

[3] Throughout the thesis the term competition policy and antirust laws will be used interchangeably.

Although in chapter 3 we offer both theoretical and practical definitions of competition policy, given the cross-country nature of the data, we leave the working of specific national competition authorities unexplored. In chapter 4, we zoom in on this area by analysing the process through which merger cases are referred, in the UK, by the Office of Fair Trading to the Competition Commission and the factors determining whether the Substantial Lessening of Competition test is met. The study utilises a newly created database developed from an initial sample of over 300 cases examined by the authority since the introduction of the Enterprise Act 2002 and, using discrete choice models, confirms that a handful of variables commonly associated with merger analysis perform well in predicting whether a case is referred. In particular, our results suggest that while market shares are, as expected, very important, other variables also play a significant role; a simple count of competitors is unlikely to yield strongly performing predictions.

In chapter 5 we will return to the main research question of how competition is interrelated with growth (explored in chapter 2) but at a much lower level of disaggregation returning to the figure of the entrepreneur. We analyse the determinants of high growth expectations entrepreneurial entry (HGE) using individual data drawn on working age population, based on the Global Entrepreneurship Monitor (GEM) surveys for the 1998-2004 period. Our model utilises both individual level explanatory variables and country-level factors. Our results suggest that innovativeness is a strong predictor of HGE. In addition, we also find that innovative start-ups are associated with highest growth expectations in countries with extensive supply of venture capital.

We also find that HGE is more likely to occur when the entrepreneur perceives that there is a gap in the market with no other producers supplying the same product. This conclusion both reinforces the theory put forward in chapter 1, that the amount of competition faced affects the rate of HGE, and also provides a microeconomic foundation for the country level growth effects described in chapter 3.

Chapter 6 is, in essence, a technical extension to chapter 5 where we stress-test our analysis by applying appropriate sampling weight to account for GEM's survey design features. There are two main reasons why work in this area of the thesis has

developed into a separate chapter: firstly, given that this is an area of econometrics which has been somewhat neglected, the chapter offers a review of current approaches to weighting both by summarising recent literature and by reporting specific examples; secondly, its conclusions contribute in the more general methodological arena since econometricians will often have to decide whether to weight or not their analyses.

The thesis terminates with some overall conclusions which will also discuss policy implications of the work and highlight areas for further research.

Chapter 1: Competing to Innovate

The notion that competition levels determine how efficient markets' outcomes are is in line with the theory advocated by the Structure Conduct Performance (S-C-P) paradigm. Markets, or even industrial sectors, will be characterised by specific structures which will result in particular outcomes. Literature in this area, however, has produced different results regarding the relationship between competition and innovation and this chapter aims to reconcile what may seem to be divergent views into a coherent overarching theory.

The main reason why economists generally dislike monopolies is that, according to the results based on rational choice microeconomics models, they decrease overall welfare. Indeed, this is one of those rare areas of the subject where both the normative and the positive approaches seem to be in agreement. Most of the arguments linking the level of competition in a market (or economy) to economic growth rest on efficiency-type arguments. In their simplest static form, these theories show that monopolies produce less efficient outcomes both in terms of productive and allocative efficiencies.[4] This effect is likely to increase over time as the Darwinian process embedded in well-functioning markets – which rewards more efficient firms - is absent: an inefficient monopoly continues to exist purely because of absence of competition.

On the other hand, as will be discussed in the following sections, some scholars have advocated that market power may also translate into efficiency gains through specific patterns of innovation. Further, the links between competition and efficiency become more complex when the issue is considered dynamically and when specific market, or industry, characteristics are taken into account. We consider of crucial importance whether innovation in a market takes place in a neck-and-neck (continuous, evolutionary, incremental) or leapfrog (revolutionary, radical) fashion.

The central idea of this chapter is that the rate of innovation (and hence efficiency) derives from different levels of competition, but that the relationship between the two is non-linear. The main reason being that innovation takes different forms depending

[4] We summarise this typical argument in Annex 1 and different types of efficiencies are discussed in chapter 3.

on the specific market characteristics: innovation in the agricultural sector will be very different from the one found in more high-tech industries. For instance, one example of this is the way industrial districts operate, where we find a clear link between structure and innovation: a specific "system of production which is also a strategy of innovation" (Guy, 2009, p. 180). Malerba (2002), for instance, considers how individual sectoral systems of innovation and production are composed, and differ along several dimensions, which are: "specific knowledge bases, technologies, production processes, complementarities, demand, by a population of heterogenous firms and non-firms organizations and by institutions" (Malerba, 2002, p. 250). Similarly, in exploring the relationship between market power, or competition, and innovation, Richard (2007) isolates several factors which will have to be considered including the extent of intellectual property protection (if relevant) and the specific dynamics of R&D within the market in question.

This notion that different innovation systems will characterise different markets transcends from the traditional differentiation between product and process innovation which can occur in any market. Different patterns of innovation are to be seen not only as a result of the specific characteristics of the industry in question (for instance, whether high-tech or otherwise) but also of the way participants *compete*. In this sense, a more useful differentiation would be to distinguish those competing *in* the market and *for* the market (see chapter 2) and how a participant's mode of innovation is related to her position within a market. For instance, within Malerba's (2002) sectoral systems approach a basic element of each system is the process of competition.

Against this backdrop, it is also important to understand how individual agents within the market operate since efficiency gains (or losses) partly derive from firms' investment decisions aimed at developing more efficient ways of producing. These decisions effectively describe a market participants' propensity to innovate and will be a function, among other factors, of the level of competition experienced both before and after the innovation. Baxter (1985) refers to these as two separate markets: today's and tomorrow's market. In markets with rapidly developing technologies, the distinction may be important since all participants will be engaging in R&D and new inventions will greatly alter the state of the market (or even create new markets).

One element which has not been considered within this competition-innovation relationship is the role played by new ventures and by entrepreneurs in general. We test our hypothesis regarding different types of innovations deriving from different market structures using data from the Global Entrepreneurship Monitor (GEM) surveys. We find that high growth entrepreneurship decreases as competition increases suggesting that this type of innovation fits within the leapfrog framework.

The remainder of this chapter is structured as follows: section 1.1 reviews some of the theoretical and empirical studies linking competition and innovation; section 1.2 introduces a theoretical framework of how different market dynamics can impact innovation; section 1.3 tests the hypothesis that a non-linear relationship exists between innovation and competition using data from GEM and section 1.4 concludes.

1.1. Models of competition and innovation

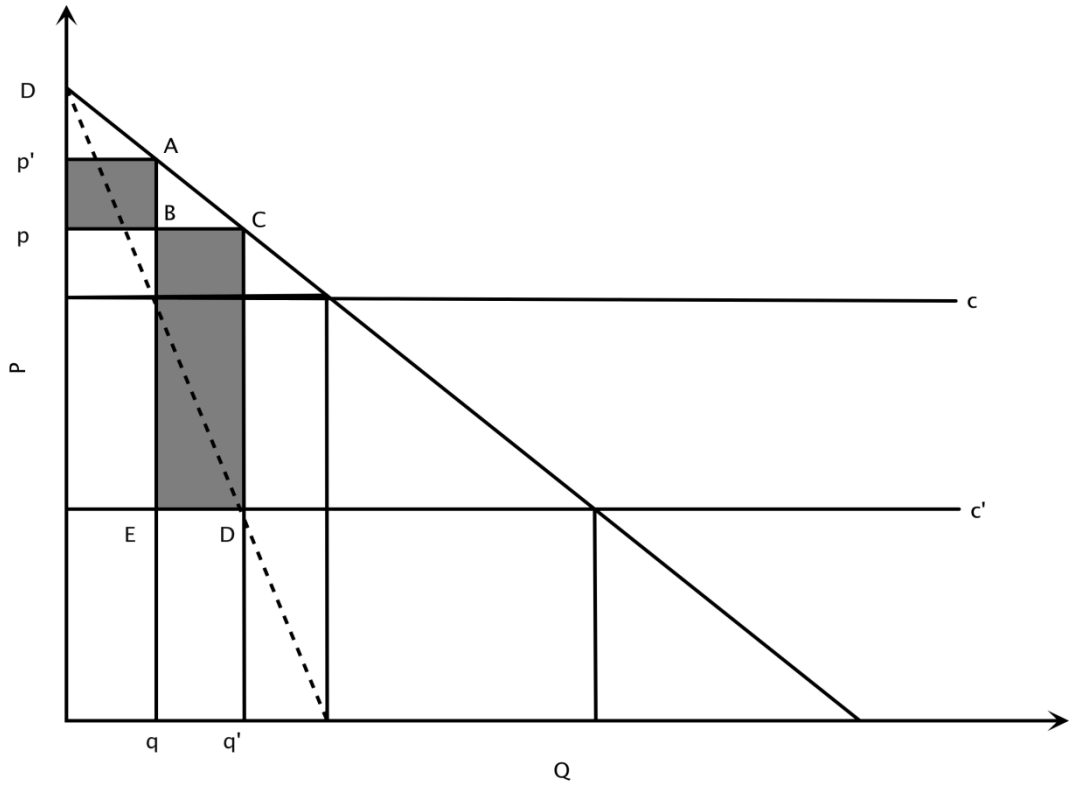
Advancements in industrial organisation, as in many other areas of economics, have been possible thanks to progress made by both theoretical and empirical economists. In a nutshell, although we had statistical studies finding positive links between competition with innovation and growth, some theoretical models were suggesting otherwise. This negative relationship which can be traced back to Schumpeter (1947) partly results from the study of markets under perfect competition as opposed to considering more real-life examples. For instance, in Schumpeter's case he concluded that if in perfect competition suppliers were already - continuously - using the available resources in the most advantageous way, there would be less of an incentive to innovate compared to a market where firms are just falling short of obtaining an optimal level. Dasgupta and Stiglitz (1980) explore the relationship between R&D and market structure and conclude that higher product market competition reduces the incentives to enter (and to innovate) as future rents will be reduced. Aghion and Griffith (2005, p.11) refer to this phenomenon as "the Schumpeterian effect of product market competition."

On the other hand Arrow (1962) finds that while in both monopolistic and perfect competition settings the rate of innovation will be less than the socially desirable level, nevertheless this will be higher for the competitive than for the monopolistic structure. Arrow showed that a monopolist's incentives to innovate would be lower

than the ones faced by a firm in a competitive market since, in the first case, the monopolist will always enjoy the existing revenue stream. Under perfect competition, a firm has more to gain from innovating since its lower prices will attract customers previously purchasing from other suppliers. In other words, even if a firm realises an increase in sales (and profits) as a result of innovation, as a monopolist some of this benefit would be cannibalised from her current revenues. Tirole (1997) refers to this phenomenon as the replacement effect.

Arrow's (1962) explanation follows the standard framework (perfect competition versus monopoly) described in Annex 1. Figure 2 below shows how, following a successful innovation, a monopolist can reduce her marginal and average cost from c to c' hence increasing production from q to q'. This would result in the monopolist gaining the shaded area (made up of the areas $p'ABp$ and $BCDE$) as additional profits.

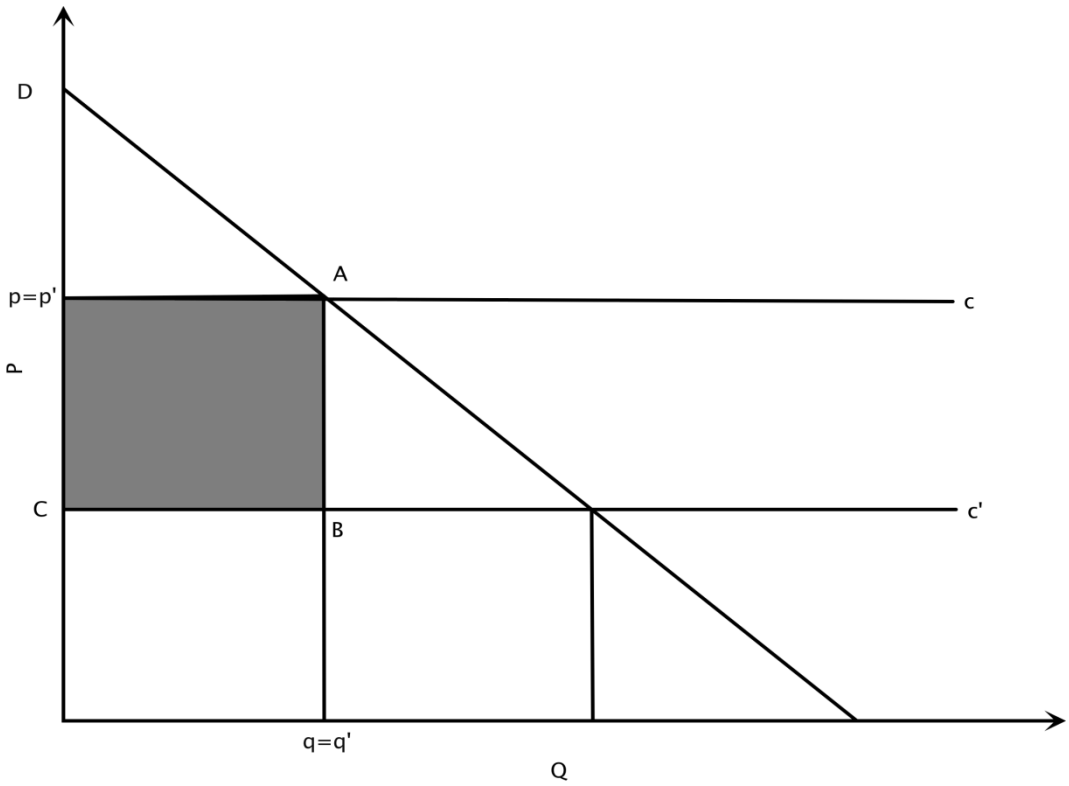
Figure 2. Arrow: innovation under monopoly



Consider now a similar scenario but under perfect competition. Figure 3 shows how a firm discovering a more efficient way of producing (hence lowering its costs) is able

to internalise sales to whole market since it is cheaper than all its competitors. The firm's profits will hence be the shaded area $p'ABC$. To note that this will result in prices which will be slightly lower than equilibrium prices and output that will be marginally increased.

Figure 3. Arrow: innovation under perfect competition



Moreover, strengthening Arrow's conclusion, Aghion et al. (1997) show that the above mentioned Schumpeterian negative effect of product market competition on innovation is reversed once we account for the principal-agent problem since higher levels of competition incentivise firms to reduce slack. Aghion and Griffith (2005) push this line of reasoning further as they confirm that competition policy has a more pronounced effect on satisficing firms than on profit maximising ones (yet while this effect is significant for productivity levels, it disappears for productivity growth).

Differences in results are also likely to depend on one's stance with respect to the shape inter-firm technological rivalry takes. In particular, neo-Schumpeterian studies assume that firms will only be able to overtake the market leader by leapfrogging her. On the other hand, Aghion et al. (1997) show that, if a step by step approach is adopted, then more intense competition can be growth enhancing.

The above studies have delineated a complex conceptual relationship between competition and innovation. In line with these mixed predictions, empirical studies in this field have produced mixed results.

For instance, for the UK, Haskel (1991), Nickell (1996) and Blundell et al. (1999) have proven, using large firm-level datasets, that a low level of competition is detrimental to productivity growth. Disney, Haskel and Heden (2003) confirm these results and extend their conclusions to explain not only productivity growth but also productivity levels.

For Aghion and Griffith (2005) one of the great limitations of the theoretical studies discussed is that they predict the relationship between the level of competition and number of firms in a market (whether profit maximising or otherwise) to be monotonic. In reality, however, empirical studies have shown that the relationship between concentration and productivity (and/or innovation) is likely to be non-linear (for a review of efforts in this area see OFT, 2007). This further clarifies earlier theoretical studies (e.g. Schumpeter, 1947) which were attempting to explain the rate of innovation under perfect competition or monopoly using the two most extreme cases of markets' environments. Aghion and Griffith (2005) find evidence of an inverted-U-shaped relationship between competition and innovation.

1.2. Towards a unified theory

The above discussion on how different market structures will produce different patterns of innovation echoes Bain's S-C-P paradigm since innovation will ultimately affect performance. However, as discussed, a gap has emerged between two distinct schools of thought: one advocating that highly concentrated markets (at times monopolies) lead to innovation and the other seeing more competitive industries as the ones characterised by high rates of innovation.

We propose that both theories may coexist for two reasons: firstly, they describe two different types of innovation which we will refer to as neck-and-neck and leapfrogging; and secondly, these differences can be explained by looking at the role played by new entrants. Moreover, we believe that entrepreneurship represents a fundamental piece of the puzzle in unpacking the competition-innovation relationship.

Neck-and-neck innovation is a continuous process which has been discussed by Kirzner (1973; 1992) and von Mises (1966). Aghion and Griffith (2005) define neck-and-neck industries as those where firms are competing very closely to the technological frontier (which they calculate using total factor productivity). As will be described in the following chapters, this approach sees the market process as involving continuous innovation where participants discover slightly better ways of producing. It has often been described as an "equilibrating", "non-drastic" process since it pushes markets more and more towards their natural equilibriums. Within this understanding of the market process, dominance becomes a hindrance to improving performance: "Market domination produces tremendous internal resistance against any innovation and thus makes adaptation to change dangerously difficult" (Drucker, 2001, p. 33). Hence, this process of innovation relies on competition acting as the main force to incentivise firms to improve efficiency incrementally.

> *"Barriers to competition are only important where the exploitation of the opportunity is a continuous process." (Casson, 2003, p. 49)*

This understanding of how innovation occurs echoes Arrow's approach described in the previous section where firms constantly compete with each other and have high incentives to innovate to realise additional revenues.

Leapfrog innovation, on the other hand, is more in line with Schumpeter's "gale of creative destruction". Here, new markets are being created (and old monopolies broken) often as a result of completely new products being introduced. Binks and Vale (1990, p. 20), for instance, describe entrepreneurial activity as "an *unrehearsed* combination of economic resources instigated by the uncertain prospect of temporary monopoly profit [italics added]." One mechanism explaining how this type of innovation takes place in reality is described by Reinganum (1985) who shows how, theoretically, a firm will innovate and become a monopolist but then, as incumbent, will invest less in innovating than its challengers and hence will eventually be overthrown. In contrast to the neck-and-neck process, leapfrog innovation may exist in markets characterised by low levels of competition since each wave of innovation delivers considerable market power to the innovator for some time.

Returning to Baxter's (1984) approach, it is helpful to understand the difference between the two modes of innovation described above and to consider how a market

structure changes before and after innovation occurs. In neck-and-neck industries the pre-innovation market structure may be very similar to the post-innovation one, whereas in leapfrog systems this may not be the case.

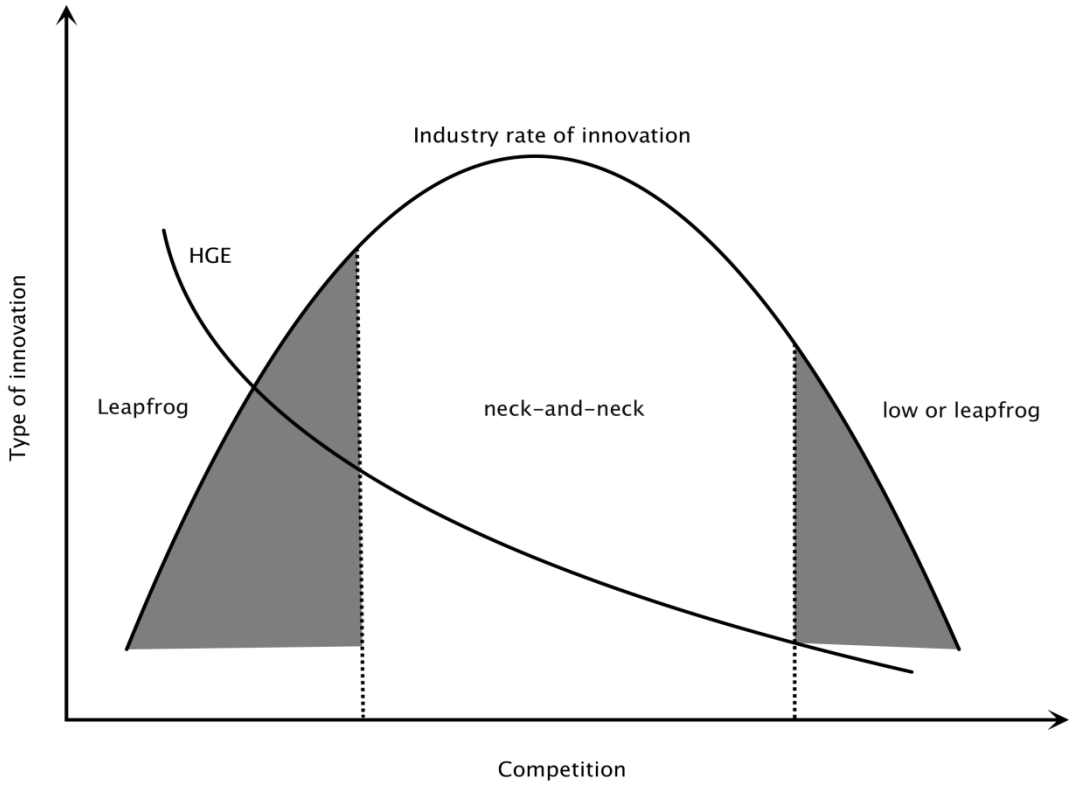
From an operational perspective, we can assume that leapfrog innovations will result in new markets being created whereas this is not the case for neck-and-neck. In practice one can check whether a new market has indeed been created by considering whether there is demand side substitution between the old product and the new one. When cross-product elasticity is low the product, or process, innovation has resulted in the creation of a new market.[5]

Moreover, these two processes may be describing slightly different types of innovations: product innovation and process innovation. For instance, leapfrog innovation may imply the introduction of a completely new product which in itself creates a new market. This would automatically result in the firm enjoying monopoly power (especially if the invention in question was patented). Neck-and-neck innovation, conversely, is likely to involve cost reduction discoveries which are usually process innovations. The two approaches may also be describing two successive stages of the same process.

In light of comments made above, we propose that, as can be seen in Figure 4, the type (and amount) of innovation conducted in an industry depends on its competitive structure. This relationship is, as found by Aghion and Griffith (2005), non-linear with high levels of innovation being present in markets which are neither a monopoly nor perfectly competitive. Parallel to this we note, as will be seen in the following chapters, that high growth entrepreneurship (HGE) decreases as competition increases, the main reason behind this being that HGE seems to occur mainly when innovation is also present. Innovative HGE tends to be, as one would expect, of the leapfrog type.

[5] In antitrust cases a SSNIP test is usually applied in this contexts. The Hypothetical Monopolist or Small but Significant Non-transitory Increase in Prices (SSNIP) test defines the relevant market by determining whether a given increase in product prices (usually in the range of 5 to 10%) would be profitable for a monopolist in the candidate market.

Figure 4. Different modes of market structure leading to different modes of innovation



1.3. Empirics

We can test the above theory using sector level data computed by aggregating individual level data. Table 1 shows the amount of innovation and competition for 1-digit International Standard Industry Classification (ISIC) sectors. The *innovation* variable has been computed using data from the Global Entrepreneurship Monitor (GEM) which asks new entrepreneurs whether their propositions will be innovative or not (ranging from 1 to 3, 3 being highly innovative). A thorough description of GEM can be found in Reynolds et al. (2005, 2008) and in chapter 5. In a nutshell, the database's defining feature is that it allows researchers to study nascent entrepreneurs (individuals who are in the process of launching a venture) across countries with 2,000 interviews carried-out in each country. Following the description given above, our *innovation* variable is of the leapfrog type since it involves innovative entry.

The *competition* variable was also computed using GEM data and it captures whether the new entrant faces many competitors or not. It was computed taking the inverse of a discrete variable asking respondents whether they will be facing any competition

(this is the *monopoly* variable we will use again in chapter 4). This was then averaged, just as for the innovation variable, at sector level.

As can be seen in Table 1, there seems to be a rudimentary relationship between the level of competition of an industrial sector and the amount of innovation conducted by new entrants (correlation -.76); however, obviously it is only indicative – we do not claim any statistical significance due to the limited number of observations.

Table 1. Innovation and competition across sectors

ISIC (1-digit)	Description	Innovation	Competition
1	Agriculture, hunting and forestry	1.45	10.80
2	Mining construction	1.48	16.17
3	Manufacturing	1.64	7.89
4	Transportation, communication	1.57	6.82
5	Wholesale	1.55	9.46
6	Hotels and restaurants	1.61	8.57
7	Finance, insurance, real estate	1.48	14.59
8	Business services	1.64	8.83
9	Health, education, social services	1.69	7.02
10	Services	1.55	9.34
	Total	1.56	9.95

This is in line with the prediction formulated above: facing lower levels of competition seems to attract more innovative entry. What this seems to suggest is that entry may occur because it is perceived that there is a gap in the market, or, as mentioned, because the product which will be sold will create a market in itself (hence, the entrepreneur perceives there to be little or no competition for what he is planning to produce). This is in line with the pattern described for leapfrogging innovation, however 1-digit ISIC codes describe extremely large segments of an economy and, moreover, the numbers presented in Table 1 are averages across countries.

We investigate the relationship between innovation and competition further by analysing the same variables but at a lower level of disaggregation. We compute the *innovation* and *competition* variables described above at 4-digit ISIC[6] (4-digit ISIC sectors are often assumed to represent real markets in antitrust cases) for each

[6] For countries where data was collected for more than one year, we take an average since the relationship between innovation and competition is likely to be constant across time.

country, yielding in all 3,745 observations (summary statistics for all variables are reported in Table 2 below) . This way we aim to control for country-level differences resulting, for instance, from difference in institutional development and in the competitive advantages of countries (Porter, 1998), while we allow the relationship between the variables in our model to vary across markets and hence, across Malerba's (2002) sectoral systems as discussed in the introduction above. The idea that innovation rates will change across sectors is well accepted (see for instance, Acs and Audretsch, 2005 for a review of the evidence). Our prediction would be to prove the existence of a non-linear relationship between the competitive structure of a market and the amount of innovation carried out in each market (to confirm the theory presented in Figure 4). We estimate the following OLS models where *innovation* was regressed on linear and quadratic logs of the competition variable (we also converted all cases when competition would have been 0 to 0.0001 so that $competition > 0$):

$$Innovation = \alpha + \beta_1 \log\_competition + \beta_2 \log\_competition^2 + \varepsilon$$

Model (1)

$$Innovation = \alpha + \beta_1 \log\_competition + \beta_2 \log\_competition^2 + \beta_3 D.country + \varepsilon$$

Model (2)

To consider further possible differences across economies we also substituted the country dummies for GDP per capita at PPP in 1995 USD (*gdp_pc_ppp*) in Model 3. This would also act as a proxy for the distance of a country from the global productivity frontier. Finally, we also interacted GDP pc with both competition variables, *GDP_x_competition* and *GDP_x_competition*^{2}, to test whether different additional effects occur in specific combinations of competition and economic development (Model 4).

$$Innovation = \alpha + \beta_1 \log\_competition + \beta_2 \log\_competition^2 + \beta_3 GDP\_pc\_ppp + \varepsilon$$

Model (3)

$$Innovation = \alpha + \beta_1 \log\_competition + \beta_2 \log\_competition^2 + \beta_3 GDP\_pc\_ppp + \beta_4 GDP\_x\_competition + \beta_5 GDP\_x\_competition^2 + \varepsilon$$

Model (4)

Table 2. Variables' summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Innovation	4453	1.56	0.691	0	3
log_competition	3872	-4.996	2.723	-6.908	0
log_competition^2	3872	-13.036	7.596	-18.421	0
gdp_pc_ppp (US $)	4734	22962.33	12127.61	813.731	45421.52
GDP_x_competition	3872	-111384	91118.1	-313760.8	0
GDP_x_competition^2	3872	-290143.6	247505.7	-836695.4	0

As can be seen from Table 3 below, we find a positive quadratic relationship of the sort predicted above in Figure 4 with the coefficient for competition β_1 being always positive and significant at 1% and the coefficient for the quadratic term, β_2, confirming the presence of a non-linear relationship. More importantly, this relationship holds once we control for differences across countries, for instance, because of varying degrees of institutional development. This is in line with Aghion and Griffith (2005) who, as discussed, predicted a non-monotonic relationship between innovation and competition.

Including the GDP per capita variable in the model does not detract from the competition effects described. However, the role of economic development is somewhat ambiguous with the GDP per capita variable being highly significant and negative in Model 3 but becoming insignificant once it is interacted with the competition variables. This is not too dissimilar to results found by Wennekers (2006) who, regressing self employment on a series of country-level variables, also finds GDP per capita to have a negative effect.

Table 3. OLS regression results (innovation as dependent variable)

	Model (1)	Model (2)	Model (3)	Model (4)
log_competition	0.352***	0.375***	0.358***	0.332***
	(0.0588)	(0.0551)	(0.0587)	(0.127)
log_competition^2	-0.120***	-0.129***	-0.122***	-0.116***
	(0.0207)	(0.0193)	(0.0207)	(0.0447)
gdp_pc_ppp			-3.81e-06***	-1.97e-06
			(9.06e-07)	(2.56e-06)
GDP_x_competition				9.57e-07
				(4.66e-06)
GDP_x_competition^2				-2.26e-07
				(1.64e-06)
country dummies		Y		
Constant	1.870***	2.008***	1.968***	1.921***
	(0.0316)	(0.0582)	(0.0391)	(0.0692)
Observations	3745	3745	3745	3745
R-squared	0.01	0.137	0.015	0.015

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1.4. Conclusions

In this chapter we have shown - both through theoretical and empirical approaches - that the relationship between the level of competition faced and the amount of innovation taking place in a market is non-linear. We have explained this by considering how different systems of innovation are characteristic of specific industries and markets. Although the concepts of neck-and-neck and leapfrog innovation seem similar to the radical and incremental types of innovation described by, for instance, Dewar and Dutton (1986), there is one important difference: radical innovation is described as containing a high degree of new knowledge as opposed to a lower level, but the innovation is measured along the same dimension. Radical innovation is still evolutionary as opposed to leapfrog innovation which necessitates the creation of a new market.

An interesting remaining question is whether the two types of innovation systems will produce different effects. Following from the previous paragraphs, it would seem intuitive to think that the results of a leapfrog innovation will be more pronounced than the changes brought by a neck-and-neck innovation. However, this may not

always be the case. Rayna and Striukova (2009), examining Apple's innovation strategy in the last twenty years, conclude that the firm was more successful when pursuing incremental rather than radical innovation.

The policy implications of our analysis are complex and may result in slightly different conclusions. Leapfrog innovation would require government to safeguard one's innovations by offering strong protection of intellectual property rights and extensive long-run protection of patents to create incentives; neck-and-neck innovation, on the other hand, requires government to encourage vigorous competition between firms.

The process of inter-firm rivalry, whether it manifests itself through neck-and-neck or leapfrog mechanisms, is central to the development of competitive advantages through innovation. Governments have a role to play in maintaining a level playing field: "a strong antitrust policy [...] is fundamental to innovation" (Porter, 2008, p. 205). The following chapter will explore in more detail what we mean by competition policy and how it can promote entrepreneurship which, as we have seen, can be an important driver of innovation.

Chapter 2: Competition Policy and Entrepreneurship

While both areas of economics, competition policy and entrepreneurship, have been researched extensively over the years, their intersection remains somewhat more obscure. One of the possible reasons for this being that the implementation of competition policy is today fundamentally aimed at safeguarding consumers rather than competitors. Its correct implementation, of course, may benefit competitors, but this is seen more as an externality than a primary objective. This is particularly interesting considering the origins of competition policy are deeply rooted in the protection of smaller competitors. The very expressions *competition law* or *antitrust law* suggest that "the law relates primarily to interfirm rivalry" (Audretsch et al., 2001; Motta, 2004) yet, the aim of the most respected National Competition Authorities (NCAs) regards primarily the protection of consumers rather than competitors.[7] Further evidence of this is that, in many countries, competition and consumers' policy are delivered by the same body. In practice, just like the Magna Carta, the Sherman Act[8] might have been written to protect the interest of a specific group of people but its implementation has resulted, over the years, in the protection of everyone's freedom.

Governments also influence firms' strategies and markets' structures by determining the level of rivalry through regulation and antitrust laws (Porter, 1998). In practice, however, another bi-product of a government's efforts in this area is that designing and implementing effective competition policies results in protecting the liberty to engage in entrepreneurship and to innovate (Golodner, 2001). More generally, "the analysis of occupational choices at individual level embodies elements defined at aggregate level" (Wennekers, 2006).

There exist relatively strong theoretical links between competition and entrepreneurship in the literature, but their characteristics are heavily influenced by one's definition of the figure of the entrepreneur. A notable contribution in this area has been Kirzner's 1973 book entitled "Competition and Entrepreneurship" where he states that "... a useful understanding of the market process requires a notion of

[7] For instance, the Office of Fair Trading's goal is "making markets work well for consumers"; Federal Trade Commission's is "protecting America's consumers".
[8] Which is considered to be the first antitrust law and was introduced in US in 1890.

competition that is *analytically inseparable* from the exercise of entrepreneurship [italics added]" (Kirzner, 1973, p. 9). One of the reasons why Kirzner's approach is in contrast to that taken by his contemporaries is that he sees competition as an evolutionary process rather than an equilibrium condition. In this context, the process of competition fundamentally implies supply-side rivalry and entrepreneurial activity. This was in contrast to the a very traditional view of perfect competition which effectively eliminated the figure of the entrepreneur all together and saw suppliers as being only able to accept the market's price (Kirzner 1973). Kirzner assumes that entrepreneurial activity (and firm entry) occurs within established markets characterised by higher or lower levels of competition. This is a direct consequence of his understanding of entrepreneurship which is rooted in the Austrian approach (see discussion on the definition of entrepreneurship in 2.1 below) which sees entrepreneurship as a central element of the economy itself: "in any real and living economy every actor is always an entrepreneur" (Von Mises, 1966, p. 253).

For Schumpeter, however, entrepreneurship involves (if not even necessitates) the creation of new markets through innovation. In these new markets, the creative destructor must, by default, enjoy a period – short as it may be – when he is effectively a monopolist. To speak of competition as a process may be an eloquent way of conceptualising the process of rivalry which characterises specific markets and it may allow more of a role for the entrepreneurial endeavour but, if this process itself results in the creation of new markets, it almost eliminates the existence of competition *a priori*. Within the Schumpeterian realm "it is the new firms or the firms with no existing market power that are more likely to undertake the most dramatic and revolutionary entrepreneurial activities" (Dutz et al., 2000). This difference between the two approaches is clearly seen in the way technological rivalry is treated: firms are either competing neck-and-neck (evolutionary) or leapfrogging (revolutionary) each other (Aghion et al., 1997).

One of the objectives of this chapter is to investigate this Kirzner-Schumpeter incongruence and shed some light on the intricate competition-entrepreneurship relationship by discussing developments in competition policy and our understanding of markets. For instance, the way we define markets in antitrust work is a result of the progress industrial organisation has made in the last decades. In practice, we are now

able to establish, with a relatively tight margin of error, whether a new entrant will be operating in an existing market or whether she has developed something radically different. This increased understanding of the boundaries of a market is a direct consequence of the work carried out by antitrust offices worldwide and of the academic research which underpins their efforts.

Our understanding of the competitive process in markets can also lead us to a better understanding of the definition and role played by the entrepreneur. For instance, the differentiation often made between competition *in* the market and competition *for* the market may describe the process of rivalry experienced respectively by Kirznerian and Schumpetrian entrepreneurs:

> *"**Competition in the market** describes how firms already in a particular market compete on a day to day basis to gain market share [...] **Competition for the market** describes how firms initially compete to supply a market. An example of this would be competition for contracts to exclusively supply a market for a period of time" (OFT, 2007, p. 12).*

Or, following Burke et al. (2006) these two concepts of entrepreneurship may translate into static (low entry and exit, low innovation) and dynamic (high entry and exit, leapfrogging innovation) markets.

Of course not all areas covered by competition policy will have a direct impact on entrepreneurship. For instance, merger control will largely concern established firms; similarly, it is difficult to think of a new entrant being accused of abuse of dominance. However, other anti-competitive behaviours may be highly relevant for aspiring entrepreneurs. For instance, the *threat* of predation may be enough to deter potential new entrants (Milgrom and Roberts, 1982). In any case, even if a particular procedure addresses primarily the behaviour of the large players in the market, this is likely to still have an impact on other participants and on potential entrants.

Finally, the fact that entrepreneurship and competition are rarely studied in conjunction is surprising given that entrepreneurship is fundamentally the study of choices made by individuals and competition economics studies the environment around those individuals. In essence, one would expect people's choices to be dictated – at least in part – by the conditions surrounding them. Becoming an entrepreneur

invariably involves an element of risk but, if conditions are too adverse, people will just revert to salaried work:

> *"People won't be willing to spend money, sweat, time and tears on their own venture if the market is rigged against them. People are willing to take risks, but not foolish risks" (Golodner, 2001).*

Removing competition from the study of entrepreneurial endeavours is like trying to explain evolution without wanting to consider the impact of the environment surrounding a particular specie. In this analogy, competition policy determines who can eat whom in the business food chain.[9]

Moreover, it could be argued that a correct competition assessment of a market would involve an understanding of its 'intrinsic entrepreneurial propensity'. Just like the demand side of a market can include customers who have not purchased so far but who may do so in the future (e.g. presence of lumpy demand) so a correct understanding of a market's supply side begs one to consider the 'potential' suppliers as well as existing ones. These can be firms active in contiguous markets but also completely new ventures (this is why, incidentally, an assessment of the barriers to entry is considered a pillar of a thorough evaluation of a market). To adapt a famous expression[10], we could think of a market's supply side as being made up of: those who supplied, those who are supplying and those who are yet to supply.

Following this line of reasoning, in describing the competitive process, economics has concentrated on only one (albeit very important) aspect: the rivalry between existing suppliers. However, there are other aspects that build up to exert competitive pressure, one of them being the threat of new suppliers entering the market.[11]

In this chapter we aim to consider jointly empirical evidence on entrepreneurial entry and competition in order to advance our understanding of the link between the two. This chapter is structured as follows: sections 2.1 and 2.2 summarise advancements on the definitions of entrepreneurship and competition policy respectively; section 2.3

[9] Quite literally if one thinks of merger control.

[10] For Edmund Burke (*Reflections on the Revolution in France*, 1790) society is "a partnership not only between those who are living, but between those who are living, those who are dead, and those who are yet to be born."

[11] For instance, Porter (1998) speaks of five competitive forces: "(1) the threat of new entrants, (2) the threat of substitute products or services, (3) the bargaining power of suppliers, (4) the bargaining power of buyers, and (5) the rivalry among the existing competitors."

reviews empirical studies aimed at linking the two concepts; section 2.4 presents a simple regression model to investigate country-level links between entrepreneurship and CP; section 2.5 concludes.

2.1. On the figure of the entrepreneur

The figure of the entrepreneur is difficult to stereotype and various strands of economic literature have, over the years, emphasised its different aspects. Wennekers and Thurik (1999) highlight three main definitional schools: the (neo-) classical which describes the entrepreneur as an agent driving markets towards their equilibriums; the Austrian school which sees him/her as someone able to combine resources to address inefficiencies and to target gaps in the markets; and, the Schumpeterian/German school which sees the entrepreneur as a de-stabilising force – a destructive creator.

The Austrian school's thought has been recognised as a major contribution to the understanding of the entrepreneurial concept. Among its founders, Hayek (1948) emphasised the knowledge utilisation role played by the entrepreneur and Von Mises (1966) saw the very market process as being driven by profit maximising entrepreneurial activity. For Von Mises (1966) what differentiates entrepreneurs from other individuals is their ability to develop, and to act upon, predictions about the future: "the real entrepreneur is a *speculator* (Von Mises, 1966, p. 582)". More recently, Kirzner (1997) has highlighted price-correcting role of entrepreneurs who are seen as links between different markets. Entrepreneurial alertness is what characterises the entrepreneurial endeavour and it cannot be bought as it is a costless tacit resource in itself - since this type of alertness effectively means following 'hunches' which do not have opportunity costs (Harper, 2003). However, within this approach the element of novelty is acknowledged, since entrepreneurial alertness goes beyond the agents' usual optimisation process, often encountered in economics, and implies the identification of new products and/or new purposes – as opposed to referring to the allocation of given means to achieve given ends (Harper, 2003). For Kirzner (1992) innovation represents one type of entrepreneurial alertness, the others being arbitrage and speculation.

The Austrian approach, however, does not emphasize the uncertainty aspect of being an entrepreneur and underplays the role of the entrepreneur as a 'risk-handler'. The

intrinsic connection between entrepreneurship and bearing risks was recognised as early as Cantillon (Parker, 2004) and it has been considerably developed by the neo-classical school. Knight (1921) in particular differentiates between risk and uncertainty and explains the decision of becoming an entrepreneur as being the result of a risk-adjusted optimisation process. The risk element attached to the decision of becoming an entrepreneur can itself be broken down into two separate elements: an objective and a subjective one. The former refers to the actual level of risk involved in taking a particular action while the latter represents how risk-averse an individual is. The amount of risk faced, both objective and subjective, will play a role in determining self-employment (see, for instance, Arenius and Minniti, 2005).

The strongest linkage between entrepreneurship and innovation has been advocated by Schumpeter who sees the two to be indivisible since the former requires some degree of the latter. Similarly, Drucker (1994) highlights innovation as the specific instrument of entrepreneurship. This definition is more restrictive than the ones discussed above as it specifically requires for the entrepreneur to be also an innovator. Our interpretation of entrepreneurial endeavour embraces the risk element of the neoclassical proposition but at the same time focuses on the Schumpeterian role played by entrepreneurs.

Ultimately, however, the various definitions of entrepreneurship discussed are not mutually exclusive and traits of each are likely to coexist within all entrepreneurs. It is also important to highlight that it is in this early stage of development, that one is first able to distinguish between high growth and non-high growth entrepreneurship. It has been shown that it is a relatively small number of enterprises which are responsible for the majority of job creation and innovation. Hence, in our empirical work, we differentiate between low growth aspiration entrepreneurship and high growth aspiration entrepreneurship (HGE), based on the expected number of jobs to be created by a new venture.

2.1.1. Measuring entrepreneurship

As with other economic variables, the concept of measurement is directly related to the theoretical definition of what exactly one is trying to quantify. As discussed above, the very concept of entrepreneurship is so fluid that different approaches will

invariably result in different proxies being used. However, studies in this area have created some consensus on what admissible measures of entrepreneurship are. A fundamental distinction, before discussing specific variables, is that empiricists will be faced with having to choose between statistics derived wither from individual-level questionnaires or from firm-level datasets. These are two different ways to consider entrepreneurship with the first approach concentrating on the decisional process while the second focusing on market entry (as mentioned, these describe two consecutive stages of the same phenomenon). For instance, in the US, the Kauffman index of entrepreneurial activity expresses in percentage the share of population who have just recently started running a business and is computed on individual-level data. Or, for the second approach, one could use the number of new businesses registered in one year (available from the World Bank).

In this chapter, we use both firm-based and individual-based sources of entrepreneurial activity to test whether competition policy has a different impact on individuals than on firms.

2.2. On the rules of the game: competition policy

The rationale for the development of competition policy (CP) is easily understood by economists.[12] Fundamentally, this is the only area of law which has been dictated by economics as a subject: its *raison d'etre* being the dead-weight loss triangle resulting from a monopoly (Audretsch et al., 2001). For Hayek (1944), even the traditional liberal argument in favour of economic freedom does not deny government intervention when aimed at safeguarding a level playing field: "[...] in order that competition should work beneficially, a carefully thought-out legal framework is required" (p. 37).

This economics foundation can easily be seen in the working definition of CP offered by Motta (2004): "the set of policies and laws which ensure that competition in the marketplace is not restricted in such a way as to reduce economic welfare". Translating this definition into law however, involves understanding that welfare, or

[12] However, its application can, at times, be frustrating even for economists: "Ronald [Coase] said he had gotten tired of antitrust because when the prices went up the judges said it was monopoly, when the prices went down they said it was predatory pricing, and when they stayed the same they said it was tacit collusion." (Landes, W., 1981, "The Fire of Truth: A Remembrance of Law and Econ at Chicago", *Journal of Law and Economics* p. 193)

total surplus, is the sum of consumer and producer surpluses. Hence, situations may arise where welfare may be increased by keeping consumer surplus constant or even by reducing it! As mentioned above, this has meant that NCAs have tended to concentrate on consumer surplus. This is, however, still a contentious point. Even within EU's CP, Motta (2004) highlights a tension between Article 81(3) which permits behaviours resulting in efficiency gains "while allowing consumers a fair share of the resulting benefit" and the Guidelines on Vertical Restraints which state that "the protection of competition is the primary objective of EC competition policy" and considers consumer welfare only as a consequence of this.

The role of institutions in determining economics phenomena has been studied by various authors (Williamson, 1985; Coase, 1988; North, 1990). In many cases, institutions within a country will develop more or less simultaneously so that, over the course of several decades, a general improvement will be recognisable across all government departments and institutions. Often, however, budget restrictions and specific political aims push a legislature to concentrate on one particular policy area over another. This results in improvements being patchy across various intervention areas. Of course, certain policies will have to be pursued in tandem if meaningful objectives are to be reached. For instance, it may be impossible to tackle structural unemployment if unskilled workers are not retrained. In other words, some labour-related objectives can only be reached by pursuing specific educational programmes.[13]

Competition policy, however, is somewhat different from other more traditional objectives found in the portfolio of work carried out by a government. For a start, practical arrangements will, hopefully, involve for the implementation of competition policy to be delegated to a non-ministerial department. This is almost a necessity since, once specific rules have been agreed on, the day to day enforcement of these rules should be strictly apolitical and impartial (of course, in reality this is not always the case, see, for instance, provisions in the Competition Act 1998 to suspend the OFT's judgement in cases when mergers concern national interests).[14] So the absence

[13] See chapter 3 for a discussion on the timing of CP in transition countries.
[14] The last time this provision was invoked in UK was in relation to the Lloyds-RBS merger in 2008.

of a political voice - of a minister in a cabinet pushing for specific objectives - means that competition policy is seldom a government's top priority.

The other factor why competition policy is often overlooked is that, politically, it is not a particularly important issue: no party will win an election by promising more transparent merger rules. There are two reasons why this may be the case. Firstly, it is unlikely that the electorate is able to see the link between improvements in competition policy and their wellbeing. Indeed, some of these connections (like the relationship with entrepreneurship) remain obscure even to academic economists. The second reason is that most developed economies have rules in place which are perceived to be sufficient in guaranteeing a level playing field and that, past this point, one enters a realm of diminishing returns. The perception supporting this notion being that, in many cases, a country's position with respect to CP is relatively straightforward: it either has one or it does not (indeed some studies have used CP dummies in regression analyses). In other words, the introduction of a national competition authority (NCA) is often seen as a final outcome rather than an initial input. For instance, while in three major transition countries (Czechoslovakia, as it was then known, Poland and Hungary) there was no political resistance in parliament to the introduction of competition legislation (Fingleton et al., 1996), this did not necessarily imply that the level of competition in markets changed on the night competition acts were approved.

This does not mean that particular decisions will not receive huge attention in the media and be discussed politically. For instance, the assessment of many high-profile merger cases involves netting the detrimental effects of the increase in concentration against potentially beneficial efficiency gains. Another obvious example is the abuse of dominance case against Microsoft on which entire books have been written.[15] It is clear from these examples that the enforcement of CP often involves highly controversial decisions based on extremely complex calculations.

[15] See, for instance, "Antitrust Abuse in the New Economy: The Microsoft Case" by Richard L. Gordon.

Within this backdrop, it is worth considering the relationship between competition policy and regulation and that the second is only required if the first one is inapplicable.

> *"Application of the antitrust laws up-front staves off regulation [...] And because antitrust enforcement preserves competitive markets, it reduces the urge for government to regulate, which urge arises most often when markets are not competitive" (Golodner, 2001).*

Further confirmation of CP's anomaly, compared to other areas of government policy, is to be found in its history. The first example of formal CP is the Sherman Act 1890 which comes relatively late at the end of the 19th century (for an overview of the historical background of CP see Williamson, 1985, ch. 14, or Motta, 2004, ch.1). This was in direct response to the *modus operandi* which US Trust had developed, hence the term anti-trust. In other words, the first introduction of CP in human history was purely for defensive reasons, anticipating the reactive, rather than proactive, nature of future developments in the area. Indeed, even today, considerable progress in this field is achieved in courts rather than in parliaments.

The above discussion may shed some light on situations which may seem peculiar at first. For instance, according to the most quoted source of CP measure in circulation (Global Competition Review score, ranging from 1 to 5), Belgium's NCA is on par with NCAs of countries like Mexico and South Africa (all receiving a score of 2.5) and behind Brazil's (with a score of 3) and Ireland's (3.5). Although anecdotal, this shows that there is a difference between a country's ability to implement effective competition policy and it having created appropriate formal institutions.

2.2.1. Market definition and competition policy: one size fits all?

An increasingly common misconception is that smaller economies should adopt CP with "a pinch of salt" and may need to be more tolerant of higher levels of concentration than would be the case in larger countries (see, for instance, Gal, 2003; Gugler, 2004). This is in our opinion questionable and results from a misunderstanding of competition economic theory and of how CP is implemented by officials working in NCAs. This issue is of particular interest for transition countries given that, within this group, there are over 12 transition economies with a population of under 5 million which have legislated in this area.

The first consideration is that the unit of observation in competition cases is the market and not the economy *per se*. In this sense, a market may be small or large and the size of market may be a function of, among other things, the country it is located in. But 'small country' does not necessarily equal 'small market' (similarly, there may be extremely contained markets in very large countries). Indeed, Schumacher (1973) describes the notion that having a large internal market is a necessity, as being more of an "optical illusion" than a substantive issue. Defining the relevant market is (in almost all antitrust cases) the initial step of the investigation conducted by the NCA. Markets are delineated along their product and geographic dimensions.[16] Very often one is faced with a small market because the goods in question are heavy to transport or because they are perishable in nature but this is irrespective of whether the market in question is located in a large or small country. Similarly, if there are high barriers to entry preventing competitors from producing particular goods – as in the case of patents – this will limit the competitive pressure on the incumbents regardless, again, of the overall size of the economy. Moreover, given the general tendency towards trade liberalisation, markets are often defined as being international in their geographic dimension which further incapacitates the theory that a country's size matters in an increasingly global economy.

A practical example may illustrate how considering a country's size, rather than studying the relevant market, may result in reaching misleading conclusions. The merger case between Staples and Office Depot (1997) had a straightforward product-market definition: retail shops of office supplies. Given that there is plenty of competition across the US in this market, it might have been legitimate to think, *prima facie*, that the transaction was permissible. However, an economist working for the Federal Trade Commission demonstrated that: (a) the market was made-up of small local markets and, (b) in markets where both competitors were present, prices were lower (hence, proving that the parties exerted a competitive constraint on each other). This resulted in the transaction being blocked.

[16] For instance, DG Comp defines the relevant product market as comprising "all those products and/or services which are regarded as interchangeable or substitutable by the consumer, by reason of the products' characteristics, their prices and their intended use"; while they delineate the market geographically as comprising "the area in which the undertakings concerned are involved in the supply and demand of products or services, in which the conditions of competition are sufficiently homogenous and which can be distinguished from neighboring areas because the conditions of competition are appreciably different in those areas" (European Commission, 1997).

Another argument put forward by Gal (2003) is that it may be more difficult for producers operating in small economies to reach a minimum efficient scale level of production. This efficiency-type argument is related to whether a particular industry is characterised by economies of scale (or scope). To allow, for instance, a two-to-one merger in a small economy solely on the basis of this efficiency theory would be wrong. Indeed, the main problem with this argument is that even if clear productivity advancements could be obtained by consenting to the transaction there will never be no guarantee that these would be passed onto consumers.[17] If we maintain that the post-merger firm will still want to profit maximise, it will be in its interest to increase price towards monopoly price (this question is of course related to the elasticity of demand of the market which determines how many customers are lost through the price increase, i.e. critical loss analysis).

Indeed, these size-related considerations are already part of most countries' competition legislations. For instance, in the UK mergers conducted by firms with a turnover of less than £70 million are automatically permitted (*de minimis* exception). Similar arrangements are also in place at the EU level. In these circumstances, the monitoring and investigative activities of the NCA are effectively suspended because of the *market* size.

2.3. Empirical studies

Empirical studies aimed at investigating the relationship between competition policy and entrepreneurship are scarce. Choi and Phan (2006) find an important link between competition and entrepreneurship by demonstrating that their two proxies of competition, the share of large firms in the economy and the amount spent on competition policy, have a positive and significant effect on new firm formation. Based on 1968-1993 data for the US these results are immune to being affected by measurement errors or inconsistencies across countries. Schaper et al. (2008), on the other hand, conducted a simple analysis to investigate the existence of a correlation between competition policy and entrepreneurship and found no relationship between the two. Although they correctly indentify the relevant data sources, their approach to report bivariate correlations and Spearman's Rank correlations is quite simplistic.

[17] This is why, for instance, the Office of Fair Trading has never cleared a merger case on efficiency arguments alone.

Also, the measure of entrepreneurship they use is far too wide while we show how a correlation exists when HGE is considered.

Finally, an increase in competition can also encourage more entrepreneurial participation in developing countries (Evenett, 2005). Further testament to this is the current effort of bodies like the Department for International Development to promote CP across the developing world as a tool aimed at reducing poverty: "more effective competition reduces opportunities for corruption and rent seeking, and creates more space for entrepreneurs and small and medium sized-enterprises" (DFID, 2008).

2.3.1. On measuring competition – measures of concentration

The relationship between the level of concentration and the level of competition in a market is, in the vast majority of cases, straightforward: an increase in concentration results in a decrease in competition. This notion has led both scholars and practitioners to almost use the terms competition and concentration interchangeably. However, as will be shown in this section, over-reliance on measures of concentration can lead to misleading conclusions.

The theoretical foundation for using concentration as a proxy of competition can be found in the Cournot model which predicts profitability will fall as concentration decreases. A fundamental measure of market power is given by the Learner Index (L) which relates the price charged (P) by a firm i to its marginal cost (MC):

$$L = \frac{P - MC}{P} \tag{1}$$

where $L = 0$ if, under perfect competition, $P = MC$ and where L can also be expressed as the inverse of the elasticity of demand ε, $L = \frac{1}{\varepsilon}$. In a Cournot setting with two firms i and j, with market shares q_i and q_j respectively, the Learner Index for firm i can also be expressed as:

$$L_1 = \frac{\alpha_i}{\varepsilon} \tag{2}$$

where $\alpha_1 = \frac{q_i}{Q}$. Tirole (1997) shows that, using (2) above and assuming firms have constant marginal costs $C_i(q_i) = c_i q_i$ and that they compete on quantities produced, we can express profits for the whole market, Π, as:

$$\Pi = \sum_{i=1}^{n} \Pi^i = \sum_{i=1}^{n} (p - c_i) q_i = \sum_{i=1}^{n} \frac{p \alpha_i q_i}{\varepsilon} = \frac{pQ}{\varepsilon} \left(\sum_{i=1}^{n} \alpha_i^2 \right) \tag{3}$$

If we assume further that consumers in the market spend a constant share of their income, *k*, on the good in question (i.e. $\varepsilon = 1 : Q = k / p$), we obtain:

$$\Pi = k \left(\sum_{i=1}^{n} \alpha_i^2 \right) \tag{4}$$

where the term within brackets is the Herfindahl-Hirschman Index (HHI) which is easily computed as the sum of the squared market shares of each firm:[18]

$$HHI = \sum_{i=1}^{n} \alpha_i^2 \text{ where, } \frac{1}{n} < HHI < 1 \tag{5}$$

Understanding the derivation of the HHI is important since this measure is used extensively both by academic economists and it is also widely adopted in investigations and merger cases conducted by NCAs worldwide.[19] However, one

[18] Other measures of concentration include: the entropy index E (which uses logs instead of squaring the market shares) equal to $\sum_{i=1}^{n} \alpha_i \log \alpha_i$; concentration ratios, CR, which express the share of the top *m* firms in the market $CR_m = \sum_{i=1}^{m} \alpha_i$; and, indexes aimed at capturing the variance of market shares over time. In some cases, e.g. national-scale retail mergers, NCA officials may initially rely on simple counts of the number of competitors within specific isochrones or *fascia counts*. This is an effective way to channel resources towards specific sub-markets which may present more difficulties: ceteris paribus one would initially allocate more time to consider a "2 to 1" merger than an "8 to 7" one – even without having any information on concentration.

[19] For instance, the US Department of Justice horizontal merger guidelines made clear reference to the HHI: "The Agency divides the spectrum of market concentration as measured by the HHI into three regions that can be broadly characterized as unconcentrated (HHI below 1000), moderately concentrated (HHI between 1000 and 1800), and highly concentrated (HHI above 1800). Although the

requirement of a concentration index is that it has to be invariant to switching the same market shares between firms (Encaoua and Jacquemin, 1980). We believe this to be a great limitation as high concentration can still mask vigorous competition (for instance, consider the market for cola drinks which is essentially a Pepsi-Coca Cola duopoly) and that competition analysis of markets can be greatly aided by also considering how market shares vary across time and between firms. For instance, De Vany and Kim (2003) find that, in the motion pictures industry, "concentration measures can mask the volatility of market shares and give a false sense of stability where there may be vigorous competition and no stability". Similarly, computations relying on HHIs and concentration ratios will fail to reveal competition in innovation of the leapfrog type described in chapter 1.

Consider, for example, the market reported in Table 4 which shows both *HHI* levels as reported in the equation above and changes (where $\Delta HHI = HHI_t - HHI_{t-1}$) for three hypothetical scenarios (A, B and C). As can be seen, both scenarios A and B result in identical increment of .04. However, in one of the cases (B) the competitive structure of the market has changed radically with firm d being now the market leader. Scenario C shows how a decrease in HHI can actually mask the market leader gaining further market power.

Table 4. Herfindahl-Hirschman Index (HHI) and market changes

	Initial market shares (at t)	**A: market shares (at t+1)**	**B: market shares (at t+1)**	**C: market shares (at t+1)**
Firm a	0.4	0.5	0.15	0.42
Firm b	0.3	0.2	0.15	0.2
Firm c	0.15	0.15	0.2	0.17
Firm d	0.15	0.15	0.5	0.21
HHI	0.295	0.335	0.335	0.2894
ΔHHI		0.04	0.04	-0.0056
ρ		1	-0.9	0.6

One approach suggested by De Vany and Kim (2003) is to consider transition matrices between the ranks firms have within the relevant market. Another approach

resulting regions provide a useful framework for merger analysis, the numerical divisions suggest greater precision than is possible with the available economic tools and information. Other things being equal, cases falling just above and just below a threshold present comparable competitive issues." DOJ, 1997.

which we think is computationally straightforward and effective in revealing these dynamic changes would be to calculate whether the order of firms changes between time periods. This can easily be achieved with the Spearman Rank Correlation Coefficient (ρ), where ρ can take any value between 1 (unchanged order) and -1 (completely reversed order), expressed, more formally, as:

$$\rho = 1 - \frac{6\sum D_i^{\,2}}{n^3 - n}$$

where D captures the difference in ranks between the two time periods and n equals the number of firms in the market.[20] Hence, when trying to capture the competitive aspects of a market, one can improve a model by including, besides the HHI, a measure of ρ to ensure dynamic changes are also considered.

Moreover, It is important to highlight, that, in practice, the computation of any concentration measure will rely on one having identified a relevant product (and geographic) market. For instance, many academic studies will simply compute HHI at 4 digit ISIC or NACE codes. While in some cases these may approximate relevant product markets, it is likely that codes used for business classification will not necessarily correspond to what we study in competition economics. Also, further issues may arise regarding what variables to use to compute the market shares. Obviously, in most cases revenues will be used, but it may be advisable to test one's conclusions by computing measures of concentration based, for instance, on profits and/or quantities produced.

Finally, concentration measures are at times used to capture country-level conditions. For instance, one could take the output of the top n firms in an economy as a share of its overall output. Dutz and Hayri (2000), for instance, construct two measures based on firm level data: a concentration ratio of the top 30 companies over GDP, and an HHI for the top 30 companies in the country. A more preferable, though computationally more demanding, approach would be to adopt a bottom-up technique instead and to compute a country-level HHI. This is to reflect the fact that competition

[20] In cases of tied ranks the following expression can be used $\rho = 1 - \frac{6\sum D^2}{n^3 - n}\left[\sum D^2 + \frac{1}{12}\sum (m^3 - m)\right]$ where m indicates the number of cases with equal ranks. This explains why scenario B yields a ρ of -0.9 instead of -1.

takes place at the market level – and not at the national level (although, of course, some markets may be national in nature). In practice, this could be achieved by summing industry-weighted market-level HHIs:

$$countryHHI = \sum_{i=1}^{n} \left(HHI_i * \frac{Y_i}{Y} \right)$$

where the subscript *i* indicates individual markets (e.g. 4 digit ISIC) and *Y* stands for output.

Overall, measures of concentration can be important in highlighting certain market features but it is important to remember that, as discussed above, concentration does not always equal competition.

2.3.2. Other measures of competition

Although most studies tend to assume concentration to be the most effective proxy for competition, this may, as mentioned, not always be the case. As a result of this alternative measures have emerged. For instance, one approach is to use import penetration as a proxy for competitive pressure. Mickiewicz (2005), for instance, describes how, within the transition context, in the period following initial price liberalisation one concern was that since a process of demonopolisation had not been initiated markets would have resulted in incumbents pricing above equilibrium. However, this was largely avoided in countries where trade liberalisation policies had also been introduced (this was, for instance, the case in Poland). On the other hand, overreliance on imports as a surrogate for competition policy can present some dangers. Foreign producers will price in a similar fashion to domestic producers. In particular, there is no guarantee that even if they face stiff competition in their home markets, this will determine their international pricing strategies (see, for example, the way the price of a Big Mac varies across the world). Moreover, the absence on anti-competitive provisions may encourage foreign firms to enter through FDI (rather than simply exporting) to take advantage of the low level of competitive pressure. Ultimately, from consumers' perspective, there is little difference between facing a domestic or foreign-owned monopoly.

Another often used measure of competition is the share of firms entering and exiting a market as this displays low barriers to entry and exit. For instance, Caves (1998) shows that the presence of market power is negatively correlated with the rate of entry in an industry. Burke et al. (2006) use a measure of market dynamism (based on the entry and exit rates) to delineate dynamic (high entry and exit) and static (low entry and exit) markets. They then proceed to show that high concentration is only detrimental in static markets and conclude that CP should be targeted accordingly.

2.3.3. On measuring competition policy

There are two main approaches to measuring CP: one focusing on quality and the other on quantity. Some studies have counted the number of laws passed related to CP (e.g. Antitrust Law Index) while others are based on surveys (for instance, Global Competition Review). A thorough description of both measures is given in Nicholson (2004).

When measuring any form of government policy it is important to remember that the mere presence of specific sets of laws (*de jure*) does not guarantee that these laws are actually enforced (*de facto*). It is one thing to have law in place, and indeed an NCA, but quite another to actually enforce these laws consistently and effectively. In this sense, what one is actually interested in is whether a level playing field exists in a particular country rather than knowing whether a competition policy bill has been approved. This is in line with the current approach within policy impact analysis to consider the *outcome* of a particular effort rather than its *inputs* or *outputs*. To illustrate this point, consider the following example: country A has approved a competition policy bill and currently employs 50 people in its NCA (input);[21] or, country A's NCA has assessed 100 merger cases last year (output); or, being an entrepreneur today in country A is much easier because markets are more regulated and anti-competitive behaviors have been minimized (outcome).[22] This is in direct contrast to some empirical studies in the past, which have simply used a dummy to indicate the presence of an NCA in any given country.

[21] An additional issue with input measures is that, if taken in absolute terms, they may simply reflect a country's size effect (Nicholson, 2004).
[22] For a thorough description on this approach see HMT's Green Book.

Ultimately, however, it has to be recognized that competition policy is only a proxy for the level of competition in a particular market and that:

> *"Competition may arise with or without competition policy, while having a competition policy does not necessarily ensure competition unless it is an effective one, with appropriate guidelines and enforcement power" (Rey, 1997, p.2).*

Bearing this in mind, we use data from the Global Competition Review (GCR) which ranks a country's NCA from a score of 1 to a maximum of 5.

The GCR data is compiled using both quantitative and qualitative sources and it is based on information gathered from NCAs but also from lawyers and economists working against the NCA in particular cases. Every year a questionnaire is sent to leading local competition specialists including lawyers, economists, in-house counsel, academics, and consumer groups. The questionnaire asks each respondent to discuss the competition authority they were most familiar with and to rate each aspect of its enforcement duties, ranging from merger control and abuse of dominance work to how independent and transparent the institution is. This is then supplemented by some 100 interviews by telephone and in person with competition experts across the various jurisdictions.

In parallel to this, GCR also approaches each authority with a detailed questionnaire covering all aspects of its competition-related duties. The questions cover everything from the number of mergers an authority challenged to how it ensures "institutional memory".[23] Hence, we feel, the GCR ranking is the most thorough source of cross-country data on the quality of work done by each NCA. A testament of this being that UK's Public Service Agreement for the enforcement of competition policy is set against results published in the annual GCR publication.

So far we have presented three approaches to quantifying the level of competition faced by entrepreneurs and individual and firms in general: measures of concentration; measures of competition and measures of competition policy. Of course, assuming the quality of data is reliable, one would expect for the three families of indicators to be highly correlated. However, in practice, the first two

[23] A detailed description can be found at:
http://www.globalcompetitionreview.com/features/article/16144/introduction-rating-enforcement/

approaches present considerable problems. In the case of concentration measures, we have discussed how these may not refer directly to competition, and, moreover, while these are extremely helpful when assessing individual markets (see, for instance, their use in chapter 4) they become rather meaningless when considered on a national level. A similar critique can be advanced against alternative measures of competition based, for instance, on import penetration (as described in 2.3.2). The objective of this chapter is to consider how a country's competitive environment promotes, or penalises, entrepreneurship. Having considered both measures of concentration and competition, we feel that considering competition policy – directly – is the most efficient approach to capturing the *de jure* rather than *de facto* state of affairs. Finally, the way the data has been collected ensures both impartiality and comparability across countries.

2.4. An investigation of the relationship between competition policy and entrepreneurship

The existence of a rudimentary relationship between competition policy and entrepreneurship can be seen in Figure 5 and 6 below which report two different measures of entrepreneurship (from World bank and from GEM) against the GCR score. One end of the graph is relatively easy to interpret with countries like the UK and the US scoring well in all measures suggesting that successful competition policy is associated with higher levels of entrepreneurship. However, at some point, this relationship breaks down; a notable example being Russia with a very low GCR score but exhibiting relatively high levels of entrepreneurial activity.

Figure 5. WDI entrepreneurship variables and Global Competition Review

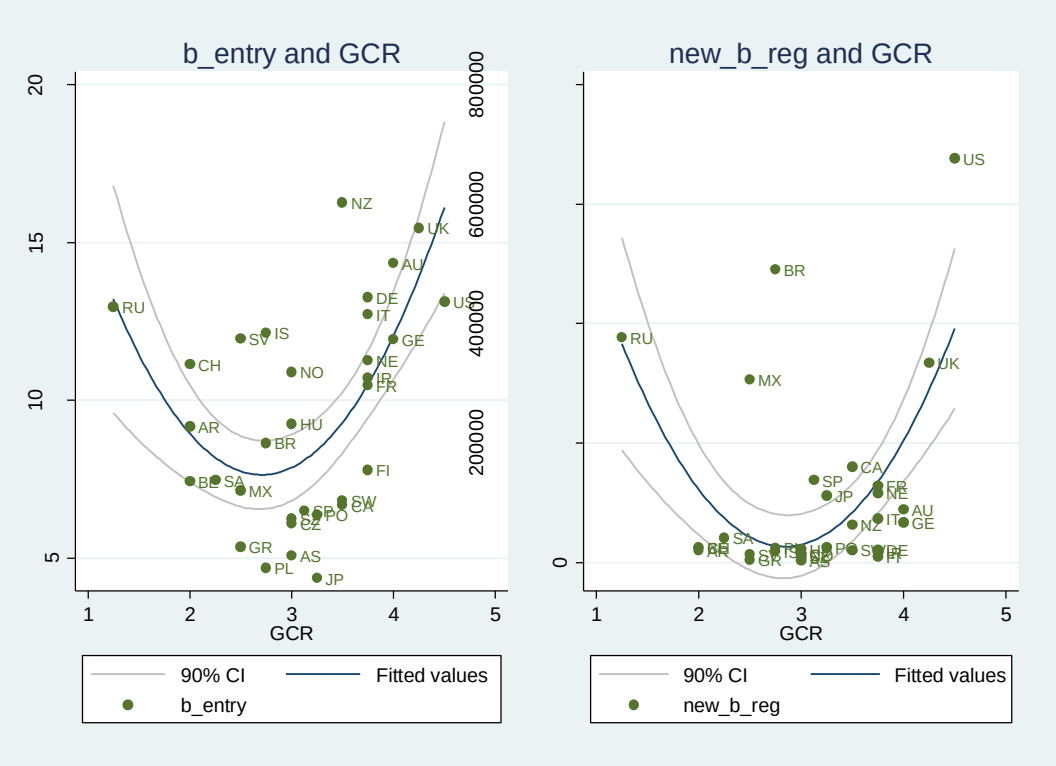
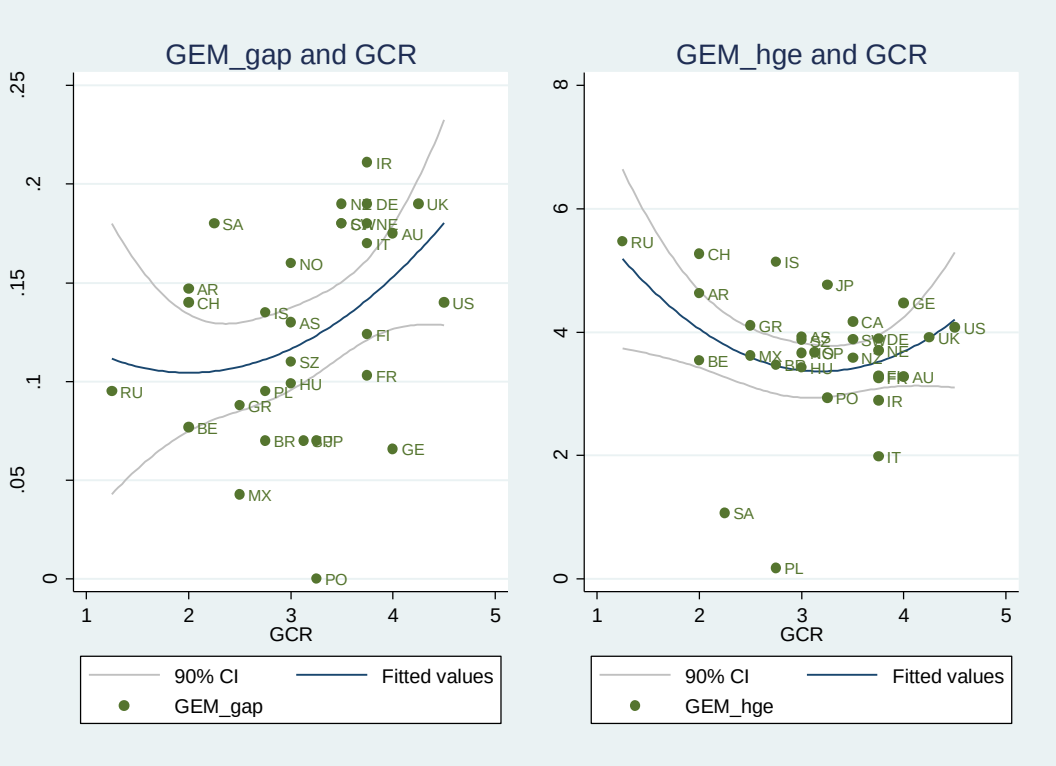


Figure 6. GEM entrepreneurship variables and Global Competition Review



To test whether competition policy has an impact on entrepreneurship we estimate the following parsimonious OLS models:

$$b\_entry = \alpha + \beta_1 GCR + \beta_2 GCR^2 + \varepsilon$$

Model (1a)

$$new\_b\_reg = \alpha + \beta_1 GCR + \beta_2 GCR^2 + \varepsilon$$

Model (2a)

where, *b_entry* is the business entry rate (new registration as % of total registered firms) and *new_b_reg* is the number of new firms registered in one year - both from the International Finance Corporation's micro, small, and medium-size enterprises database (available from World Bank's WDI database). *GCR* is the score received by the country's NCA (where two authorities are present, as is the case, for instance, in the UK, a simple average was computed). To capture the difference between *de jure* and *de facto* NCAs we split our sample at the mean of GCR (which is 3.1) for Model 1 and Model 2.

We also experiment with two measures from the Global Entrepreneurship Monitor database[24] as dependent variables to see whether individual-level entrepreneurship can be explained by the quality of a country's NCA. *GEM_gap* captures whether the entrepreneur feels that there are no competitors operating in the market she is about to enter (hence, this is a proxy for opportunity) and *GEM_hge* (high growth aspiration entrepreneurship) measures entrepreneurship in terms of how many jobs the entrepreneur expects to create in the future (hence, allowing us to differentiate between ventures which will create little jobs and projects which are likely to generate considerable number of posts):

$$GEM\_gap = \alpha + \beta_1 GCR + \beta_2 GCR^2 + \varepsilon$$

Model (3a)

$$GEM\_hge = \alpha + \beta_1 GCR + \beta_2 GCR^2 + \varepsilon$$

Model (4a)

To account for the fact that entrepreneurship is also likely to depend on the level of economic development reached by a country (although there is no clear consensus

[24] A description of this is given in chapter 4.

what the sign of the relationship is – for a review of studies linking entrepreneurship or self-employment with economic development see Wennekers, 2006), we also include GDP per capita (at PPP US dollars 1995), *gdp_ppp* (Models 1b, 2b, 3b and 4b) and its squared term gdp_ppp^2 (Models 1c, 2c, 3c and 4c). To note that our dataset has a relatively small number of observations - 32 in all - because only a subset of countries is surveyed by GEM and GCR. This is not too far removed from studies addressing similar research questions. For instance, Wennekers (2006) runs a model of self-employment on country-level variables for 48 economies.

Table 5. Variables' summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
b_entry	32	9.491	3.33	4.36	16.27
new_b_reg	32	108128.8	159474.5	3587	676830
GCR	32	3.113	0.746	1.250	4.5
GEM_gap	30	0.127	0.053	0	0.211
GEM_hge	30	3.638	1.1	0.18	5.47
gdp_ppp	32	26007.59	10294.22	8470.994	47305.58

Table 6 and Table 7 below show results of the models. These results are largely in line with the relationship described in Figure 5 and 6: there is, in 3 out of 4 specifications, a strong quadratic relationship between our competition variable and entrepreneurship. A better CP seems to encourage entrepreneurship however, below a certain threshold, CP does not seem to be so important. This is probably because the difference between a "very bad" and a "bad" regulatory regime is not as influential as the difference between a "mediocre" and a "good" one. Overall, however, one conclusion is clear: competition policy matters.

One exception to this trend are the results produced by Model 3 which are particularly interesting in that both coefficients for the GCR variables are statistically insignificant. One interpretation is that, recalling the definition of the different types of innovation paths described in chapter 1, the dependent variable GEM_gap effectively measures leapfrog, rather than neck-and-neck entry. The fact that CP does not seem to play a role in determining variation in this variable confirms the conclusions drawn in chapter 1, namely that leapfrog type of entry does not necessitate high levels of CP as it involves the creation of new markets.

Table 6. Entrepreneurship and competition policy models (WDI dependent variables)

Variables	Model (1a) new_b_reg	Model (1b) new_b_reg	Model (1c) new_b_reg	Model (2a) b_entry	Model (2b) b_entry	Model (2c) b_entry
GCR	-759182***	-729151***	-618053***	-14.21***	-13.89***	-13.44***
	(221211)	(238522)	(201301)	(3.148)	(3.102)	(3.055)
GCR2	133409***	135504***	121988***	2.628***	2.651***	2.596***
	(41588)	(42237)	(33693)	(0.561)	(0.566)	(0.577)
gdp_ppp		-4.557	-32.03*		-4.98e-05	-0.000161
		(3.846)	(17.34)		(6.83e-05)	(0.000244)
gdp_ppp^2			0.000518*			2.10e-09
			(0.000289)			(5.20e-09)
Constant	1.11e+06***	1.11e+06***	1.21e+06***	26.86***	26.90***	27.32***
	(270305)	(281600)	(265599)	(3.993)	(3.933)	(4.551)
Observations	32	32	32	32	32	32
R-squared	0.358	0.405	0.516	0.395	0.408	0.412

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7. Entrepreneurship and competition policy models (GEM dependent variables)

Variables	Model (3a) GEM_gap	Model (3b) GEM_gap	Model (3c) GEM_gap	Model (4a) GEM_hge	Model (4b) GEM_hge	Model (4c) GEM_hge
GCR	-0.0491	-0.0584	-0.0395	-3.098***	-3.437***	-3.895***
	(0.0571)	(0.0616)	(0.0632)	(1.020)	(1.102)	(1.282)
GCR2	0.0122	0.0120	0.00979	0.486**	0.479***	0.533***
	(0.00993)	(0.0102)	(0.0110)	(0.179)	(0.171)	(0.178)
gdp_ppp		1.16e-06	-3.92e-06		4.19e-05	0.000165
		(1.07e-06)	(4.50e-06)		(2.77e-05)	(0.000116)
gdp_ppp^2			9.62e-11			-2.33e-09
			(7.91e-11)			(1.77e-09)
Constant	0.154*	0.154*	0.175*	8.303***	8.332***	7.825***
	(0.0771)	(0.0832)	(0.0944)	(1.373)	(1.435)	(1.483)
Observations	30	30	30	30	30	30
R-squared	0.141	0.170	0.207	0.119	0.206	0.256

*** p<0.01, ** p<0.05, * p<0.1

Robust standard errors in parentheses

A note on measurement is in order. One aspect which is worth highlighting is that measuring CP is not an easy task. In many ways this is true for the measurement of most government policies but while certain areas of intervention may be easier to isolate (for instance, testing whether unemployment-reducing policies are working) others remain somewhat more elusive. Indeed, as discussed, the correct implementation of CP involves for several features of the system to work correctly: from the relevant government departments to having an appropriate legal framework. There may even be some controversy regarding what CP, in practice, actually entails. For Kirzner "competition, in the process sense, is at least potentially present so long as there exist no arbitrary *impediments* to *entry"* (Kirzner, 1973, p. 97). This definition seems far too restrictive and today, we now consider barriers to entry as being only one element of a market (see, for instance, Williamson (1985) for a discussion of this over-preoccupation with barriers to entry). In this sense we feel that the GCR variable used in our models represents the most effective attempt at capturing CP.

2.5. Conclusions

In this chapter we discussed the concepts of entrepreneurship and competition (including competition policy) and their intersections. In particular, our initial discussion echoes findings in the first chapter since different types of competition, competition in the market and competition for the market, may translate into different types of entry and innovation, leapfrog and neck-and-neck.

Although at times CP decisions have been founded on more normative, or even political, principles, the main rationale for CP has to do with efficiency rather than distributional issues (Motta, 2004). This suggests that the implementation of effective CP should have welfare enhancing results. One way to understand this mechanisms is by seeing how creating a fair and competitive environment will encourage more agents to enter markets. The empirical analysis presented suggests the existence of this mechanism.

Future research could expand and test our hypothesis further. For instance, the analysis in this chapter was based on data for 32 countries. It would be interesting to see whether similar results would be obtained for a larger group in the future.

However, it is also worth bearing in mind that collecting data on entrepreneurship and on the quality of a country's competition policy presents some practical difficulties. To date, for instance, not every country has a clear competition policy and, as discussed, to simply consider whether a relevant bill has been approved or not may lead to misleading conclusions.

Another approach would be to conduct a similar analysis to the one presented in this chapter but incorporating appropriately constructed concentrations measures. If this path is pursued, the discussion in section 2.3.1 and section 2.3.2 offers both a critique of current approaches and provides a blueprint for future empirical work. In particular, the adoption of more dynamic measures of concentration would greatly enhance econometric studies in this field.

Chapter 3: Growth in Transition: the Role of Competition Policy

As discussed, the process through which competition policy is likely to have a beneficial impact on the economy and on total welfare is a straightforward one: competitive markets produce more efficient outcomes. The elimination of anti-competitive practices like cartelization and collusion also plays a role as these invariably result in prices raising above incremental costs. For example, Porter (1998) sees the process of domestic rivalry as being an important determinant of factor creation and a stimulant of demand which contribute to the development of a nation's competitive advantage; and Dutz and Hayri, (2000) find that implementing competition law causes growth. Borrell and Tolosa (2008) find a positive and statistically significant effect for policies aimed at increasing competition on a measure of total factor productivity for a cross-country dataset (based on 52 observations). Dutz and Vagliasindi (1999) study the impact of the introduction of an antitrust regime, and its quality and efficiency, on firms' mobility (with data from 3,000 firms across 20 transition countries) to be positive and significant.

The mechanism through which competition can enhance economic growth is easily understood by economists. The most emblematic evidence of this being the almost mystical properties economists attach to the concept of perfect competition. Generally, we can say that "tensions are unlikely to arise between the appropriate enforcement of competition laws and attainment of efficiency in [at least] a static sense" (Evenett, 2005). Indeed, according to Posner (1976) antitrust law's objective is the protection of competition *and efficiency*.[25] The main mechanism through which competition policy (CP) and growth may be related is straightforward enough and is deeply rooted in the concept of efficiency. Competition within a market pushes firms to: produce what is required for an appropriate price - allocative efficiency; develop ways to lower their costs or production - productive efficiency; invest in discovering ways to improve their products or services - dynamic efficiency (for a thorough explanation of the mechanisms behind these efficiency gains see, for instance, Motta 2004, or Tirole, 1997). Within this framework, Singh (2002) argues that in the case of developing countries the aim of competition policy/laws should be to support the

[25] We will use the terms antitrust laws and competition policy interchangeably.

development of an economy and hence dynamic, rather than static, efficiency should be the ultimate aim of such policies.

The concept of dynamic efficiency is particularly relevant within the context of countries which are not yet producing at the world technological frontier. In this setting, competition promotes growth through innovation as an intermediate step: higher levels of competition push firms to innovate which results in growth. One mechanism through which this takes place is through the way operating in a competitive environment alters one's attitudes to innovation-related risks: "One of the central concerns expressed by businessmen is that competition forces upon them a high level of risk; there is uncertainty both about whether their own research will be successful and about what research programme their rivals are undertaking" (Stiglitz, 1986). Porter (1998), on the other hand, sees the presence of rivalry as a force which decreases the risk related to investing to create specialized abilities.

The main challenge associated with attempting to test the above hypothesis is that it requires one to be able to observe changes in CP. The events which have unfolded since 1989 in Central and Eastern Europe provide as near to laboratory conditions as one might hope for. The development and implementation of market-oriented policies in transition economies over the last two decades has been a common research theme. While a consensus has developed over the notion that pursuing these reforms has, overall, led to growth in the region, the influence of specific policies on growth is still a highly debated area (Falcetti et al., 2006). The controversy spans across two macro-areas: the timing of the reforms and the typology of reforms. The first relates to the effect a specific measure of policy development had at different points in time of a country's transition process. The second, fundamentally, has consisted in trying to disentangle the effect of specific policies, that is to mitigate the high multicollinearity between individual policies' indices. This chapter aims to tackle the second question and to isolate the impact competition policy has had on economic growth, using the transition indicator scores produced by the European Bank for Reconstruction and Development (EBRD).

Overall, improvements measured by these EBRD indicators have been shown to have a positive and significant effect on economic growth (see, for instance, Falcetti et al.,

2006). The converse of this has also been proven: a negative change in policy development, or "reversals", is detrimental to growth (Merlevede, 2003; Falcetti et al., 2002; and, for reversals of financial liberalisation and political reform, see Campos and Coricelli, 2009). But as far as we are aware, existing research did not consider the role of competition policy and its impact on performance; this chapter intends to fill this gap. Moreover, it has been shown (see Campos, 2001) that using traditional growth estimation procedures has fallen short of explaining changes witnessed in transition economies. Campos (2001) concludes that institutional features and changes will have to be included in models explaining growth to obtain more realistic results.

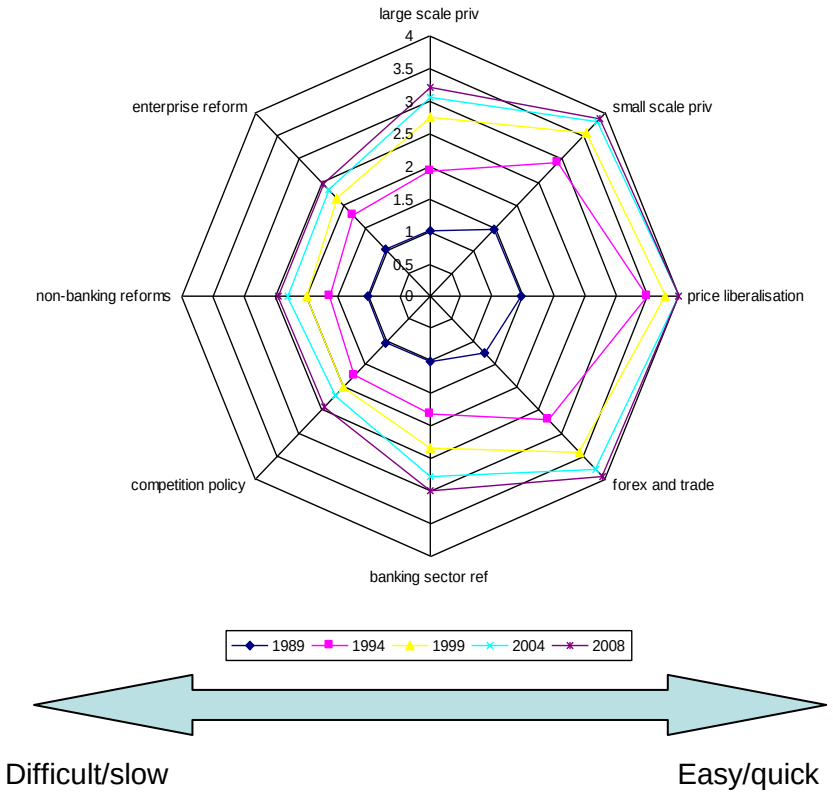
The remainder of this chapter is structured as follows: section 3.1 introduces competition and other policies which have been central to the transition process; section 3.2 describes the various data sources and the construction of the dataset; section 3.3 covers the econometric model and its results; and, section 3.4 concludes.

3.1. Competition policy in context: timing and reforms' complementarities

Within the transition context, a consensus has still not developed regarding whether a particular policy should be developed together with other policies related to it - big bang theory (as advocated and implemented by Balcerowicz in Poland), or whether certain policies should be implemented before others - gradualist approach (for a detailed description of both camps see Dewatripont and Roland, 1995; and Schleifer, 2009). Part of the argument hinges on understanding whether a particular set of policies exhibits high complementarities between its components, in which case it may be desirable to attack on all fronts simultaneously. On the other hand, it may also be the case that a specific policy will only succeed if some preliminary foundations are laid first. From a game theory perspective, it can be argued that the first approach may be seen as more credible since it implies higher sunk costs (and hence it may reduce the likelihood of a set of policies being reversed). Fingleton et al. (1996) argue that CP is one example of policy which might have been pursued ahead of others since it was seen as relatively uncontroversial and as an important steppingstone for other initiatives (at least in terms of passing the relevant legislation).

The existence of complementarities has been advocated by De Macedo and Martins (2008). However, evidence shows that some policies have been introduced at a much slower pace than others. Figure 7 below shows how some policies were implemented faster (right hand side of the spider graph) while others took longer (left hand side). This can be seen by the speed at which high scores of the EBRD indicators were reached (the graph shows the scores at five year intervals). Within the purpose of this chapter, it is particularly interesting to note that competition policy in transition countries, for instance, has constantly lagged behind. While it could be unrealistic to expect governments to pursue all policies simultaneously, certain policies may be effective only once a certain threshold level has been obtained in other areas. For instance, it may be advisable to hold off large scale privatisations until a competitive market has been developed in the industry in question (otherwise, monopoly rents are simply transferred from the government to private individuals).

Figure 7. EBRD reforms indicators



Within the transition arena, the timing of specific reforms has been an important issue, given that governments do not have the necessary funds (or indeed time) to

accomplish everything they would ideally want to. In this context, Fingleton et al. (1996, p. 1) argue that:

> *"Competition in necessary precisely because it is not enough simply to provide a basic framework of law to enable private agreements to be enforced. In the absence of explicit competition policy, there is a very real risk that the competitive process might be obstructed or distorted by the actions of private parties or the organs of the state itself."*

A different view holds that it is not complementarity but higher importance of some reforms that the empirical evidence suggests matters. For instance, the case of China may suggest that growth can be obtained even without large scale privatisations provided enterprises are restructured and appropriate incentives are created while improving the quality of property rights. More generally, the creation of a competitive environment can enhance efficiency regardless of whether suppliers are state or privately owned (see section below on ownership). This however, leaves the question of whether additional growth could be obtained through privatisation (Megginson and Netter, 2001).

A relationship which deserves special attention is the way CP interfaces with trade policy. As mentioned in Mickiewicz (2005) the effects of opening an economy to imports are very similar to adopting antitrust laws. Indeed, import-penetration is often used as a proxy for the level of competition in a market. However, there may also be a tension between the two policies since domestic firms may be better able to compete internationally if they are allowed to grow under more relaxed competition laws:

> *"It seems clear that the pro-competitive effect of trade should reduce the gains from domestic anti-trust policy, while the desire to exploit monopoly power in foreign markets argues in favour of laxity in domestic anti-trust policy. Thus a clear message emerges for policy design: in an open industrial economy, trade policy and anti-trust policy should not be designed independently" (Venables and Smith, 1986, p. 637).*

Another possibility is that different policies will impact specific groups in different ways hence suggesting specific policies should be pursued depending on the market structure in question. Anghion et al. (1997) show that the impact of industrial policy and competition policy on technology adoption depend on whether firms are profit maximising or behaving 'conservatively' (i.e. slacking):

Table 8. Impacts of policies depends on firms' objectives

	Profit maximising firms	Conservative firms
Competition policy	Negative	Positive
Industrial policy	Positive	Negative

Finally, in certain cases, the two policies may seem to be in direct opposition but their joint implementation creates the desired set of incentives. So, for instance, patent protection legislations (which encourage investment in R&D) will be introduced in tandem with antitrust laws (which are aimed, at least in part, at limiting the exploitative rights of firms who have invested in successful R&D projects). It should be plain to see that it would be advisable for both these policies to be implemented simultaneously to avoid overprotecting a particular group (e.g. patent-holding incumbents or new entrants).

3.1.1. Competition policy and privatisation

The transition process from a command economy to a free-market oriented one has, almost inevitably, involved the privatisation of some factors of production previously owned by the state.[26] Privatisation has hence been one of the central themes of the transition path which Eastern and Central European countries have undergone since the fall of the Berlin Wall. In parallel to this, but also as a direct consequence, the structure of markets in transition economies has changed, often generating an increase in competition. This has been the result of both market-driven factors (for instance, an increase in domestic entrepreneurial entry; an expansion of foreign direct investment; higher import penetration), but it has also been a process driven by the implementation of specific regulatory policies. Competition policy, in particular, has had historically the objective of maintaining the competitive process of free markets or protecting effective competition (World Bank and OECD, 1997). A debate has therefore emerged in the literature regarding the relative importance of privatisation, and hence ownership, versus competition: one school of thought argues that deregulation and competition is more important than ownership while others maintain

[26] A notorious exception to this being China.

that privatisation is a necessary condition for performance improvements (for a thorough description of this debate see Megginson and Netter, 2001):

> *"Many of the theoretical arguments for privatization are based on the premise that the harmful effects of state intervention have a greater impact under state ownership than under state regulation, not that the harmful effects can be eliminated through privatization."*

In contrast, in describing the situation transition economies found themselves in the early 1990s, Fingleton et al. (1996, p. 46) reflect that many felt competition related issues should have been addressed ahead of privatisation:

> *"The associated high levels of industrial concentration have given rise to concern that economic liberalisation or privatisation would not work without prior dissipation of monopoly power."*

However, they also hypothesise that the above is likely to play a more or less central role depending on the economy in question. For instance, in Russia officials perceived monopoly power to be more of an obstacle than in, say, Poland (these issues may also be connected to a country's approach to trade, since, as mentioned, allowing imports may be an effective way to reduce incumbents' power). For Dewatripont and Roland (1995) it is likely that liberalisation policies pursued in Russia in the early phase of transition would have been better received if they had followed efforts aimed at developing a small private industrial sector, as was - for instance - the case in Poland or in Czech Republic. Shleifer (2009) provides further support for this and cites Latin American countries as examples where privatisation and tight fiscal policy alone resulted in only partial benefits.

In practice, this discussion has been closely related to the different stances regarding the timing of reforms described above (the Balcerowicz, or big-bang, approach versus a more gradualist one). At a more academic level, the debate has been treated by scholars who have considered what the most desirable way of privatizing a natural monopoly may be and what, if any, should the regulatory role played by government be. Arguments broadly fall within two sphere: the property rights approach and the governance approach (Williamson, 2000). The first school of thought claims that the existence of a privately owned natural monopoly should not be a cause of concern if the property rights concerning the monopoly are clearly identified and if various firms are allowed to bid for the right of supplying at some point in the process (Demsetz,

1968). Similarly, Posner (1972) sees regulations in the cable television industry as largely superfluous since, providing entry is at some point possible, new technologies (and suppliers) will replace old ones guaranteeing a fair outcome in the long-run. The question of what to do with a natural monopolist is posed *ex-ante* and is answered, in large, by the notion that open bidding will eliminate excessive profits (since potential suppliers will undercut one another in their bids).

This approach has been challenged by the second school of thought which considers the problem from an *ex-post* perspective since what is seen as important is the peculiarity of the long-term relationships which develop between consumers and producers in a natural monopoly market (Goldberg, 1976). Within this context, regulation can have a positive effect but each product and regional market will have to be assessed on their own merits (Priest, 1993) which may yield conflicting results.

Returning to privatisation, another possibility is that state-owned firms may restructure (and increase efficiency) independently of privatisation. For instance, a major incentive which might push state-owned firms towards restructure and/or privatisation is whether, through the transition process, state subsidies were terminated implying hard budget constraints (Aghion et al., 1993). This push towards restructuring would have been compounded by a general decline in demand for the produce of state-run firms across the region in the early 1990s (see, for instance, Estrin et al., 1993). Another cited reason has been that the removal of state aid also meant that state-owned firms needed, relatively rapidly, to raise capital from the financial markets. In order to obtain loans from banks, firms were pushed to restructure to improve their credit ratings (Aghion et al., 1993).[27]

On the other hand, there is also evidence suggesting that private enterprises are generally more efficient than state-owned ones. However, it is also recognised that there are industries which represent exceptions to this rule. These are markets characterised by: very high entry barriers; massive economies of scale or scope; and having high externalities. The remaining grey area relates to situations where the supply of a good or service necessarily implies monopolistic competition. From this,

[27] One somewhat extreme view is that, as Alan Greenspan put it, the most important role is played by the capital markets: "The ultimate regulator of competition in a free economy is the capital market. So long as capital is free to flow, it will tend to seek those areas which offer the maximum rate of return."

it follows that the impact of privatisation will be greater in situations without a concrete market failure. In other words, privatisation would have the greatest positive impact in competitive markets, or markets which can rapidly become competitive (Megginson and Netter, 2001).

The impact of privatisation is difficult to test also because expectations of privatisation may affect the performance of the state sector firms in a positive way (Mickiewicz, 2005). For instance, it could be argued that the threat of privatisation (or replacement of management) might have acted as an efficiency incentive during the transition period. This political contestability approach, which essentially sees the government as imitating the threat of a take-over, has been argued to create a form of non-price competition. However, there are several reasons why this is likely to have only a limited impact. For instance, the political process implies an element of change and there is no guarantee that a successive government would have carried out a particular threat (Vining and Boardman, 1992).

3.1.2. A note on ownership

Injecting competition in a system characterised by considerable state ownership could be an alternative way to achieve efficiency gains without necessarily privatising firms. If we assume that a person's "efficiency" has to be a function of her abilities and her incentives, then competition can be a powerful tool to promote change:

$$Efficiency = \boldsymbol{f}\ (incentives;\ ability)$$

Although, as mentioned, some studies (for instance, Megginson and Netter, 2001) have demonstrated that public sector organisations tend to be less efficient than private enterprises (to the extent that this claim has almost become a cliché in economics), they lack the availability of an appropriate counter-factual. If one assumes that the abilities of workers in a country's public institutions are comparable to the ones of people employed by the private sector, then any productivity differences must be the result of the way employees are incentivised (e.g. lower salaries and bonuses; political pressure, etc.). But one needs not to assume that state firms may be less efficient in selecting employees. Typically, in fact, the relevant trade-off from an employee's perspective is between security of employment and

wages: state firms offer more security in hard times while private firms may offer higher levels of remuneration.

Competition may have different effects depending on the ownership of firms. State-owned enterprises may benefit disproportionately more than private firms in the same industry from an increase in competition. As mentioned, if competition policy is particularly beneficial in reducing managerial slacking (see, for instance, Aghion and Griffith, 2005; Aghion et al., 1997), then a similar mechanism could apply to state-owned enterprises. This generates the hypothesis that competition may be more important than privatisation.

3.2. Description of the data

We use a purposely constructed dataset covering the 1989-2008 period for 29 transition countries. In all, EBRD collects data on 8 reform indicators. These are: large scale privatisation; small scale privatisation; governance and enterprise restructuring; trade and foreign exchange system; competition policy; banking reform and interest rate liberalisation; securities and non-bank financial institutions; and infrastructure. The specific definition related to each value of an indicator varies in relation to the specific dimension analysed. The competition policy indicator, for instance, varies from 1 "no competition legislation and institution" to 4+ "standards and performance typical of advanced industrial economies: effective enforcement of competition policy; unrestricted entry to most markets".[28]

It is important, within this context to consider the difference between a policy output and a policy outcome (for a thorough discussion of the differences between output and outcomes, see HM Treasury, 2003; Office of Fair Trading, 2006; and section 2.3.3 above).[29] In brief, consider the way a NCA may investigate the features of a market by publishing a report on the way a particular industry operates. In the UK these are drafted *ad hoc* by the Office of Fair Trading and are called "market studies". Suppose we wanted to see whether the OFT's intervention had an effect on the

[28] The remaining values being: (2) Competition policy legislation and institutions set up; some reduction of entry restrictions or enforcement action on dominant firms; (3) Some enforcement actions to reduce abuse of market power and to promote a competitive environment, including break-ups of dominant conglomerates; substantial reduction of entry restrictions; (4) Significant enforcement actions to reduce abuse of market power and to promote a competitive environment.

[29] To note that in the legal world a similar distinction is made between *de jure* and *de facto* measures.

economy, we could either measure an output (a report was published) or the outcome of that intervention (suppliers are now being more transparent). It is easy to see that a specific output is not necessarily reflected in an outcome. An agency can write hundreds of reports resulting in negligible changes whereas it may publish a brief but sharp press release and alter the way a market operates. Although, the outputs may seem easier to measure in economics studies, we are mostly interested in outcomes. Returning to the data used in this chapter, an obvious difficulty of EBRD's method of coding its indicators is that it effectively uses a mixture of output measures (e.g. legislation and institutions set up) rather than outcomes which have been shown to be decisively more relevant in assessing the impact of a NCA. For instance, in the case of the competition indicator value 2 ("competition policy legislation and institutions set up") denotes an output whereas aspects of the value 4 ("effective enforcement of competition policy") relate to market outcomes. This clarification is particularly relevant for those who may want to collapse competition policy to a simple dummy capturing solely whether a NCA exists or not.

Falcetti et al. (2006) highlight three empirical issues associated with using EBRD's indicators.

The first is the already mentioned high correlation both across countries and over time. Studies have generally dealt with this by constructing a linear combination (or average) of all indicators. An alternative is to include a subset of indicators (both approaches are adopted in this chapter).

The second relates to intrinsic anomalies in the data as, for instance, data for the first part of the transition period were inferred backwards only in 2000 and, at times, comparability of indicators across countries can be dubious. These are fundamentally measurement error issues and, although they do not preclude conducting empirical analysis using these variables, they represent an important health warning.

The third point relates to the discrete nature of the indicators which are bounded between 1 and 4+. This may cause problems during estimation if the non-parametric nature of the variables is maintained. For instance, Falcetti et al. (2006) suggest that there is likely to be a pronounced difference for a country to switch between the first two ranks of the indicators compared to switching between the last two values.

Similarly, implementing certain policies may be harder than others (and to complicate matters further these difficulties are likely to be country-specific).

Table 9 below tracks the evolution of the competition policy indicator over time.

Table 9. Competition policy indicator

Score	1989	1999	2008
1	29	6	1
1.7		2	3
2		8	8
2.3		8	6
2.7		3	3
3		2	3
3.3			4
3.7			1
Total	29	29	29

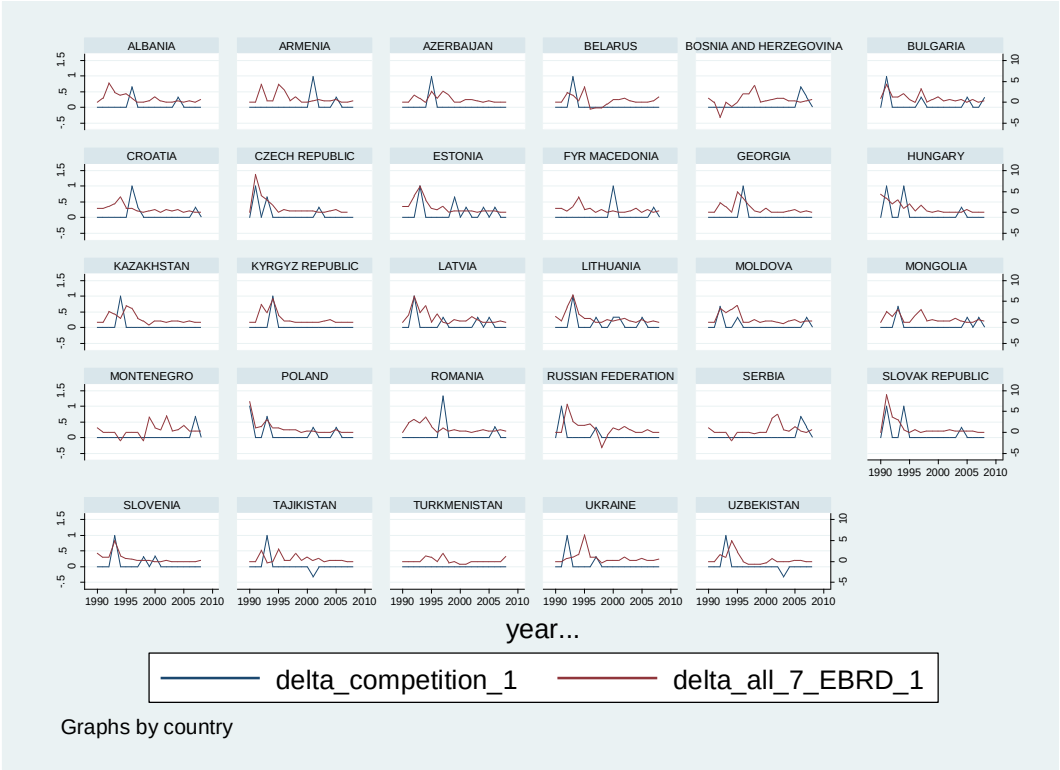
As mentioned, the implementation of competition policy has been rather slow and its speed is in strong contrast with the levels reached by other EBRD indicators. In particular, **Error! Reference source not found.** shows how a rather long time is necessary for competition policy to reach desirable levels. The level achieved in the competition policy indicator depends to some extent (correlation of .5) on how long ago antitrust legislation was introduced. This can be explained further if we consider outcome rather than output measures. For instance, consider the introduction of a new antitrust crime or agency. From the approval of the bill it is inevitable that a certain amount of time passes before the conduct of the market changes: the NCA has to be established; NCA's staff have to be trained; some cases have to be brought to justice to set examples; practitioners have to take stock and advice their clients accordingly. This is clearly reflected in **Error! Reference source not found.**: no country reached a score of 3 or above in less than 15 years. The advantage of using EBRD indicators as opposed to simple dummies is that the approval of a bill in parliament does not necessarily mean that a level playing field has been created.

Table 10. Average of EBRD indicators (excluding competition policy)

Score	1989	1999	2008
1	21		
1.1-1.5	2	2	
1.51-2	6	2	1
2.01-2.5		3	2
2.51-3		9	3
3.01-3.5		9	13
3.51-4		4	8
4.01-5			2
Total	29	29	29

Still, by 1996 antitrust laws had been passed in 22 of the 29 countries examined (Dutz and Vagliasindi, 1999). Table 10 shows a simple average of all the indicators (excluding the competition policy one) and while no country had a mean value above 2 in 1989, ten years later this had grown to 13 and by 2008 over three quarters of the countries had achieved 3 or above across all indicators (the first countries to achieve an average of 3 were Hungary and Czech Republic in 1993). On the other hand, only around one quarter of countries have achieved a 3 in competition policy as of 2008. Figure 8 depicts the gap between changes in competition and an aggregate of all other policy indicators (using EBRD data). Two patterns clearly emerge from this analysis. Firstly, it seems that changes in competition often take place at different points in time compared to other indicators (hence, supporting the view that efforts in this area were not pursued in tandem with other policies). Secondly, patterns change quite radically across countries indicating that internal dynamics were important in determining the momentum behind a particular policy.

Figure 8. The policy gap between competition and other policy indicators



Since it can be seen that CP has progressed in an individual way compared to other EBRD indicators, this allows us to disentangle its effects from other policies better than it may be the case for two closely related initiatives which may have a high correlation. The following section is aimed at measuring the impact of CP and other policies on growth.

3.3. Empirics: models and results

The EBRD dataset used and its main features and implications have been discussed above. Table 10 below presents the summary statistics for the variables used which have all been derived from the EBRD dataset except for the GDP measures which are taken from the World Bank Development Indicators.

Table 10. Variables' summary statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
delta_gdp	498	1.839	9.747	-44.9	85.9
delta_gdp_1	498	1.839	9.747	-44.9	85.9
delta_gdp_2	470	1.479	9.884	-44.9	85.9
first_stage	579	3.048	1.039	1	4.225
comp	580	1.867	0.713	1	3.67
d_1998	580	0.5	0.5	0	1
d_1998_comp	580	1.098	1.191	0	3.67
d_1998_first	579	1.802	1.866	0	4.225

We estimate the following panel regression (Model 1) to test what the respective impacts of competition and privatisation on economic growth are:

$$\Delta GDP_{it} = \alpha + \beta_1 \Delta GDP_{it-1} + \beta_2 \Delta GDP_{it-2} + \beta_3 pri_{it-1} + \beta_4 comp_{it-1} + \varepsilon_{it}$$

(Model 1)

where the subscripts *i* and *t* indicate countries and years respectively, *pri* is the accumulated amount generated by privatisation and *comp* is EBRD's competition policy index. We then estimate Model 2 by replacing *pri* with a linear combination of those policies which have been more easy to implement ('first stage' reforms), *first_stage*. Our approach is supported by Figure 7 which shows how first stage reforms were obtained faster than others. To test for this time effect, we include interactive effects with a time dummy *d_1998* which equals 1 if year>1998:

$$\Delta GDP_{it} = \alpha + \beta_1 \Delta GDP_{it-1} + \beta_2 \Delta GDP_{it-2} + \beta_3 d\_1998 + \beta_4 comp_{it-1} + \beta_5 first\_stage_{it-1} + \beta_6 d\_1998(comp_{it-1}) + \beta_7 d\_1998(first\_stage_{it-1}) + \varepsilon_{it}$$

(Model 2)

Table 11 below reports results from Model (1) and Model (2). We obtain two key results. First, competition seems to be more important than privatisation which supports the position expressed by Fingleton et al. (1996) discussed in the previous sections.

Second, when other policies are included in the model, competition policy only becomes significant once first stage reforms have been implemented (post-1998), which points to strong complementarities between policies as advocated by De Macedo and Martins (2008). First stage reforms relate to liberalisation, therefore the result implies that sound regulatory regimes achieve little success where price liberalisation, freedom of entry and external openness are not yet established.

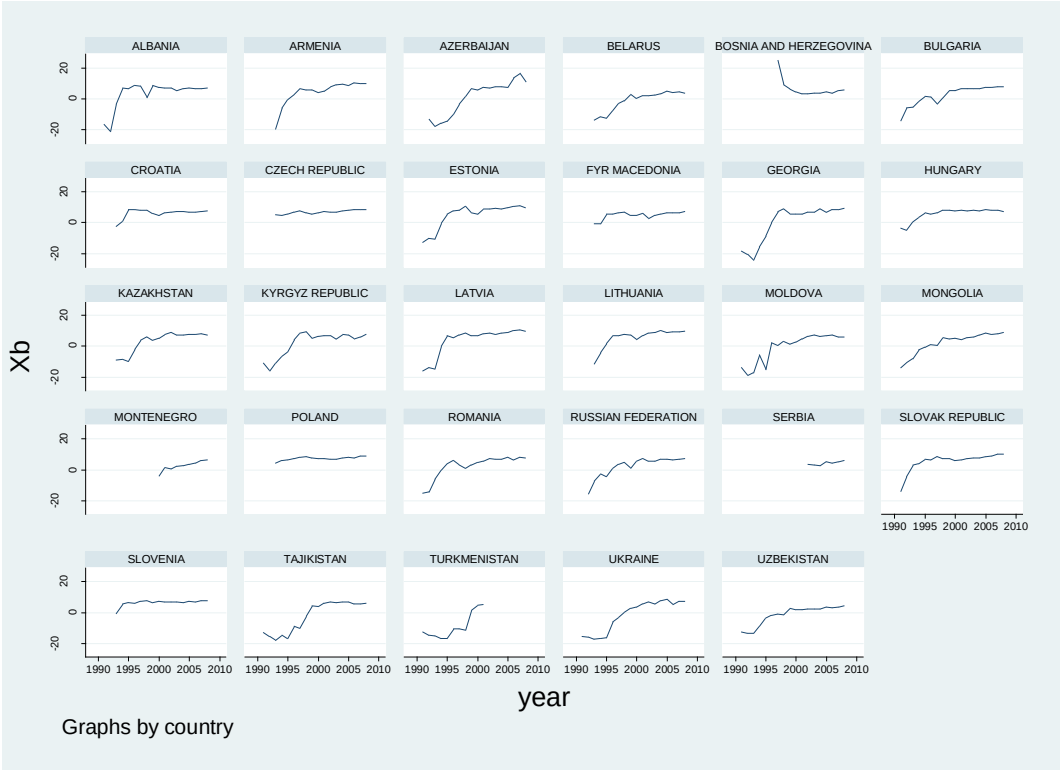
Table 11. Panel regression: fixed effects

delta_gdp	Model (1)	Model (2)
delta_gdp_1	0.513***	0.370***
	(0.0716)	(0.0604)
delta_gdp_2	-0.0131	-0.0135
	(0.0618)	(0.0528)
d_1998		11.92***
		(3.093)
comp	4.697***	-0.788
	(1.082)	(0.943)
pri	0.0256	
	(0.0585)	
first_stage		2.116***
		(0.246)
d_1998_competition		1.923**
		(0.901)
d_1998_first_stage		-1.382***
		(0.285)
Constant	-7.771***	-18.52***
	(1.935)	(2.18)
Observations	417	440
R-squared	0.539	0.701
Number of panel_id	28	29

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

An additional result which is worth noting is the significance of the 1998 dummy both by itself and, as discussed, when interacted. This effect, however, as can be seen in Figure 10 below, is more pronounced for some countries.

Figure 9. Predicted values of Model (2)



One criticism which can be advanced is that studies aimed at investigating the relationship between competition policy and growth may suffer from problems of endogeneity. For instance, when assessing the impact of competition policy on, say, productivity, the decision to legislate in this area is endogenous and may be determined by policies in other areas (trade, privatisation) and by other factors including productivity itself (Borrell and Tolosa, 2008). However, econometric approaches aimed at tackling these types of issues may also fall short: "if convergence proves to be a long-lasting process, e.g., because of institutional reforms, the BLR[30] approach will not be applicable for transition economies in the near future" (Campos, 2001).

3.4. Conclusions

A powerful testament to the existence of a link between competition and growth is that, between the end of the Second World War and the fall of the Berlin Wall, capitalist economies have, on average, grown faster than command economies.

[30] This is a method of estimating long-run growth rates and is based on work done by Barro, Levine and Renelt. In essence, two equations are estimated in sequence: the first explains growth for market economies and these results are then these are imposed on transition economies' data.

Writing in the early 1980s Wiles noted that the spectre haunting Eastern Europe was then the "spectre of zero growth" (Wiles, 1982). There are probably as many reasons why this has been the case as there are differences between the two systems: from lack of property rights to absence of political freedom to systemic corruption. However, one aspect which, above all, differentiates the two systems, is the limited nature (often complete absence) of competition in command economies.

In some circumstances, transition inevitably involved a total obliteration of the previous economic structure and, particularly in Russia, this fuelled a politically tumultuous period. During this process – which involved vast privatisations – a huge economic and power vacuum developed. One of the most lucid description of these events is given by someone who experienced the process intimately; this is how President Clinton describes the predicament President Yeltin's faced in 1991:

> *"Economic disaster loomed, as the rotting remains of the Soviet economy were exposed to free-market reform [...] state-owned assets[were sold] at low prices to a new class of ultra-rich businessmen called "oligarchs" [...] organized-crime networks also moved into the vacuum created by the collapse of the Soviet state [...] Yeltsin has destroyed the old system, but had not yet been able to build a new one" (Clinton, 2004, p. 503).*

It is in this crucial moment of transition from one political and economic structure to the next that competition enters the stage. We have argued that where competition was introduced through appropriate policies this has had a noticeable and positive effect on economic growth.

Competition economics is still a relatively new area of the subject and many countries worldwide are still to approve antitrust laws and to implement competition policy. In a sense, CP has been somewhat downplayed compared to trade policy, deregulation, or privatisation. This chapter was aimed at demonstrating that CP has played a role in generating growth within the transition process by disentangling its contribution.

In particular, we provide evidence that CP may have played a more determining role than change of ownership. Also, we find that the sequence in which different policies are implemented may also be important. Moreover, we conclude that a helpful approach for the group of countries considered is to differentiate between the first ten years of transition and the following decade.

The findings presented in this chapter are also of particular importance for developing countries which are in the process (or are considering) implementing a CP. The importance of taking steps in this direction has already been recognised (see, for instance, provisions within the Common Market for Eastern and Southern Africa addressing the need for clear antitrust laws).

Porter, in line with the conclusions drawn in this chapter, summarises the relationship between the main transition policies as follows:

> *"Deregulation and privatisation on their own, however, will not succeed without vigorous domestic rivalry – and that requires, as a corollary, a* ***strong and consistent*** *antitrust policy" (Porter, 2008, p. 205, bold added).*

The development of strong and consistent antitrust policies is something that requires both time and political willingness. In the next chapter we will analyse the functioning of one of the most efficient systems in the world to understand what it takes, in practice, to create a strong and consistent merger control system.

Chapter 4: To Refer or Not to Refer: an Empirical Analysis of Merger Policy

Merger control has become a central function of national competition authorities (NCAs) and today over 60 countries worldwide review merger cases under competition law. Indeed, the implementation of various competition policies in transition countries described in chapter 3 has resulted in mergers being assessed by newly created national competition authorities. The link between a market's concentration and its level of competition is relatively straight forward (bearing in mind that this may not always be the case, see the clarifications made in 2.3.1) and, although the actual tests adopted vary slightly across jurisdictions, the underlying principles applied are very similar.[31] The essence is to decide, *ex ante*, whether the merger in question will alter the structure of the market in such a way that the transaction would result in consumer detriment (this clearly follows the S-C-P paradigm discussed in the introduction).

In the United Kingdom, the Office of Fair Trading (OFT) together with the Competition Commission (CC) are entrusted with enforcing competition policy, the latter acting as a Phase II body in merger cases. The current system hinges on the OFT's mergers branch to analyse mergers and to establish whether transactions present competition concerns - defined as a substantial lessening of competition (SLC). If a 'realistic prospect'[32] of an SLC is found, the case is referred to the CC unless an exception to the duty to refer applies. Upon reference, the CC then considers whether the merger will 'on the balance of probabilities' substantially lessen competition.[33] Although the OFT publishes its decisions on-line, there has been little research carried out in this field for two reasons. Firstly, because a significant amount of case data is of a confidential nature and, whilst the OFT objectively aims to publish as much detail as possible as to the reasoning behind its decision, a significant amount

[31] For instance, under the statutory thresholds developed within each jurisdiction, the creation of a dominant position (test applied in Germany) would usually result in a substantial lessening of (UK, USA) or significant impediment to effective competition (EU).

[32] Whereas under the Enterprise Act 2002 the OFT uses a 'realistic prospect' test for reference, the CC is required to assess transactions on the 'balance of probabilities'.

[33] Under the statutory framework, following an SLC finding the OFT is exempted from its duty to refer mergers to the CC when the parties offer clear cut remedies to maintain the level of pre-merger competition (usually requiring divestment of certain assets in markets of overlap), or when the market is of insufficient scale to warrant CC investigation (the '*de minimis* exemption').

of useful information is withheld from the public domain. Secondly, because the actual internal process which leads to a decision being taken can be quite intricate. In this sense this chapter has been written "from the inside" and presents a detailed description of how mergers are evaluated by the OFT.

One of the earliest attempts at evaluating government policies in this area belongs to Posner (1970), who analysed one hundred years of US antitrust enforcement since the implementation of the Sherman Act 1890. Posner's final point is still valid today: like any other sector of the economy the efficiency of antitrust enforcement can be increased but the first step has to be a greater interest in "the dry subject" of antitrust statistics.

This chapter uses antitrust statistics to shed some light on what is still sometimes seen as a black box and presents an analysis of 143 merger cases examined by the OFT between January 2006 and September 2008. The main objective of this study is to analyse the OFT's recent decisional process from an empirical perspective and to offer some explanations of what the main drivers behind the decision to refer or not to refer mergers to the CC have been.

The reminder of this chapter is structured as follows: section 4.1 reviews the recent studies in this area and describes the decision process within the OFT; section 4.2 gives a description of the dataset and variables; section 4.3 describes the models and presents the results of the analysis; and, section 4.4 concludes.

4.1. Literature review

A growing body of literature has emerged which addresses the topics covered by this chapter. Research efforts in this area tend to analyse merger control within a single country partly because while a particular transaction may present problems in a specific jurisdiction it may not under another regime; and also because comparable case-level data across countries is scarce.

Over the decade following Posner's (1970) seminal paper, merger control as a discipline developed considerably. Testament to this are the US Department of Justice 1982/1984 merger guidelines[34] which highlight a series of factors to be taken into

[34] Prior to this, the last time the merger guidelines had been changed was in 1968.

consideration when assessing a horizontal merger: concentration, ease of collusion, entry barriers, efficiency and whether the target was a failing firm. The first factor, concentration, was to become an important feature of the US system as merger classes were created depending on the Herfindahl-Hirshman index (HHI).[35] More generally, analysts at NCAs will dedicate considerable attention to the predicted change in concentration following a merger. For instance, Bergman et al. (2003) and Bougette and Turolla (2006) find that the probability of Phase II referrals by the European Commission rises considerably as the parties' market shares increase. However, this traditional approach can be misleading (see, for instance, Farrell and Shapiro, 1990) and the parties' market shares are generally only one of the factors considered by the OFT - though a very important one.

Coate and McChesney (1992) highlight two features of the American system as it stood in the 1980s which are still highly relevant today: firstly, that all factors have to be evaluated against each other to reach a decision; and, secondly, how the relative interpretations of the two main decisional groups - lawyers and economists – should be weighted. Indeed, the central question of this chapter is to examine, *ex post*, the relative importance of the various factors which are considered during a case.

Contemporary merger control tends to consider that a variety of factors and decisions are determined by multivariate market scenarios (La Noce et al., 2006, for instance, prove this is the case for Italy). A World Bank study of Mexican merger policy similarly confirms that entry barriers and equity shares, as well as market concentration, play a role in the decision making process. Coate and Mcchesney (1992) conclude that the inclusion of multiple factors in the assessment process did not alter enforcement greatly and that, in particular, concentration remains a necessary, but not necessarily sufficient, condition for challenging a transaction. They find this to be also the case for barriers to entry. These results are supported by Khemania and Shapiro's study (1993) of Canadian merger policy and by studies on the EU approach by Bergman et al. (2003) and, more recently, by Fernandez et al. (2008). Their results show that market share is the main factor determining decisions, but other factors are also relevant. For instance, the effect of high market shares is mitigated when barriers to entry are low or when import penetration is high.

[35] This is a feature which still differentiates UK and US merger enforcement.

Khemania and Shapiro's (1993) study, however, remains agnostic on whether the elimination of a vigorous competitor, or the presence of a failing firm, are also relevant since both are correlated with market shares.

For the UK, Davies et al. (1999) analysed a dataset of 73 UK Monopolies and Mergers Commission cases.[36] The paper's main conclusion, which represents a return to concentration as the main driving factor, is that one can predict quite accurately (approximately 4 in 5) the outcome of a decision with minimal information.

A central issue faced by practitioners working in merger control is how consistency can be maintained while allowing enough flexibility in the evaluation process. This is of particular importance as a consistent system will produce predictable results, which benefit parties considering whether a specific merger may be admissible or not.[37] Some studies in this area have focused on investigating the *ad hoc* nature of merger decisions. For instance, a case-by-case approach was taken to assess the UK's Monopolies and Mergers Commission by Weir (2003). Nilssen (1997) suggests that two decisions in the same market assessed by the Norwegian Competition Authority were mutually inconsistent. Fernandez et al. (2008) also present evidence to support the accusations of inconsistency for the EU as EC's decisions may be biased against market leaders. Indeed, the fact that most jurisdictions will include mechanisms to allow political intervention for certain industries, and in certain cases, is a testament to the limited universality of merger policy. These inconsistencies represent part of the error term of the econometric model presented in this chapter which will fail to explain variation in the data caused by overriding factors – whether internal to the NCA or otherwise – that are not part of the standard decision making process.

4.1.1. The process of merger analysis within the OFT

A thorough description of the procedure which is followed by the OFT in merger cases is given by the current procedural guidelines (OFT, 2008). In a nutshell, the path of a typical merger case is as follows. Cases are either notified to the OFT (as completed or anticipated deals) or they are detected by the Chief Intelligence Officer who monitors national press and other sources for potentially problematic non-

[36] These are Phase II cases, hence the dataset used only includes mergers which were found potentially problematic by the OFT.

[37] This is of particular importance in voluntary notification regimes like the one adopted by the UK.

notified activity. (Since notification is not mandatory, a large number of non problematic cases are not analysed by the OFT.)[38] On a merger case entering the mergers branch, a case officer and an economist are assigned to the case with the latter's main task being to prepare an economic advice paper and to assess the implications of the transaction for the relevant market(s). This paper is a highly structured document designed to consider all aspects of a case and it constitutes the first assessment of whether the Substantial Lessening of Competition (SLC) test may or may not be met. In terms of key information sources, the economic advice will draw in the first instance on the parties submission, which will contain information on, among other things, market definition, market shares, the extent of competition loss and the scale of barriers to entry and buyer power. The case team will then test the suppositions presented by the parties over a period of around eight weeks through a process of ongoing discussion with the parties themselves and with various interested third parties (including customers, direct and indirect competitors and potential entrants). After this period, the economic advice paper will be written based on the suite of evidence available to the case economist at the time.

If concerns cannot be ruled out during the economic analysis, a paper setting out the OFT's 'theories of harm' is presented to the parties which are then given the opportunity to respond in person. This is called the "issues meeting" and, as the name suggests, its main purpose is for the case team to discuss any concerns they may have directly with the parties. The case is then brought before senior OFT management at a Case Review Meeting (CRM). On the basis of the conclusions of the CRM and their own considerations the decision maker[39] then concludes as to whether the reference test is met at a subsequent meeting ("decision meeting"). Importantly, the information available to the decision maker at the decision making stage may be substantively different from the information available at the stage when the economic assessment is made, as parties will often provide a substantial volume of further information on the critical issues raised by the OFT. The decisional process can therefore be considered as an additional analytical iteration of the mergers assessment process. In such circumstances where an SLC is considered to be a realistic prospect, the decision

[38] Often those with very small horizontal overlaps.

[39] This will typically be either the Chief Executive Officer, the Senior Director of Mergers or the Chief Economist.

maker will then consider whether one of the exceptions to the duty to refer can or should be appropriately invoked. The OFT may suspend its duty to refer only when Undertakings In Lieu (UIL) are offered by the parties to remedy the SLC finding, or when the *de minimis* or other exception is applied (see Table 12 below).[40] If no exception is viewed to apply, the case will be referred to the CC for a full Phase II assessment.

4.2. The dataset

4.2.1. Sample

Each economic assessment was carefully reviewed by economists currently working within the mergers directorate (the reviewer) in order to extract the information required for our empirical analysis. This mainly involved 'coding' particular aspects on the economic assessment. For instance, a categorical variable was created to capture the extent of barriers to entry in the market (whether negligible, substantial, or insurmountable).

Between April 2005 and September 2008 approximately 339 merger cases were evaluated fully by the OFT.[41] Of these, 266 were cleared without need for case review meeting. A further 24 were cleared following the case review process. Of those cases where an SLC was found at Phase I, 18 were remedied by undertakings in lieu (UIL), 1 was exempted from the duty to refer on the basis of the *de minimis* exception and 30 were referred to the CC. Of those cases referred to the CC the vast majority were a result of horizontal unilateral effects concerns.[42] This chapter therefore focuses on the factors relevant to horizontal mergers assessment rather than, for example, vertical or conglomerate effects.

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[40] The *de minimis* exception exempts markets of insufficient importance from CC investigation. Other exemptions apply when the OFT concludes that efficiency benefits to consumers will outweigh competition concerns or when sections 22(2) or 33(2) of the Enterprise Act 2002 apply.

[41] This sample excludes rail franchise cases. Inclusion would have increased the number of *de minimis* cases to 4. Case dates are taken from the date the case was opened on the OFT's internal case recording system. Cases which were found not to qualify under the jurisdictional tests set out within the act have been excluded.

[42] As noted in the OFT's Substantive Merger Assessment Guidelines, traditional merger analysis focuses on three key areas of concern: horizontal unilateral effects; coordinated effects; and vertical effects.

Table 12. Case outcomes by financial year

Financial year	No CRM and cleared	CRM and cleared	UIL	SLC but *de minimis* found	Referred to CC	Total
2005-2006	107	6	6	0	9	128
2006-2007	72	8	5	0	14	99
2007-2008	72	7	6	0	4	89
2008-2009	15	3	1	1	3	23
Total	266	24	18	1	30	339

Our dataset is based on the key information consistently contained within the economic assessments written over this period and includes only those cases for which there was readily available information relating to the economic assessment. In taking this approach we acknowledge that, for CRM cases, certain adjustments made to the data between the writing of the economic assessment and the final decision stage will be lost. However, for the variables collected we do not consider that the size of such adjustments is likely to be large, nor do we consider it likely that there will be any systematic bias in their sign.[43] These adjustments will therefore form part of the error term in our model.

Over and above the explanatory variables collated for modeling, clearance decisions provide important evidence on the overriding comments driving case outcomes at Phase I. Table 13 below lists the key reasons for clearance as specified within the economic assessment. These reasons are not mutually exclusive and often a transaction is deemed permissible because of two or more reasons, hence the number of reasons for clearance is greater than the number of decisions.

[43] No data was collected on the scale of differences for the key economic variables collated within the dataset at the economic assessment stage and decision stage due to time constraints. The basis for this presumption is therefore a qualitative assessment based on the experiences of case economists. Overall, the consensus was qualitative judgments such as the number of true 'effective competitors' may change substantially more than, say, market share estimates.

Table 13. Key reasons for Phase I clearance

Reason	Count
No overlap	5
Small increment	46
Small combined market shares	22
Sufficient post-merger constraint [44]	108
Large competitive fringe	6
Not close competitors (product pace)	23
Not close competitors (geographic)	5
Low barriers to entry/expansion	38
Buyer power	16
Total	269

As can be seen, around half of cases are cleared in part on the basis of the parties combined share of supply or share increment arising from the transaction being modest. In many cases (108 of 269) the OFT relied on a relative assessment of the competitive constraint that would exist post- merger or on the 'closeness of competition' between the parties (28 of 269 cases) to develop a case for clearance. Perhaps surprisingly, the third most common reason for clearance is that the market presents low barriers to entry and/or expansion, although again it is noteworthy that only 6 cases were identifiable where this was the only reason for clearance. Of interest generally, is the fact that relatively few cases are cleared on the basis of a single reason. This supports the argument that few 'silver bullets' for clearance exist, and that Phase I merger decisions are taken on the basis of a wide base of information.

4.2.2. Analytical framework and variables' description

The key variables collected within this dataset were identified in accordance with the structure of the economic assessments carried out within the OFT, with the aim of identifying which of these factors affect the analysis of cases. Table 14 outlines key summary statistics for the variables collected. A notable variable not included within the dataset is the Herfindhal-Hirshman Index (HHI) since it is not calculated on a

[44] That is, when combined market shares are insufficiently small to clear a transaction outright, but where there are sufficient numbers of effective competitors post-merger to constrain the merging parties. This may be, for example, because of one or two very substantial competitors or because of a larger number of smaller, but nevertheless significant, competitors.

systematic basis at Phase I.[45] On a case by case basis it is inevitable that key information relevant to the OFT's decision will be excluded as a result of our focus on the variables below, as in practice the analysis of any case is highly tailored to the industry/market in question. The subset of 'omitted variables' relevant to decisional practice will therefore form part of the error term in our estimated model.

With regard to market structure we collated market shares of the acquiring (*MS1*) and acquired (*MS_delta*) firms to measure the effect of the merger on market structure. In practice, the derivation of market shares is rarely straightforward and will require a subjective assessment of the correct 'market' for analysis and of information given by the merging parties and third party sources. Reported market shares within economic assessments, whilst pre-determined for the purposes of decision making, can therefore be seen as the outcome of an analytical process rather than fixed figures. Given that the OFT must only satisfy a 'may be the case' threshold for reference, sometimes the OFT will use a conservative, or 'narrow' market definition for the purposes of its assessment. In multimarket cases[46] the market share is taken as the share of the most problematic market, which will drive the reference decision. As additional potentially informative measures of competition, we also collated absolute number of large competitors (*large_c*)[47] and the total number of competitors identified as being active within the market (*competitors*).[48] The number of customer concerns and additional third party concerns from market participants were included in the dataset (*n_custome~ns* and *n_add* respectively) in light of the fact that third party enquiries constitute a major element of the OFT's investigations.[49] Questionnaires are sent out

[45] In reviewing cases it became clear that more complex measures of market concentration, such as the HHI were not consistently reported, nor was the data on which to calculate them. For a thorough description of concentration measures see Chapter 2, 2.3.1.

[46] Where there are many product or geographically separate markets, or where a number of alternative potential market definitions are proposed.

[47] We define 'large competitors' as those with a market share of greater than 25% of that of the merged parties. Subsequently this measure reflects only the relative size of competitors, rather than any true reflection of their effectiveness as a competitive constraint which will rely on many other factors such as the closeness of competition or capacity constraints.

[48] Defined as the number of competitors identified by name within representative market share tables presented within economic assessments.

[49] Within economic advice papers third parties are flagged as having 'competition concerns'. The economist's assessment of whether competition specific concerns exist results from a subjective assessment of third party comments in relation to other evidence. We note also that a certain degree of uncertainty exists with regard to the causal link between case outcomes and absolute numbers of concern, since more participants are likely to be questioned in more problematic cases with the effect that the number of concerned customers may rise. Such concerns would be reduced by using a

as a matter of practice to a cross section of market participants to provide insight into the competitive process within markets and the likely effects of the merger. Barriers to entry (*BTE*) and buyer power (*BP*) measures take the form of categorical variables with three values.[50] The existence of additional plausible theories of harm (*TOH_2*) tests the argument that reference to Phase II authorities for further investigation is more likely in markets where plausible vertical and horizontal theories of harm are present, due to the additional complexity of the economic considerations.

In addition to these traditionally informative measures of competitive effects, proxies for the degree of product differentiation (*PD*), the level of the supply chain (*SC*) and the turnover of the acquired firm (*TO_acquired*) were also collected. The inclusion of these variables will not necessarily test any underlying predicted economic relationship as is the case with the other variables described above, but rather they may provide an insight into the consistency of the OFT's approach to merger analysis. This test is relevant given that these factors may have a substantial degree of influence on the approach to merger analysis.[51]

proportional approach (the proportion of customers and competitors raising concerns out of those surveyed), however, lack of information meant we were unable to estimate this measure.

[50] This approach required some subjective assessment by the reviewer.

[51] In retail markets analysis is more likely to be done at the local level and on the basis of fascia counts. In differentiated product markets a further degree of complexity is added to the assessment process as it is necessary to assess the extent of differentiation of the merging parties' products.

Table 14. Variables' summary statistics

Variables	Description	Obs	Mean	Std. Dev.	Min	Max
SLC	Whether a substantial lessening of competition is found	349	0.123	0.336	0	1
SLC2	As above but also differentiating between CRM and non-CRM cases	339	0.36	0.722	0	2
MS1	Market shares of acquiring firm	154	33.804	21.738	0	96
MS_delta	Market shares increment (target's market share)	156	12.748	12.844	0	50
n_custome~ns	Number of customers concerned with the transaction	162	3.275	9.585	0	116
n_add	Number of concerns from other market participants[52]	160	2.003	2.593	0	14
BTE	Barriers to entry (negligible; substantial; or insurmountable)	173	1.029	0.66	0	2
BP	Buyer power (none; some; considerable)	176	0.608	0.623	0	2
TOH_2	Whether the case had additional theories of harm	177	0.305	0.461	0	1
PD	Level of product differentiation (homogeneous; some; or highly differentiated)	173	0.89	0.642	0	2
SC	Supply chain level (producer; wholesaler; or retailer)	170	1.782	0.818	1	3
TO_acquired	Target's turnover	159	189.471	451.285	0.27	2700
large_c	Number of large competitors (>25% of the parties' combined market shares)	152	2.513	2.898	0	18
competitors	Number of competitors	158	4.658	4.716	0	27

[52] Additional market participants questioned during OFT analysis will include direct and indirect competitors, potential competitors, intermediaries and suppliers among others.

4.3. Methodology

4.3.1. The model

As noted above, in undertaking its statutory duty within the Phase I framework the OFT takes a number of sequential decisions. The first is whether or not to take a case through the formal CRM process. The second is whether or not a realistic prospect of SLC is found to exist. Finally, the OFT considers whether any of the exceptions to the duty to refer should be invoked.

Such decisional practices could be modeled in a variety of ways, each of which would provide slightly different insights into the economic decisions taken by the OFT. The simplest approach (Model I) is to consider the overall decisional outcome of the Phase I assessment - namely whether to refer or not - using a binary probit estimation model.

Distinguishing case outcomes in this way has arguably the greatest relevance to the external competition community, who will undoubtedly be interested in the factors that have lead the OFT to invoke the potentially costly Phase II CC investigation. This can be expressed as the following binary choice model:

$$\Pr(SLC) = \begin{Bmatrix} 0 & if & clearance \\ 1 & if & reference \end{Bmatrix} \tag{1}$$

$$\Pr(SLC = 1 \mid x) = \Phi(xb)$$

Where *SLC*=1 if an SLC is found and *x* is a vector of the regressors described in Table 14.

A second approach, drawing on the work of Shapiro (1993), is to characterise the OFT's decision making process in an ordered manner, the three ordered steps being: a case is cleared without reaching the CRM; a case is cleared at the CRM; and, a case is referred to the CC. Such an approach necessarily imposes the condition that non-CRM-clearances are viewed as less problematic than CRM-clearances which, in turn, are viewed as less problematic than SLC cases. There is a debate as to whether such a ranking correctly characterises the Phase I merger process. Notably, it is not necessarily clear that a CRM clearance case should be ranked as more concerning

than a non-CRM clearance, given that a finding of no SLC is implicit in both outcomes. However, for the OFT to invoke the CRM process, which in itself imparts a cost on parties and on the OFT, it must be the case that initial investigations by the case team are insufficient to rule out a potential SLC finding. Or, to put it another way, when a theory of harm worthy of further evaluation is considered to exist on the basis of the information presented in CRM cases. In such circumstances we view it as appropriate to characterise such borderline cases as more problematic than those in which the case team is able to confidently conclude upon a non-SLC finding without the need for CRM. Also, such an approach would explain OFT's initial decisional practices (whether to bring a case to CRM or otherwise), which we consider to be relevant to the external community given the extra financial burden that the formal CRM process often places on merging parties.

This second approach can be expressed with the following ordered probit model:[53]

$$\Pr(SLC2) = \begin{cases} 0 & if \quad no \quad CRM \\ 1 & if \quad CRM \\ 2 & if \quad referred \end{cases}$$

(2)

Denoting the three values of *SLC2* as *J*, $SLC2_i = m$ if $\Gamma_{m-1} \le SLC2_i^* < \Gamma_m$ for $m = 1$ to *J*. Where Γ indicates the cut-off points. This can be estimated as (Model II):

$$\Pr(SLC = m \mid x) = F(\Gamma_m - x\beta) - F(\Gamma_{m-1} - x\beta)$$

(3)

[53] This approach does not model separately those instances where the OFT invokes exceptions to the duty to refer a case in the instance that an SLC is identified. Such exceptions occur when the OFT applies either the *de minimis* principle, or where satisfactory UILs are accepted by the OFT in order to remedy the SLC since the samples available are necessarily small. Further, the factors which dictate whether any such exception to the duty to refer exists are likely to be different from those which affect findings of an SLC and tend to be more legal than economic in nature. We therefore considered that any such segmentation would be unlikely to enable reliable estimation of the structural equation.

Overall, in our view, given that the first model is likely to suppress significant degrees of variance in the explanatory, we have a strong preference for the second of these two approaches, subject to a standard set of specification tests.

4.3.2. Results

Results for Models I and Model II (outlined at (1) and (2;3) above) are presented in Table 15 and Table 16. The only variables which have been omitted are *large_c* and *competitors* as they are both highly correlated with the market shares variables. We also experimented by including a series of binary variables for each financial year to account for any variance in outcomes over time, however, these were not significant and have since been removed. It is worth noting that this seems to suggest that outcomes do not vary significantly over time.

Given that different reviewers (all mergers branch economists) coded different economic papers and that their interpretations of what constitutes, for instance, a high barrier to entry may be subjective, we cannot be sure that observations are independent across reviewer groups. Hence, when estimating the models below, we chose to cluster the error term by reviewer.

An important element to be considered in categorical dependent variables models is how well the results fit the data. Whilst there is no universal measure for probit models, we report three measures of goodness of fit for the models discussed (see Table 17 below): the McFadden's R2 (or likelihood-ratio index) which compares a model with all explanatory variables to one with just the intercept and is the standard measure reported by most software applications for models with categorical outcomes; the Count R2 which is the percent of cases correctly predicted; and, the adjusted count R2 which 'discounts' the Count R2 by considering only the extra cases which would not be correctly guessed by simply choosing the largest marginal. Overall, the three measures prove that the explanatory variables identified have a significant effect on case outcomes implying the models have considerable explanatory power: Model II, for instance, predicts 84% of cases correctly (Count R^2).

Turning to the coefficient estimates, we note that the results do not vary significantly across the two models and that all coefficients have the expected signs. Focusing on the more refined Model II, we see that the market share of the acquired and acquiring

firm are positively correlated with outcomes as expected and significant at the 1% and 5% level respectively. Dummies reflecting barriers to entry coded as moderate or high (*BTE_1* or *BTE_2*) exhibit a statistically significant negative relationship with the probability of clearance, again as expected. Interestingly, only the coefficient for high *BP* (*BP_2*) is statistically significant in determining ordered outcomes, although the sign of both is as expected. This is indicative of only extreme instances of buyer power driving decisional outcomes. The extent of competitor and customer concerns also show a positive and statistically significant relationship with outcomes as expected.

Table 15. Model I – Probit estimation results and marginal effects

Dependent (SLC)	Probit Results	Probit marginal effects
	Model (I)	SLC=1
MS1	0.0352***	0.0011389***
	(0.0076)	(0.00059)
MS_delta	0.0281**	0.0009072***
	(0.0115)	(0.00053)
n_cust	0.0558	0.0018051**
	(0.0366)	(0.00101)
n_add	0.247***	0.0079688*
	(0.0489)	(0.00322)
_IBTE_1	6.446***	.6847541*
	(0.316)	(0.09843)
_IBTE_2	7.336	.9992886***
	(0)	(0.00054)
_IBP_1	-0.45	-0.0175501***
	(0.318)	(0.00876)
TOH_2	0.900**	.0425738**
	(0.391)	(0.02986)
PD	-0.232	-.0075069***
	(0.283)	(0.00704)
SC	-0.305	-.0098633***
	(0.223)	(0.00636)
TO_acquired	-0.000182	-0.0000059***
	(0.000463)	(0.00001)
Constant	-9.464***	
	(0.773)	
Observations	143	
McFadden's R^2	0.604	
Count R^2	0.897	
Adjusted count R2	0.586	

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Interestingly, the existence of additional theories of harm exhibits a highly significant positive relationship with SLC outcomes, despite the fact that the vast majority of cases are referred on the basis of traditional horizontal unilateral effects concerns. This provides support for the argument that unilateral horizontal concerns are more likely to arise when other plausible theories of harm have been raised. Of the remaining three variables, *TO_acquired*, *PD* and *SC*, none display any degree of statistical significance at the 10% levels. This would suggest that case outcomes are not driven by arguably irrelevant factors, that a consistent approach to the consideration of key evidence has been adopted.

Table 16. Model II – Ordered probit estimation results and marginal effects

Dependent (SLC2)	Ordered probit results	Ordered probit marginal effects (estimated at outcome mean)	
	Model II	SLC2=2	SLC2 =3
MS1	0.0261***	0.0038284***	0.0104***
	(0.004321)	(0.00147)	(0.00166)
MS_delta	0.044***	0.0065051**	0.017***
	(0.011629)	(0.00294)	(0.00445)
n_cust	0.1421***	0.0207885**	0.0564***
	(0.030816)	(0.00885)	(0.01179)
n_add	0.2057***	0.0300762***	0.081***
	(0.03858)	(0.01015)	(0.01489)
_IBTE_1	1.958***	0.2171249***	0.6715***
	(0.385427)	(0.06128)	(0.09499)
_IBTE_2	2.673***	0.1132702*	0.6787***
	(0.453513)	(0.06888)	(0.07083)
_IBP_1	0.201	0.0294411	0.07994
	(0.246294)	(0.0396)	(0.09763)
_IBP_2	-8.467***	-0.2131***	-0.7528***
	(0.610887)	(0.06626)	(0.07195)
TOH_2	0.812***	0.1151126*	0.30861***
	(0.247839)	(0.06223)	(0.08925)
PD	-0.16975	-0.0248193	-0.06744
	(0.446032)	(0.06973)	(0.17705)
SC	-0.30865	-0.0451277	-0.12262
	(0.228105)	(0.04189)	(0.09061)
TO_acquired	-0.00021	-0.0000314	-0.00009
	(0.00042)	(0.00006)	(0.00017)
Constant _cut1	4.572***		
	(0.800)		
Constant _cut2	5.210***		
	(0.735288)		
Observations	143		
McFadden's R^2	0.522		
Maximum Likelihood R^2	0.572		
Count R^2	0.84		
Adjusted count R2	0.52		

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

In interpreting the relative scale of the coefficients presented we note that the parameter estimates described above suffer from the typical problems associated with probabilistic models. Hence, the marginal effects of the regressors have also been reported. We have chosen to estimate these marginal effects at the outcome specific mean since estimating at the overall mean would have introduced a substantial bias.

Using this approach, we see that the market share of the acquired firm (*MS1*) is significant at the 5% level or higher across all outcomes and positively correlated with CRM and SLC outcomes. The market share of the acquired firm (*MS_delta*) also exhibits a consistent degree of significance across all outcomes. As one would expect, the absolute size of the marginal effects of both variables is greater on SLC outcomes than on CRM ones indicating that an increase in market share raises the probability of an SLC finding more than a CRM (no SLC) outcome. Overall, for every 10% increase in the acquirer's market share, the probability of the case being discussed at a CRM increases by 3% and the overall likelihood of the merger being referred also raises by 10%. For the acquired firm, the respective figures are 6% and 17%.

BTE_2 and *BP_2* are highly significant in explaining SLC outcomes as expected. Whilst in line with the analysis above, non extreme values of *BP* fail to show any statistical significance across outcome. Similarly, increasing *BTE* from moderate to significant results in significantly greater increase in the probability of SLC outcomes than CRM (no SLC) ones.

n_cust and *n_add* also exhibit consistent statistical significance at the 5% level or higher across outcomes. The marginal effect of increasing the number of customer and other complaints is greater on SLC outcomes than CRM (no SLC). The marginal effect of customer complaints can be seen to be somewhat less than the equivalent additional complaints coefficient across both outcomes. However, as the scale and variance of the two variables is substantively different, it is not appropriate to draw conclusions as to the relative importance of incremental customer and competitor concerns as per OFT decisions on the basis of these marginal effects alone.[54]

Where additional theories of harm are present, the likelihood of reference increases by more than the likelihood of CRM (no SLC) outcomes. *PD*, *SC* and *TO_acquired* coefficients fail to show any degree of statistical significance.

[54] Table 14 presents the mean and standard deviation of the two variables, and indicates that the number of customer complaints is higher and more variable than the number of additional concerns. As marginal effects are in part a function of the mean value at which they are evaluated, such marginal effects do not represent an appropriate 'like for like' basis for assessment. Further, given that there are fewer additional complaints, it may be that, overall, these customer complaints have a greater overall effect on decisions.

Overall, both models perform well and confirm expectations regarding the direction of the relationships between our dependents and the various regressors. The models also have high explanatory power being able to predict accurately almost the totality of cases.

4.3.3. Fascia counts as alternative measures of market structure

The models estimated above include those measures of market structure commonly associated with merger analysis. Two of these are the market share of the acquiring and acquired parties which are generally seen as fundamental indicators of market power (provided one is of course able to calculate the total value of the market in question). In some circumstances, however, it is extremely difficult to obtain meaningful calculations for market shares. For instance, this may apply in hospital cases where analysts often prefer to consider 'fascia counts' and, instead of using concentrations measures, will simply count the number of competitors constraining the parties. Alternatively, it might be that for some industries the number of fascias, or "choices", is more relevant than the market shares.[55]

An interesting question to ask is to what extent the explanatory power of the models discussed will be affected by the measure of market structure employed and, further, whether a fascia count such as the number of identifiable competitors variable (*COMP*) can still predict the outcome of a case. This is also relevant for situations where the OFT has highly limited information on a case, for example, when the intelligence officer is considering whether to call a case in for investigation. This would shed some light on what effects the level of information on market structure has on the likelihood of predicting the correct outcome of a given case.

Therefore, as an extension, we run three additional ordered probit models with *SLC2* as the dependent variable but including only the following explanatory variables: Model (a) number of competitors (*competitors*); Model (b) count of large competitors (*large_c*); and, Model (c) parties' market shares (*MS1, MS_delta*). The explanatory power of these models is compared to Model (II) in Table 17 below. Three conclusions can be drawn from this analysis.

[55] For supermarkets, for example, what may be relevant is the number of choices available to consumers rather than how much each shop sells.

Firstly, including additional variables from our dataset greatly improves the explanatory power of the models and market shares data alone only explain a relatively limited part of the variation.

Secondly, a count of the number of effective competitors explains as much as market shares data. Of course, given that large competitors were defined in reference to the merged parties' market size, the number of effective competitors is inversely correlated with the merging parties' market shares (between -0.50 and -0.67). However, it may be somewhat easier to obtain a proxy for the former than attempting to develop proxies for the latter if information is available on the relative size of competitors.[56]

Finally, using a simple count of the number of competitors operating within the market significantly reduces the explanatory power of the model. Indeed, under this specification the adjusted count R^2 falls towards zero. A fascia count with no quantitative assessment of the competitive position of firms operating within the market is therefore unlikely to yield reliable predictive results over and above a simple rule of thumb.

Table 17. Comparative R^2 statistics

	Adjusted Count R2	McFadden's R2	Maximum Likelihood R2
Model (II)	0.52	0.522	0.572
Model (a)	0.043	0.101	0.186
Model (b)	0.15	0.189	0.264
Model (c)	0.174	0.201	0.27

4.4. Conclusions

In this chapter we examined what the factors behind the OFT's decision to refer merger cases to the CC are. Our findings can be summarized as follows.

Of those transactions contained within our sample, approximately one in ten were referred to the CC. Merger cases are predominantly deemed permissible if it is found

[56] For example, it may be that a firm is able to provide comparative sales volumes against those of its major competitors but is not able to derive the 'total market size' with sufficient certainty to develop market share estimates.

that sufficient competitive constraints remain in the market; mergers are cleared on the basis of low market shares alone less often. The third most common reason to clear a case is that the market in question has low barriers to entry and expansion.

Overall, on the basis of the variables in our dataset, our preferred model was able to predict around 85% of decisions correctly. Overall, the parties' market shares represent an important factor in determining decisions. For every 10% increase in the acquirer's market share, the probability of the cases being discussed at a CRM increases by 3% and the overall likelihood of the merger being referred also raises by 10%. For the acquired firm, the respective figures are 6% and 17%. However, despite these trends, this analysis does not provide support for the argument that a simple qualitative assessment of such shares can lead to successful predictions of case outcomes. In the vast majority of cases considered by the OFT careful consideration will need to be given to determine the appropriate market definition and also the appropriate measure of shares of supply within that market. The shares of supply used within this model are therefore the outcome of a great deal of case specific assessment of the competitive conditions facing merging parties, and not simply a fixed measure. Furthermore, when market shares are used in isolation the predictive power of the models estimated is significantly reduced, and a number of alternative variables can be seen to exhibit a strong and statistically significant relationship with case outcomes.

Importantly, where valid competition specific concerns are raised by customers, and other third parties, the likelihood of Phase I clearance falls (although our analysis cannot shed light on the relative importance of these two factors). Furthermore, our results indicate that mergers occurring in markets with high barriers to entry and expansion, or where buyer power is not substantial, are more likely to be referred than one would expect.

Of interest is also the fact that cases are more likely to be referred in instances where more numerous theories of harm are raised, suggesting some relationship between the economic complexity of cases and the likelihood of Phase II assessment.

With respect to relative predictive power of various measures of competition, we find that a simple competitor count significantly reduces the performance of the model.

However, a relative assessment of the size of market participants is as likely to result in correctly predicted outcomes as can be achieved using the parties' market shares.

The findings of this chapter provide additional evidence to the results presented in the previous chapter and support the notion that competition policy plays an important role in the economic development of a country for two reasons. Firstly, because consistency and predictability in the way mergers are assessed allows firms to operate efficiently and without having to face excessive uncertainty. Secondly, a system free from political pressures, like the one described in this chapter, will operate to maximise welfare.

Finally, future research in this area should be aimed at contrasting the findings presented in this chapter with data from other countries since the UK's results provide a benchmark against which to test other NCAs' performance. In particular, it would be interesting to investigate this over time to see, for instance, whether transition countries are catching up in the way they assess mergers.

Chapter 5: On the Determinants of High Growth Entrepreneurship: Competition, Innovation and Venture Capital

This chapter combines focus on innovative entry with the cross-country heterogeneity in the financial environment to ask how these interact to shape growth aspirations of entrepreneurs. This is where we aim to fill a gap which has emerged in the literature. In particular, it has been highlighted that more research has to be conducted especially on early stage venture capital investment (Jeng and Wells, 1998) and that demonstrating empirically a casual link between innovation and venture capital and employment growth is a challenging task (Gompers and Lerner, 2001).

Following Davidsson's (2003) illustration, one can think of entrepreneurship as having two dimensions, one specific to the market in question and one specific to the firm. Within this framework, a particular activity can be either old or new, generating a two-by-two matrix. In this context, studies in this area often refer to firms which are new, whether they are also creating new markets or entering the existing ones. Indeed, some authors (see, for instance, Gartner, 1988) believe that the creation of new organisations is synonymous with entrepreneurship. Within this set of new enterprises, the line distinguishing innovative and imitative firms is blurred and will vary across countries and industries.

Some of the theories developed to explain firm-level dynamics are also likely to apply to individual-level mechanisms. For instance, existing businesses face very different obstacles from new entrants when trying to innovate: while the former will have to break down, at least to some extent, an existing structure, the latter will have to create a structure within which innovation can be delivered (Drucker, 1994). Innovative entrepreneurial entry presents additional difficulties for entrepreneurs. For Amason et al. (2006) one of the main differences between "imitative" and "innovative" start-ups is that the latter will have to be both new and different simultaneously. This clearly makes their businesses more risky as management cannot simply emulate competitors but will have to learn from its own mistakes.

Returning to the discussion on the nature of entrepreneurship in chapter 2 (2.1), Nooteboom (1993) suggests that the inception stage of an enterprise is Schumpeterian

in nature while its execution is more Austrian. This two-phased approach is also supported by Shane and Venkataraman (2000) who see entrepreneurship as made up of two processes: discovery and exploitation. Following this approach, the dataset used in this chapter refers to start-ups which are in between the two processes and could be described as being in a post-discovery but pre-exploitation phase of development.

Within this context, and against the discussions on entrepreneurship in chapters 1 and 2, we now focus on what the market features which attract entrepreneurship may be. In particular, we are interested in whether the lack of competition in a market spurs entry. For instance, Casson supports the notion that entrepreneurship involves the exploitation of a unique opportunity: "if two or more entrepreneurs compete to exploit the same opportunity, then normally neither of them will obtain any reward" (Casson, 2003, p. 44). This suggests that the presence of a "gap" in the market will attract new ventures and this is particularly likely to be the case for leapfrog innovation enterprises (see chapter 1, 1.1).

The remainder of the chapter is structured as follows: section 5.1 reviews the relevant literature on the intersection between competition, innovation and HGE, and constructs our hypotheses; section 5.2 discusses the role of venture capital; section 5.3 considers other relevant control variables; section 5.4 presents our dataset and variables; section 5.5 reports the results of our analysis and, section 5.6 concludes.

5.1. Innovation, competition and growth expectations

Recently, there has been considerable interest from policy makers regarding the role of small, innovative, young firms. Indeed, this is the main question addressed by this chapter: is there a link between being innovative and having high growth aspirations entry (HGE)? Furthermore, how is this relationship moderated by the nature of financial environment faced by new ventures? We hypothesize a positive relationship between HGE and innovation. We believe there are two main mechanisms through which this may take place.

Firstly, the proposed link between innovation and growth aspirations is a reflection of the general maxim that higher rewards imply riskier ventures. The launch of a new product invariably involves an additional element of risk, which is difficult to spread.

While imitating is simply a numbers' game (offering an existing good at a lower price), introducing something new comes with an increased risk element. This is why established firms only tend to dedicate a certain amount of resources to the development of new products. Innovation risks are offset by the profits which the firm can internalise from the introduction of those products/processes which prove to be profitable. For the investment in R&D to be a successful strategy, these profits have to be higher than the returns offered by existing products as they will also have to cover for failed attempts. In other words, a fundamental difference between the process of innovation in newly created and established enterprises is that in large firms R&D departments are able to experiment and to afford a certain failure rate while in innovative start-ups investors may be putting all their eggs in one basket.

In our dataset, respondents involved in start-up activities are asked about their expectations but, at this stage, we do not know how many will fail: expectations of entrepreneurs who believe they will experience high growth are based on their subjective assessment of risks associated with their ideas. This *ex ante* approach is very different from the *ex post* analysis usually conducted regarding firms' growth. Nevertheless, if high growth gazelles are critical for the wider benefits of entrepreneurship to materialise, the first step to achieve that is to create conditions where the number of high aspiration entrepreneurs is higher. This in turn justifies focus on high growth aspiration entrepreneurship.

Secondly, the link between growth and innovativeness results from the fact that innovators may be creating new markets and could enjoy periods of substantial market power given lack of competitors (especially if entry involves new patents being registered). This is in line with the definition of leapfrog innovation discussed in chapter 1. More mature markets, on the other hand, are characterised by the presence of established suppliers and may exhibit more modest growth rates. One explanation of this may be that start-ups concentrate on innovating in less crowded technological fields (Ameida and Kogut, 1997) while it is mostly larger firms which are able to conduct radical innovation since their size allows for more risk-taking (Dewar and Dutton, 1986).

The above is somewhat related to the ongoing debate on what the determinants of a firm's growth rate are. In particular, Gibrat's law states that a firm's size and its growth are independent, yet several studies have advocated the opposite, therefore a strong consensus has not still emerged (for a description of the debate see, for instance, Mata, 1994). If one assumes that there is a strong correlation between age and size, then this debate becomes relevant for our research since, given that all entrepreneurs interviewed are "nascent", one may (or may not) expect them to have similar (or different) growth expectations depending on one's position with respect to Gibrat's law. Therefore, large dispersion in growth expectations at a starting point may itself be taken as evidence against a strong link between the size of the venture and its growth. Where our research converges with the criticism of Gibrat's law is that it stresses the role of innovation as something which, in itself, shifts firms' size distribution (Ameida and Kogut, 1997). This is echoed by Cefis and Marsili (2004) who find, for a sample of Dutch firms that, even after accounting for age and size, firms seem to benefit from an innovation premium which increases their life expectancy. Drucker, however, dismisses the importance of size *per se* as a determinant of a firm's propensity to innovate:

> *"It is not size that is an impediment to entrepreneurship and innovation; it is the existing operation itself, and especially the existing successful operation" (Drucker, 2001, p. 137).*

A firm's propensity to innovate will also be related to the incentives it faces and to whether, through innovation, it is able to internalize a new revenue stream. This is typically either detracted from other suppliers or it is the result of a new market being created. Binks and Vale (1990), focusing on the latter scenario, describe entrepreneurial activity as the search to generate 'temporary monopoly profit'. If an inventor is able to protect its discovery without having any constraints in the price it can charge for the license fee (or for the new good/service introduced) the benefits resulting from her innovation would be very similar to the ones enjoyed by a monopolist (Richard, 2007). This is very much in line with the definition we gave in chapter 1 of leapfrog innovation entrepreneurship. To measure whether a market is characterised by leapfrog innovation, we use a categorical variable in GEM which

identifies whether the entrepreneur feels she will face any competitors.[57] We call this dummy *monopoly*, to reflect the creation of a new market and it equals one if entry will result in a new market being created (i.e. no competitors present). We expect the variable to be positive and significant since the creation of a new market is related to leapfrog innovation which is likely to have high employment growth expectations.

Finally, the relationship between innovation and growth is ultimately reflected in cross-country studies where an economy's rate of growth can be explained by innovation; the latter becomes more important for countries which are closer to the technological frontier (Acemoglu et al., 2006), and those are the countries we focus on in our study (high middle income and high income economies). Accordingly, the link between innovation observed at a venture level and growth aspirations represents one of the microeconomic foundations for the link between innovation and economic growth.

5.2. Supply of venture capital and growth expectations

A crucial aspect of innovative entry concerns the way the new ventures are financed. When an external agent finances a nascent enterprise, a fundamental issue of information asymmetry emerges. Still, this is even more pronounced in cases of innovative entry. As put by Junkunc (2007): "In the context of breakthrough innovation the asymmetric information problem becomes more akin to asymmetric knowledge, since even with full information typical individuals will be unable to evaluate the ramifications of the disruptive breakthrough." So our second research question is: how is availability of different financing opportunities affecting the entrepreneur's growth strategy? A basic distinction can be drawn between self-finance and externally funded enterprises. The second group is usually broken down further into: family, friends, venture capitalists (VCs) and business angels. Even this distinction may be too restrictive as it is debatable whether Kirzner's entrepreneurial alertness can be marketed since "to hire 'an entrepreneur' is to be an entrepreneur" (Harper, 2003): to some extent, venture capitalists become themselves part of the entrepreneurial effort.

[57] The actual question asked being: "Right now, are there many, few, or no other businesses offering the same products or services to your potential customers?"

Zider (1998) argues that VCs essentially fulfil a funding gap which is created out of a particular situation. The typical entrepreneur that may be attractive to a VC is someone who has a good idea and skills but is lacking hard assets to offer as collateral and is difficult to assess in terms of performance (Gompers and Lerner, 2001). The level of risk associated with this type of potential debtor is so high that normal approaches to risk calculations would mean charging interest rates above the limits set by usury laws. VCs, equipped with specialised expertise, are happy to step in and fill this gap by typically expecting ten folds returns over just five years (or a 58% annual interest rate with no early repayment options) for successful projects (Cumming, 2006).

Being innovative and new simultaneously is likely to have financial implications for the enterprise. We hypothesise innovative endeavours to be generally more expensive for two reasons: firstly, they are likely to involve additional sunk costs (for instance, because of the additional research required) and secondly, as mentioned, the uncertainty associated with the project will attract a higher risk premium making innovative investments more expensive than imitative ones. These higher costs are likely to encourage external funding. Hellman and Puri (2000) show that innovative start-ups are more likely to receive capital from VCs. We confirm this by differentiating between imitators and innovators and showing that the latter are more likely to receive VC financing.

The mechanism through which VC involvement can benefit emerging companies goes beyond the purely financial contribution made. As widely recognised, VCs also provide insight and experience of the specific industry in question to the CEO of the new firm which, it has been shown, can in itself add value and promote growth. In particular, VC involvement affects firms' performance through the various stages of development of the project. Firstly, because of the pre-investment screening process and, subsequently, through monitoring and value adding (Berger and Udell, 1998; Gompers and Lerner, 1999). For instance, Manigart et al. (1996) show that while the level of experience of VCs does not seem to have a clear relationship with value added, they demonstrate that VCs' experience of the start up's industry is positively associated with value added.

Moreover, the employment growth and firms' financing issues are closely interrelated. Belke et al. (2003) use OECD country data for the 1986-1999 period and find that even controlling for institutional variables and labour and capital market characteristics, the presence of venture capital has a positive impact on employment growth. On the other hand, Manigart and Hyfte (1999) find for Belgium that although VC's involvement results in higher cash flows and total assets it does not seem to be associated with increases in employment growth compared to firms operating in the same sector and of similar size. Similarly, using questionnaire data from 500 British and German firms, Buergel et al. (2000) find that VC financing does not result in higher levels of turnover or employment growth. These inconsistencies in empirical results may, at least in part, be a result of the adoption of inappropriate estimation techniques. Firm-level studies on VC and firms' performance often compare VC backed enterprises against non-VC ones. However, as highlighted by Engel (2002) this often results in biased results as a few important firms characteristics may determine which firms VCs select. He therefore adapts a selection approach to a bivariate probit setting and finds that German firms with external non-VC investors achieve 50 per cent higher employment growth and that VC involvement results in a striking 170 per cent increase in the same growth rate.

While our approach is akin to this literature, we introduce a novel angle. We focus on the link between aggregate VC supply at a macro-level and growth aspirations of an individual entrepreneur with adequate controls. As a result we are not faced with selection-bias-type issues and consider VC as a homogeneous mass. The key intuition behind our approach is that while in a start-up phase it is unlikely that an innovative entrepreneur may already secure VC-type funding, availability of such funding in the economy will encourage the entrepreneurs to form high growth aspirations, as they may expect to realise higher profit by not being constrained financially during the subsequent stages of their projects, when it will be appropriate to seek VC finance.

5.3. Other control variables

5.3.1. The economic landscape and institutions

New institutional economics (Williamson, 1985; 2000) suggests that institutions shape the behaviour of agents. In a similar fashion, North (1990, p. 77), similarly, places great importance on these macro-level characteristics:

> *"Discovering markets, evaluating markets and techniques, and managing employees do not occur in a vacuum […] The kinds of information and knowledge required by the entrepreneur are in good part a consequence of a particular institutional context."*

The focus of this study is on innovative entrepreneurship as opposed to innovation in general (e.g. intra-preneurship). However, the actions of individuals are to be inscribed within their environment. This is why innovation and entrepreneurship have been described as forming part of a country's culture. For instance, some researchers advocate that entrepreneurship and innovation may be determined, at least to some extent, by the level of individualism in a society (Morris et al., 1993). This dovetails with the various definitions of entrepreneurship described above. For instance, Kirzner's concept of entrepreneurial alertness describes a process taking place mainly at the individual level, since it is she who recognises and exploits specific opportunities. Shane (1993) found that individual-oriented societies innovate more than group-oriented ones concluding that "autonomy, independence and freedom" determine a country's level of innovation. One step down from the realm of culture, a country's formal institutional landscape can also be more or less conducive to innovation (e.g. tax regimes, public support for private research initiatives). Hessels et al. (2007), for instance, show that the level of social security has a negative effect on the supply of HGE (which they refer to as ambitious entrepreneurship).

A novel element in our research is that, in contrast with previous studies, we stress the significance of the link between the high growth aspirations and innovativeness of the new ventures. Consistent with this we intend to focus on the aspect of the institutional environment that may be most conducive to a successful expansion of an innovative entry, namely protection of the intellectual property rights. Accordingly, we expect that protection of intellectual property rights is important for HGE.

Country-level characteristics described above are, at least to some extent, a function of the economic level of development reached by the country in question. While having more developed and better functioning institutions may be conducive to the

efficient allocation of resources between agents, it is also possible that relatively poor countries may provide more opportunities for HGE thanks to catching-up potential as reflected on micro level. We therefore also expect that countries with higher level of GDP per capita provide less scope for HGE.

5.3.2. Individual fear of failure and high growth aspirations entry

There are three possible dimensions on which to carry out empirical analysis on entrepreneurship. In the previous section we have considered how country-level variables may impact HGE. The second level of disaggregation is to look at the firm. Some firms are particularly receptive to encouraging the development and implementation of new ideas and innovation can be seen as an integral part of any firm's entrepreneurial culture.[58] This dimension is excluded from the analysis in this chapter as we are only considering the phase when firms are actually being established. Finally, the third dimension, which is also the focus of this chapter, is at the level of the individual.[59] Interestingly, most economics models on entrepreneurship leave the source of individual differences largely unexplained (Harper, 2003). In the previous sections we already discussed how the 'individual' aspect of the innovative process may affect high growth aspirations. In this section we motivate additional individual level hypotheses.

The individual-level analysis pertains to the occupational decision members of society make and various papers have modelled this decision making process at a theoretical level as an optimisation problem (Aghion, 2007, ch. 7). Once a fundamental distinction has been drawn between individuals who choose to participate in the country's economic activity and those who do not (whether by choice or otherwise), individuals in the former group will be faced with having to decide whether they are, overall, better off as employed or self-employed. Our focus is within the latter group, and for the purpose of this study, we are interested in the occupational question faced

[58] For instance, it is not by chance that the same firm, Seiko, introduced the world's first quartz watch; the first TV watch; the first automatic power generating (A.G.S) quartz watch and the world's first watch driven by body heat. Equally, some individuals are more prone to invent than others. A single person, Kornelis A. S. Immink, a Dutch scientist and entrepreneur, personally advanced the era of digital recording having been involved in the development of: the Compact Disc, the Digital Versatile Disk and the Blu-Ray Disc.

[59] Another alternative advocated by Davidsson (2003) is that ideally the unit of observation should be the start-up process itself and the idea behind it, which may transcend from the concept of the firm or the entrepreneur.

by each member of a country's workforce that can be broken down into two elements: firstly, whether the individual will decide to become self-employed and, secondly, whether, and to what extent, his entry will be based on high growth expectation. In particular, we assume these two elements are decided simultaneously.[60]

Regardless of the actual order of the sub-decisions involved in selecting occupation, the assessment of a decision-maker will fundamentally depend on perceptions. Theoretical models on occupational decisions will tend to assume the individual as a rational utility maximising agent. However, this understanding of the risks and rewards associated with becoming an entrepreneur are, in reality, highly subjective. Arenius and Minniti (2005) find that perceptual variables are all significant in explaining the likelihood of entrepreneurial entry occurring; even when economic factors have been included in the estimation. These results are echoed by Ardagna and Lusardi (2008).

Individuals differ in their understanding of how actions influence events (locus of control) and in their more personal beliefs how they may, or may not, be able to carry out the necessary actions (Harper, 2003). In particular, these two traits result in alternative attitudes towards risk taking. Given the relationship between risk and entrepreneurial endeavours, which we discussed in section 5.1, we expect that more risk averse individuals will be more likely to choose being employed (Kihlstrom and Laffont, 1979). Therefore, we expect our risk proxy, fear of failure (see variables description table 18 below for definition), to possess some predictive power. We expect entrepreneurs who enter with high growth aspirations to be more confident and generally less fearful. While another interpretation could be that high aspirations entrepreneurship attracts individuals who overestimate the likely pay-offs from their ideas (Hall and Woodward, 2008), it may also the case that this type of overconfidence has self-fulfilling properties (Aidis et al, 2008).

5.3.3. Additional control variable at the individual level

We expect education and experience to be additional factors explaining HGE. Growth potential may be a result of someone having identified a gap within a particular

[60] We recognise that there may be adverse selection issues as some evidence suggests that people who do not work are less likely to become entrepreneurs than individuals who are in employment (Ardagna and Lusardi, 2008), therefore we control for the employment status.

market and this is likely to involve being aware, or knowing personally, other entrepreneurs in that industry. This in turn is correlated with prior entrepreneurial experience. In particular, owners of established businesses may have an advantage with respect to high growth aspirations entrepreneurial entry.

In addition, differences in entrepreneurship rates have been found to vary according to age (Levesque and Minniti [in press]; Reynolds et al., 2003; Blanchflower, 2004; Ardagna and Lusardi, 2008; Gray, 2002) and to a lesser extent gender (Brush, 1990; Langowitz and Minniti, 2005). We expect these factors to also play a role in determining high growth aspirations entrepreneurial activity. In addition, in our specifications we introduce an interactive effect between gender and age to see whether there are further compounded effects of gender and age if, for instance, HGE is more pronounced for young males.

We also control for employment status because, as argued above, a decision to enter may be conditional on this factor. For high aspirations entry, being in employment may be associated with important network and experience effects, in addition to the factors discussed above, and therefore the expected sign should be positive.

More generally, a way to describe the motivation behind entrepreneurial activity is to consider the entrepreneur as being either *pushed* or *pulled* into self-employment. The former occurs when the environment he lives in is neither conducive to being employed (for instance, because of labour market disincentives) nor offers generous welfare provision for those not working, whereas the second possibility refers to the individual exploiting his (innovative) *alertness.* Within this approach, pull factors are internal to the individual (age, education, risk averseness) whereas push factors are dictated by the environment (institutional quality, as discussed above).

5.3.4. Control variables at the aggregate level

At the aggregate level, our primary focus is on the effects of venture capital availability on individual decisions to enter. However, we need to introduce additional financial controls as supply of venture capital may be correlated with the overall availability of finance. Obviously, availability of funding in addition to VC may determine entrepreneurs' growth aspirations. Obtaining credit from a bank plays a critical role. Aghion (2007) introduces financial constraints in a model of entry and

predicts that in societies with high agency costs and therefore underdeveloped financial sectors, growth rate will be lower. In addition, in relation to start-ups, informal finance forthcoming from family and friends may play a critical role substituting or complementing institutionalised sources of finance (Korosteleva and Mickiewicz, 2008). We proxy for the latter by using country-level prevalence rates of informal finance extracted as peer effects from our data. In addition, one standard variable used for proxy of formal finance is credit to private sector over GDP. However, due to multicollinearity, the variable does not fit well with our remaining indicators. For that reason we rely on the related Wall Street Journal Heritage Foundation index of financial freedom, which proxies for the extent of financial options. Also, it is more directly related to entrepreneurial finance as typically more liberal banking regimes have stronger positive effect on supply of finance to more risky recipients, and start-ups, especially high aspirations ones fall in this category.

These mechanisms have also to be considered within the wider economic context. Koellinger and Thurik (2009) find, using a panel generated with GEM data, that there is no evidence indicating that entrepreneurship follows the business cycle. Moreover, their study suggests that the opposite may be true: "entrepreneurial activity is a leading indicator of the business cycle in a Granger-casualty sense". We join the current discussion on whether entrepreneurship may be pro-cyclical, a-cyclical, or a leading indicator of a cycle, by including the growth rate of the economy in our models. However, to be consistent with Koellinger and Thurik (2009), and to take into account that entrepreneurship and overall economic activity may affect one another with lags, we use the growth rate of the previous year as one of our independent variables. We expect HGE to be weakly pro-cyclical.

5.4. The dataset and variables

This chapter uses a purposely constructed dataset which combines country level variables with individual level variables from the available version of the integrated Global Entrepreneurship Monitor database (GEM) over 1998-2004. GEM was designed to unpack the reasons why people decide to become entrepreneurs as opposed to choosing salaried work. The defining feature of the dataset, and the reason why it is ideal to answer our research question, is that it captures individuals who

have just decided to become (or have very recently become) entrepreneurs. This is unique and it is very different from the typical variables offered by large institutions like the World Bank which, for instance, records the number of new businesses registered (see use of World Development Indicator in chapter 1). Moreover, because several questions are based on the subject's perception of the market this allows for comparability across markets. For instance, in this chapter, we are particularly concerned with innovation but an entry may be innovative in one setting but not in another country. Using this data we are able to isolate whether the new enterprise will be innovative *within* the relevant market. Similarly, we also utilise data from a question related to the amount of competition faced and, again, we are able to extrapolate the level (or at times total absence) of competition faced by the nascent entrepreneur which allows us to understand whether HGE is motivated by the attempt to create a temporary monopoly. This type of data would be unobtainable using other sources. Finally, our dependent variable is based on respondents' predictions of future employment growth. Although this could be seen as a limitation, in that it may not translate into reality, it has been shown that there is a strong link between expectations and actual performance (Wiklund and Shepherd, 2003; Aidis et al., 2008).

A thorough description of GEM can be found in Reynolds et al. (2005, 2008). GEM is based on adult surveys conducted between 1998 and 2004 and it covers 41 countries. In all, at least 2,000 interviews were carried out in each country which goes a long way in tackling the selectivity bias typical of other datasets. The database's defining feature is that it allows researchers to study nascent entrepreneurs (individuals who are in the process of launching a venture) across countries.

We are further able to differentiate between entrepreneurs offering a product which is new to some customers and one which is new to all customers since entrepreneurs are also asked how new the technology they are planning to use is. This is aimed at capturing varying degrees of technological development across the sample of countries. Interestingly, although the answers given are very similar across country groups, the individual statements might have been based on very different technologies. For instance, something which is considered as "very latest technology" in country A may be considered as obsolete in country B. This effect is acknowledged

in Bosma et al. (2007) who conclude that differences between the levels of innovative early-stage entrepreneurial activity may be a reflection of varying degrees of competition and availability of new products across countries.

Similarly, there are also likely to be vast differences in the innovation rates across industrial sectors. In some cases, like the production of raw materials, it is virtually impossible to introduce new products (although process-innovation is still possible). At the opposite end of the spectrum, the pharmaceutical industry hinges on continuously investing in the development of new drugs (which can take many years) and producers are able to re-coup their investments from patenting successful drugs. Still another model is found in high-tech industry where firms leapfrog by introducing a new technology which is used for a number of years until it is surpassed by a technology introduced by a rival. In this sense, an entrepreneur wanting to start a new enterprise will have to come to terms with the characteristics of the industry he is choosing to operate in. Inevitably, some sectors will be more prone to innovation than others and the new entrepreneur may be constrained by his previous expertise and by financial resources (as some sectors are more capital intensive than others). However, we have refrained from attempting to construct industry-specific controls and agree with Davidsson (2007) describing the task of measuring 'innovative intensity' in a way that is comparable across countries and industries as being almost insurmountable.

Another limitation in using GEM to draw conclusions regarding innovative entry is that, in its current incarnation, GEM only captures product innovation but not process innovation. As early as Schumpeter (1924) a distinction was made between process and product innovation (although the two can take place simultaneously) and other surveys in this field, notably the Community Innovation Survey, typically differentiate between the two types of innovation. On the other hand, however, it is likely that the omission of an explicit process-related question would be more of an issue for established firms.

As mentioned, our dataset also includes a series of country level variables imported from various sources. These include GDP per capita, GDP growth, a proxy to capture

the strength of intellectual property rights, and an indicator on financial freedom, which proxies for the supply of formal finance.

Finally, we also constructed a cross-country dataset of venture capital (VC). Data on VC is still not readily available from government statistical offices and a variety of sources were consulted. Generally, each country will have a national venture capital association which holds annual data on VC. These values were then converted into US dollars for comparability. In studying cross-country VC patterns, one clearly notices a difference in the quality (and quantity) of data across different economies. In hunting for VC data, scholars attempting a similar exercise will encounter three possible scenarios: for USA and most EU countries good data is generally available and it is possible to differentiate between different typologies of VC (like early-stage and technologically-intensive), other high income countries like Australia and New Zealand, have some aggregate data being available and finally, the vast majority of countries, and virtually all developing ones, for which no data is available. In all, we have VC data for 21 countries.[61]

Table 18 and Table 19 list variables used including a brief description, their sources and descriptive statistics.

[61] USA, Greece, Netherlands, Belgium, France, Spain, Hungary, Italy, Switzerland, UK, Denmark, Sweden, Norway, Poland, Germany, New Zealand, Japan, Canada, Portugal, Finland, and Israel.

Table 18. Descriptive statistics and definitions of independent variables from GEM

Variables	Definition	Obs	Mean	Std. Dev.	Min	Max
Gazelle	1 if HGE=>9 (minimum of 30 employees)	32664	0.056637	0.231152	0	1
HGE		32664	2.846314	3.021829	0	9
Innovation	1=entry, 2=low innovative entry, 3=high innovative entry	25188	1.427108	0.684907	1	3
gemage	The exact age of the respondent at time of interview	579773	42.98141	16.55584	1	104
male_x_age	interaction of *gemage* and *male*	463221	63.19092	2077.118	0	99998
age_sq	*gemage* squared	462583	2137.52	1587.518	1	10816
educ_secpost	1=respondent has a post secondary or higher education attainment, 0 otherwise	562431	0.65317	0.475962	0	1
educ_postgra	1=respondent has a post secondary or higher education attainment, 0 otherwise	447741	0.316433	0.465085	0	1
educ_grad	1= has graduate experience, 0 otherwise	562431	0.106122	0.307993	0	1
male	1=male, zero otherwise	489994	0.473592	0.499303	0	1

[cont. overleaf]

gemwork_dum	1=respondent is either in full or part time employment, 0 if not	588567	0.511476	0.499869	0	1
OMESTBBT	1=current owner/manager of business, 0 otherwise	607184	0.052747	0.223528	0	1
fear	1=respondent has shut down business in past 12 month, 0 otherwise	472230	0.325901	0.468711	0	1
busang_prev	1=business angel in past three years, 0 otherwise	489994	0.026957	0.020221	0.00313	0.151122
monopoly	1=no competitors	23622	0.119084	0.323894	0	1
ipp_innov	interaction of *ipp* and *innovation*	44250	0.303553	1.208556	0	6.3
vc_innov	interaction of *VC* and *innovation*	27116	7.42E-08	7.24E-07	-1.20E-06	3.45E-05

Table 19. Descriptive statistics and definitions of independent variables from additional sources

Variable	Definition	Source	Obs	Mean	Std. Dev.	Min	Max
financial_freedom	financial freedom indicator	Heritage Foundation	589579	69.7047	17.812	30	90
VC	venture capital (in constant US $) divided by GDP *1000	European VC Association and national venture capital associations	348602	0.000003	0.000006	0.000001	0.000055
ipp	Intellectual property protection	World Bank - Doing Business	489994	5.267984	1.031292	2.3	6.6
delta_gdp_~1	GDP growth rate in previous year	World Bank - World Development Indicators	489994	2.642002	2.420951	-10.89	10.72
ln_gdp_pc_pp	natual logarith of gdp per capita at PPP	World Bank - World Development Indicators	489994	10.04412	0.650868	6.687894	10.74958

5.4.1. The model

The dataset described in the previous section, allows us to study individuals' decisions to become entrepreneurs and to enter with high employment growth aspirations. We present the occupational dilemma faced by individuals as two alternative models. The first can be expressed as the following decisional choice model:

Pr(*Gazelle*) = 1 if involved in a start-up with expected employment creation ≥ 30

= 0 otherwise

We estimate this empirically with the following probit model (Model 1):

$$\Pr(Gazelle = 1 \mid x) = \Phi(xb) \qquad (1)$$

Where, again, *Gazelle*=1 if entrepreneurial entry occurs with the expectation of having at least 30 employees within five years, and x is a vector of the regressors described in Table 18 and Table 19. Different specifications are reported to investigate the effect of the age and gender variable: Model 1 includes a squared term for the age variable (*age_sq*); Model 2 replaces it with an interactive term of age and gender (*male_x_age*) and Model 3 includes both.

Corresponding to the hypotheses discussed above, we also try specifications (Model 1(a); Model 2(a), and Model 3(a)) where our innovation variable (*Innovation*) is interacted with our intellectual property protection proxy (*IPP*) and with venture capital supply (*VC*). *Innovation* can take the following values: *Innovation=1* if there is entry, *Innovation*=2 if the entry contains some innovation, *Innovation*=3 if the new enterprise is entirely innovative.

To check the sensitivity of our results on the construction of dependent variable and in order to analyse how our variables affect HGE further, we construct an alternative dependent variable, *HGE*, which expands entrepreneurs' expectations into 10 values ranging from 0 (if the respondent does not envisage to employ any additional members of staff within the next five years) to 9 (if she thinks 30 or more people will be employed). Table 20 shows summary values for the various bins for *HGE*.

Table 20. Construction of HGE based on employment creation expectations in 5 years

HGE	Mean job creation
0	0
1	1
2	2
3	3
4	4
5	5
6	6.84
7	11.36
8	20.97
9	1729.12
Total	101.2066

We denote the 10 values of *HGE* as *J*, $\mathrm{HGE}_i = m$ if $\Gamma_{m-1} \leq \mathrm{HGE}_i^* < \Gamma_m$ for $m = 1$ to *J*, where Γ indicates the cut-off points. This can be estimated as the following ordered probit model:

$$\Pr(HGE = m \mid x) = F(\Gamma_m - x\beta) - F(\Gamma_{m-1} - x\beta) \quad (2)$$

We then apply the same specification described above for the probit model in Model 4 to Model 6 (without interactions) and Model 4a to Model 6a (interacting the innovation variable with *ipp* and *VC*). Throughout, when estimating the above models, we generate clustered (robust) standard errors around country-year clusters to account for possible survey biases. A more thorough description of what the implications of these decisions are econometrically, and considerations on whether a weighted analysis should have been conducted are both tackled in Chapter 6 which stress-tests and expands the methodology adopted in this chapter.

Discussion of the results follows.

5.5. Results

Results from Model 1, Model 2 and Model 3 reported in Table 21 below, suggest that pursuing innovative projects (*Innovation_2* and *Innovation_3*) has an effect on whether the enterprise is a gazelle at 1%. Our hypothesis regarding the absence of

competition is also confirmed at 1% across all models: entrants creating new markets have higher growth expectations.

The role of VC seems more ambiguous, since although the sign is as expected, it does not have a statistically significant effect. However, when the innovation variable is interacted with *ipp* and *VC* in Models 1(a) to Model 3(a), the interaction of VC and innovation – *ipp_innov* – is found to be responsible for the Gazelle effect (significant at 5%). So, in the interacted form, availability of venture capital has strong effect on innovative entrepreneurs resulting in adoption of higher growth aspirations.

As far as other country level variables are concerned, we confirm that protection of intellectual property rights matters at 1%. However, neither coefficients for financial freedom (*financial_freedom*) or the rate of economic growth (*delta_gdp_lag1*) are significant. For the former, this is likely to be related to the way the Heritage Foundation constructs the financial freedom indicator which is aimed at measuring the extent of government intervention in the banking sector. This measure is constructed by averaging data from a variety of sources[62] which do not necessarily produce a coherent, unidirectional variable.

Individual-level variables generally have the expected signs when statistically significant. As anticipated both experience and human capital play a role in explaining HGE in terms of education (*educ_secpost*) but this does not seem to hold for entrepreneurs who have already established a business in the past (*busang_prev*). We find that whether the entrepreneur has completed secondary education and whether he/she currently owns or manages a business to be strong predictors of HGE entry (both significant and positive at 1%). The models produced some interesting results regarding the age and gender effect. While we find that males are more likely to be involved in HGE than women, it seems that interacting the gender variable with

[62] The Financial Freedom Index relies on the following sources for data on banking and finance, in order of priority: Economist Intelligence Unit, *Country Commerce*, *Country Finance*, *Country Profile*, and *Country Report*, 2007-2009; International Monetary Fund, *Staff Country Report*, "Selected Issues and Statistical Appendix," and *Staff Country Report*, "Article IV Consultation," 2007-2009; Organisation for Economic Co-operation and Development, *Economic Survey*; official government publications of each country; U.S. Department of Commerce, *Country Commercial Guide*, 2007-2009; Office of the U.S. Trade Representative, *2009 National Trade Estimate Report on Foreign Trade Barriers*; U.S. Department of State, *Investment Climate Statements 2009*; World Bank, *World Development Indicators 2009*; and various news and magazine articles on banking and finance.

age is more relevant than including a squared term for age (this becomes apparent in Model 4 to Model 6).

Results from the ordered probit analysis, in Model 4 to Model 6 (which are found in Table 22), are largely in line with the results described for Model 1, confirming that the our explanatory variables are strong predictors of whether a start-up has high growth expectations. However, there are also some differences. In particular, once we use more heterogeneity in growth aspirations, VC supply matters by itself (in additive form); and 'practical experience' (*busang_prev* and *OMESTBBT*) is more important than educational attainment.

Table 21. Probit models marginal effects (dependent variable Gazelle)

	Model 1	Model 2	Model 3	Model 1(a)	Model 2(a)	Model 3(a)
_Idep2a_2	0.0167***	0.0169***	0.0167***	0.0168***	0.0171***	0.0169***
	(0.00629)	(0.00626)	(0.00626)	(0.00630)	(0.00627)	(0.00627)
_Idep2a_3	0.0497***	0.0501***	0.0498***	0.103	0.103	0.103
	(0.0101)	(0.0101)	(0.0101)	(0.137)	(0.137)	(0.137)
gemage	-0.00139**	-0.000369	-0.00151*	-0.00140**	-0.000363	-0.00152*
	(0.000701)	(0.000474)	(0.000888)	(0.000698)	(0.000474)	(0.000887)
age_sq	1.46e-05		1.44e-05	1.47e-05*		1.46e-05*
	(8.85e-06)		(8.81e-06)	(8.80e-06)		(8.77e-06)
educ_secpost	0.0218***	0.0217***	0.0218***	0.0218***	0.0218***	0.0218***
	(0.00799)	(0.00798)	(0.00796)	(0.00799)	(0.00798)	(0.00795)
educ_postgra	0.00830	0.00808	0.00822	0.00811	0.00789	0.00803
	(0.00914)	(0.00919)	(0.00915)	(0.00916)	(0.00921)	(0.00917)
educ_grad	0.00840	0.00847	0.00831	0.00861	0.00868	0.00853
	(0.00949)	(0.00962)	(0.00948)	(0.00949)	(0.00962)	(0.00948)
male	0.0401***	0.0334	0.0341*	0.0402***	0.0337	0.0345*
	(0.00629)	(0.0207)	(0.0205)	(0.00629)	(0.0206)	(0.0204)
gemwork_dum	0.0137*	0.0124	0.0137*	0.0137*	0.0124	0.0137*
	(0.00810)	(0.00824)	(0.00811)	(0.00810)	(0.00823)	(0.00811)
OMESTBBT	0.0176	0.0173	0.0175	0.0177	0.0174	0.0176
	(0.0125)	(0.0127)	(0.0126)	(0.0125)	(0.0126)	(0.0126)
fear	-0.00978	-0.00975	-0.00980	-0.00969	-0.00967	-0.00971
	(0.00904)	(0.00904)	(0.00902)	(0.00907)	(0.00907)	(0.00904)
financial_freedom	-0.000151	-0.000165	-0.000150	-0.000136	-0.000150	-0.000135
	(0.000291)	(0.000293)	(0.000293)	(0.000290)	(0.000292)	(0.000292)

[cont. overleaf]

busang_prev	0.519	0.522	0.522	0.519	0.522	0.523
	(0.462)	(0.465)	(0.461)	(0.459)	(0.462)	(0.457)
VC_GDP_US_1000	4633**	4643**	4639**	4077**	4101**	4085**
	(2132)	(2122)	(2134)	(1971)	(1967)	(1974)
ipp	0.0588***	0.0585***	0.0588***	0.0600***	0.0597***	0.0601***
	(0.0177)	(0.0177)	(0.0177)	(0.0169)	(0.0170)	(0.0169)
delta_gdp_lag1	-0.00743	-0.00738	-0.00741	-0.00749	-0.00744	-0.00747
	(0.00501)	(0.00503)	(0.00501)	(0.00502)	(0.00504)	(0.00501)
ln_gdp_pc_pp	-0.127***	-0.125***	-0.127***	-0.127***	-0.125***	-0.127***
	(0.0339)	(0.0340)	(0.0339)	(0.0336)	(0.0337)	(0.0336)
monopoly	0.0452***	0.0454***	0.0452***	0.0450***	0.0451***	0.0450***
	(0.0114)	(0.0114)	(0.0114)	(0.0114)	(0.0114)	(0.0114)
male_x_age		0.000207	0.000175		0.000200	0.000168
		(0.000604)	(0.000601)		(0.000605)	(0.000601)
ipp_innov				-0.00719	-0.00708	-0.00719
				(0.0148)	(0.0148)	(0.0148)
vc_innov				2422*	2365*	2411*
				(1356)	(1369)	(1355)
Observations	6938	6938	6938	6938	6938	6938
R-squared	.	.	.	.	.	.

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Table 22. Ordered probit models (dependent variable: HGE)

	Model 4	Model 5	Model 6	Model 4(a)	Model 5(a)	Model 6(a)
_Idep2a_2	0.0577	0.0599	0.0590	0.0582	0.0603	0.0595
	(0.0441)	(0.0439)	(0.0440)	(0.0439)	(0.0437)	(0.0438)
_Idep2a_3	0.178***	0.178***	0.178***	-0.331	-0.329	-0.325
	(0.0374)	(0.0372)	(0.0372)	(0.221)	(0.221)	(0.221)
gemage	-0.00872	-0.00632***	-0.0116*	-0.00869	-0.00632***	-0.0116*
	(0.00548)	(0.00170)	(0.00610)	(0.00550)	(0.00171)	(0.00611)
age_sq	6.89e-05		6.69e-05	6.80e-05		6.60e-05
	(5.77e-05)		(5.98e-05)	(5.78e-05)		(6.00e-05)
educ_secpost	0.0575	0.0564	0.0568	0.0566	0.0556	0.0559
	(0.0440)	(0.0439)	(0.0440)	(0.0439)	(0.0439)	(0.0440)
educ_postgra	0.00961	0.00706	0.00758	0.00988	0.00736	0.00786
	(0.0404)	(0.0401)	(0.0399)	(0.0403)	(0.0399)	(0.0398)
educ_grad	0.0196	0.0180	0.0174	0.0200	0.0184	0.0178
	(0.0457)	(0.0456)	(0.0457)	(0.0456)	(0.0455)	(0.0457)
male	0.333***	0.162**	0.163**	0.333***	0.163**	0.164**
	(0.0268)	(0.0735)	(0.0758)	(0.0268)	(0.0735)	(0.0758)
gemwork_dum	0.177***	0.172***	0.178***	0.176***	0.171***	0.177***
	(0.0250)	(0.0244)	(0.0250)	(0.0254)	(0.0248)	(0.0255)
OMESTBBT	0.137***	0.135***	0.135***	0.139***	0.137***	0.137***
	(0.0515)	(0.0517)	(0.0515)	(0.0510)	(0.0513)	(0.0510)
fear	-0.0546	-0.0538	-0.0539	-0.0537	-0.0529	-0.0530
	(0.0361)	(0.0361)	(0.0359)	(0.0359)	(0.0359)	(0.0357)
financial_freedom	-0.00315	-0.00316	-0.00311	-0.00320	-0.00321	-0.00315
	(0.00253)	(0.00253)	(0.00253)	(0.00253)	(0.00253)	(0.00252)

[cont. overleaf]

busang_prev	3.048	3.134	3.125	3.031	3.117	3.108
	(1.983)	(2.006)	(1.989)	(1.980)	(2.003)	(1.986)
VC_GDP_US_1000	17633*	17999*	17770*	15749**	16161**	15908**
	(9749)	(9710)	(9777)	(6975)	(6995)	(7022)
ipp	0.154**	0.154**	0.155**	0.140**	0.140**	0.141**
	(0.0606)	(0.0605)	(0.0604)	(0.0622)	(0.0619)	(0.0619)
delta_gdp_lag1	-0.0496**	-0.0493**	-0.0494**	-0.0495**	-0.0491**	-0.0493**
	(0.0242)	(0.0243)	(0.0243)	(0.0246)	(0.0246)	(0.0246)
ln_gdp_pc_pp	-0.598***	-0.589***	-0.598***	-0.592***	-0.583***	-0.592***
	(0.153)	(0.153)	(0.153)	(0.153)	(0.153)	(0.153)
monopoly	0.135***	0.136***	0.134***	0.134***	0.134***	0.133***
	(0.0399)	(0.0399)	(0.0396)	(0.0399)	(0.0400)	(0.0397)
male_x_age		0.00450**	0.00442**		0.00445**	0.00438**
		(0.00199)	(0.00205)		(0.00198)	(0.00205)
ipp_innov				0.0875**	0.0874**	0.0865**
				(0.0379)	(0.0378)	(0.0378)
vc_innov				10393	10126	10275
				(19895)	(19736)	(19793)
Observations	6938	6938	6938	6938	6938	6938
R-squared	.	.	.	.	.	.

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.6. Conclusions

An invention, resulting from innovative entry may drastically alter a market structure. Markets, especially the ones characterised by rapidly changing technologies have a fluid nature: today's products may be very different from tomorrow's product and the firms which are ahead of the curve will gain or lose market shares according to how well they are able to innovate. Changes in products will often result in changes in market structures and market shares (Baxter, 1984). In this chapter we have pushed this line of reasoning further and have shown that markets are constantly being created through leapfrog innovation. This supports the approach put forward in chapter 1 that different types of entrepreneurship exist and that their differences lay in the innovative process of the market in question.

This chapter integrates further two essential ideas put forward in the preceding chapters of the thesis. The first, as discussed in chapter 1 is that markets characterised by leapfrogging innovation have a different type of competition system in which new markets are constantly created by entrants (in contrast to the neck-and-neck type of competition). The second, as explored in chapter 3, is that creating conditions which are conducive to HGE will ultimately result in economic growth.

We also find that both innovation and supply of venture capital are important factors supporting high growth aspirations of new entrepreneurs. In contrast, both informal finance and institutional framework related to formal finance (other than venture capital) matter less: signs of the coefficient are positive as expected, but the effects remain insignificant. Moreover, while, overall, high growth enterprises benefit from the presence of venture capital, it is the innovative ventures that benefit most from this.

Our model only considers VC data supplied by the European Venture Capital Association which may underestimate the extent of VC in some situations. The analysis in this chapter could be improved by including data on governments' efforts to bridge the venture capital gap. This gap emerges as there may be high search costs associated with both sides of the VC market: business angels looking for suitable entrepreneurs to back and start-ups looking for capital. Governments are well-placed to address this market failure (see rationale for this in Mason and Harrison 1995) and,

especially in some European countries there are increasing amounts of efforts in this direction (see Sunley et al. 2005 for a comparison of policies in UK and Germany).

High growth aspirations are subjective perceptions of entrepreneurs, yet they are important. They motivate start-up owners-managers to engage in high value added activities. Supply of such high aspiration entrepreneurship is crucial for economic development. Even if many of those ventures may fail, it is sufficient that some will succeed to generate strong microeconomic foundation for growth and development. This is why supply of entrepreneurs with high aspirations matters. The key policy lesson from this chapter is that if we care most about highest value "gazelle" entrepreneurial projects, we should focus on the development of the form of finance that is most suitable to overcome serious informational asymmetries associated with those that is on venture capital. In addition, propensity to innovate seems the key issue behind the supply of the high-potential projects. Public policy that shape both the educational system and national culture to become supportive and rewarding to innovative and entrepreneurial effort counts.

All the findings presented in this chapter have been the result of an unweighted analysis. Although, GEM is a survey and sampling weights are available, we decided to carry out the regressions unweighted to allow for easy comparison with previous studies in the field. In fact, the vast majority of empirical studies with GEM data are unweighted. Although we have confirmed our hypothesis and developed further some of the main theories advocated in other chapters of the thesis, we feel that a further test is necessary to determine whether applying the appropriate weights changes our results in any way. This is the purpose of the next, and final, chapter.

Chapter 6: Sample Bias in Microeconometric Analysis of Entrepreneurship: the Role of Weights in GEM

Microeconometric analysis is typically carried out on sample datasets; population data is rarely available. A source of contention is therefore always whether the method of data collection should be taken into account, and how. Techniques such as two-step estimators to explicitly take account of the probability of selection are in common use, but these are usually concerned with isolating a subsample (for example, the probability of union membership in a sample of the labour force). More fundamentally, there is the question of whether the sample itself is representative for the purposes of estimation of a parameter of interest, which can be a sample mean or an average treatment effect.

The question of whether the sample is representative is not an easy one to answer because the population is not generally available. Therefore, econometricians and statisticians use proxy measures such as weighting or controlling for design variables (i.e. conditioning variables) to account for the sample selection. The choice of what, if any, proxy measure to use is a controversial issue. There is a large literature on weighting, originating mainly from the statistical literature. However, most applied microeconometric analyses ignore weighting. Instead, conditioning variables are often used, but largely because they capture features of the data generating process that cannot be ignored or confound the interpretation of other parameters of interest.

It is clear that in producing aggregate statistics the weighting of variables has a significant effect. However, it is not clear that this effect persists in marginal analyses, and because the conditioning variables used to control for design effects often have a direct economic interpretation, weighting is used relatively rarely in econometric studies.

This chapter aims to extend and apply the methodology and analysis originally conducted on Office for National Statistics data in Fazio et al. (2006) to data from the Global Entrepreneurship Monitor (GEM) used in the previous chapters. The remainder of this chapter is structured as follows: section 6.1 reviews the use and interpretation of weighted analyses; section 6.2 looks at the construction and use of

weights in GEM; section 6.3 tests the significance of weights by re-analysing the empirics reported in chapter 5; section 6.4 concludes.

6.1. Weighted data and samples

6.1.1. Survey design and linking data

Chesher and Nesheim (2004) identify the main statistical issues resulting from sampling and data linking under two broad headings: survey design and measurement error.

Although the most straightforward method of selecting a sample from a population is simple random sampling, most modern data available to researchers is the result of complex survey designs which could involve techniques such as stratification, multistage selection and unequal probability selection (Nathan and Holt, 1979). Of these, stratification on size, defined by employment, is by far the most important. It entails choosing independent subsamples of predetermined size from internally homogeneous but externally heterogeneous strata, therefore reducing sampling variation (Carrington and Eltinge, 2000). Generally speaking, stratification in national statistical institutes' business surveys is biased towards larger firms as they are considered more representative in terms of employment and generating revenue. Hence, these unequal probabilities of selection can bias the estimation of the parameter of interest. Before further analysis, and in order to reproduce a dataset which closely maps the original population, the weights from the survey design should be used to alter values accordingly. One method of eliminating this bias is to weight the observations by the inverse of survey design-dependent probabilities of being selected in the sample.

Moreover, microeconometric analysis often involves pooling data from more than one dataset. This is usually done to gain extra variables of interest which are not included in the original dataset. When two datasets (or the same datasets across different years) are to be linked, the resulting overlap will possess different properties compared to the two original sets: "a linked dataset can be regarded as the result of a single survey conducted with complex design which is the product of the designs of the contributing surveys" (Chesher and Nesheim, 2004). For example, in terms of stratification, this means that, providing the parent datasets had

independent survey designs, the resulting overlap's weights will be the product of the weights used in the original surveys. However, sample designs vary and the sample choice methods themselves may not be independent, requiring complex adjustment methods.

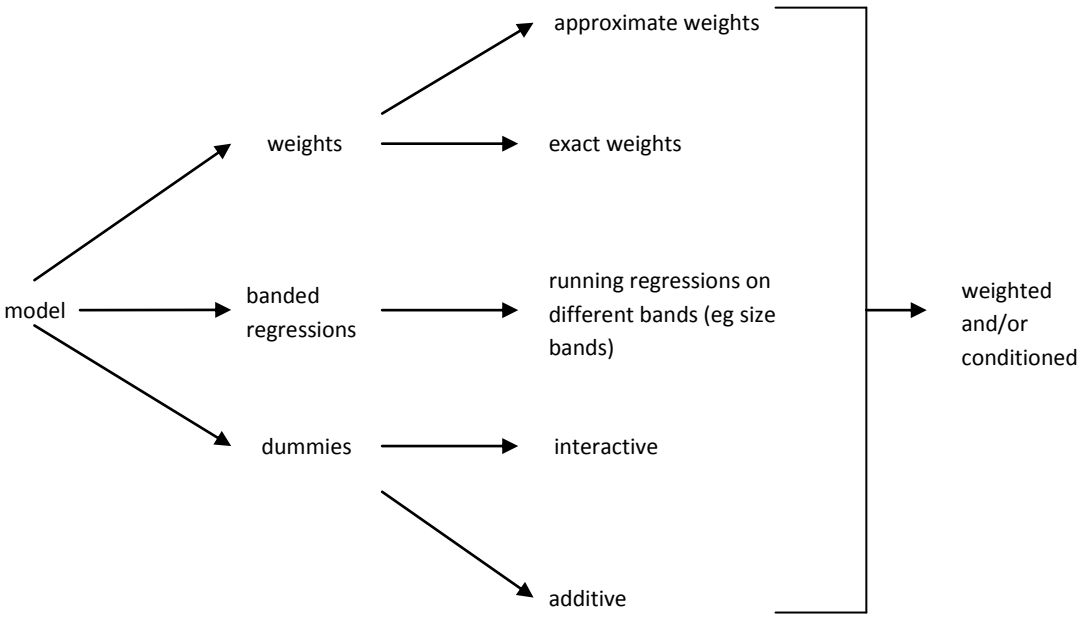
Complex sampling design can distort the information contained in the observable finite population. Typically, weights are more important for ensuring the unbiasedness of simple marginal statistics like means and tabulations. Conversely, more complex statistics that depend on the correlations between variables may remain approximately unbiased even if unweighted.

6.1.2. Weighting solutions

One would expect that the application of different weighting/conditioning techniques should yield similar results, but this is not necessarily the case. Even if a model is "correctly" specified (in terms of the underlying economic relation), different weighting schemes can have different impacts.

Figure 10 summarizes some of the approaches which could be used to account for sampling design or to control for particular variables.

Figure 10. Approaches to conditioning and weighting



When an econometrician ignores the sample selection of the data, then the analysis rests on the following assumptions. It is assumed that the finite population of N

observations is a simple random sample of size N from a population. The population data can be characterized by a regression model of the form:

$$Y = X\beta + \varepsilon \tag{1}$$

where *Y* is an N x 1 vector, *X* is an N x k matrix and *ß* is k x 1 vector of parameters to be estimated. ε represents a vector of deviations from the linear relationship and has a property $E(\varepsilon|X) = 0$. The finite population of interest is defined to be:

$$\beta = (X'X)^{-1}X'Y \tag{2}$$

where the *Y* vector and *X* matrix are population quantities. For the purpose of this illustration, a class of stratified sample design is considered. For this class of design, the population is divided into $h = 1,\ldots, H$ strata by various geographic, industry and employment sizeband, etc. For stratum *h,* a random sample of *n(h)* observations is selected with unequal probabilities without replacement, where $P(h_i)$ represents the probability of selection for observation h_i. Consider a survey with a random sample stratified by employment size and industry. Running an unweighted regression estimates the mean effect across the two strata. That is, estimators for X'X and X'Y are *x'x* and *x'y* respectively, with

$$x'x = \sum_{h-1}^{H}\sum_{i-1}^{n(h)} X'(h_i)X(h_i)/P(h_i)$$

and

$$x'y = \sum_{h-1}^{H}\sum_{i-1}^{n(h)} X'(h_i)X(h_i)/P(h_i)$$

These estimates will provide an estimate of *ß*, namely:

$$\hat{\beta}_{OLS} = (x'x)^{-1}x'y \tag{3}$$

Running a weighted regression assumes that the population mean impact is desired. That is the estimators are depicted as follows:

$$\hat{\beta}_{WOLS} = (x'wx)^{-1}x'wy \tag{4}$$

where *w* is a diagonal matrix of weights. According to Carrington et al. (2000), the argument for which $\hat{\beta}_{WOLS}$ is a better estimator is "that varying probabilities of selection may lead the relationship between the dependent variable and regressors in the sampling distribution to differ from the relationship in the finite population." In theory, β_{WOLS} converges to the population parameter, ß.

However, weighting does assume that there is a single population parameter to be uncovered by appropriate adjustments to the importance of individual observations. This may not be an appropriate economic model. Researchers will add variables to the model to reflect economic structure; if these variables are also involved in the design of the survey, then it is not clear that there is any further role for weighting.

For example, banded regressions – that is, running separate regressions within each size band – imply a different model for each stratum, including the error distribution if necessary. If the same size bands are used as the primary sampling criterion, then weighting by size is infeasible and irrelevant. If instead size dummies are added to a regression:

$$Y = \beta X + \wedge SX + u \tag{5}$$

then weighting might still be relevant if the sample selection has an impact on variables not interacted with the size dummies; but weighting will have no further impact on the variables affected by the dummies.

One significant advantage of using conditioning variables or banded regressions is that it is no longer necessary to specify the exact sample proportions in the weights – this is automatically allowed for as long as the dummies are identified with exact subsamples. In other words, dummies or bands classify variables by sampling rules, irrespective or the size of the population. Weighting, on the other hand, needs to be

based on the population characteristics. This is particularly important when linking across datasets, where sample proportions may differ or be unknown beyond the broadest level. It is also an issue for historical datasets where detailed sampling fractions may not be available for long time series.

The choice of weighting is closely related to how one decides to estimate the errors in a regression. In particular, this means choosing between a simple estimation, robust estimation and clustered estimation[63] (a regression is said to have robust standard error if it is reliable even under autocorrelation or heteroskedasticity). For instance, as will be demonstrated below, clustering standard errors around groups which are constructed on the same dimensions of the weights may yield similar results to applying the official weights. To understand the effects this has on the results, it is useful to look at the variance of the estimators. The regression in (1) above has a variance of:

$$V_{OLS} = \sigma^2 (X'X)^{-1} \tag{6}$$

where $\sigma^2 = \left(\frac{1}{(N-k)} \right) \sum_{1=1}^{N} e_i^2$ and e_i is the *i*th residual. The formula for robust standard error is:

$$V_{robust} = (X'X)^{-1} * \left[\sum_{i=1}^{N} (e_i * x_i)' * (e_i * x_i) \right] * (X'X)^{-1} \tag{7}$$

where x_i is a row vector of regressors.

The last approach is to run the regressions clustering the errors around particular groups of observations. For instance, in a dataset of medical diagnoses, one may want to cluster cases around each doctor. Assuming there are *n* clusters, we can substitute the summation of the product of the residuals and x_i within a cluster ($u_j = \sum e_i * x_i$) for the term in the square brackets above (in equation (7)):

[63] In STATA, robust and clustered errors are specified with the options "*,r"* and "*,cluster (*clustering variables*)"* respectively.

$$V_{cluster} = (X'X)^{-1} * \sum_{j=1}^{n} u_j' * u_j * (X'X)^{-1}$$

(8)

From this it follows that, if $V_{robust} > V_{cluster}$ then $\sum e_i * x_i$ has less variation within a cluster than for individual observations.

In the following section of the chapter, we will report estimations using both clustered and robust standard errors. One hypothesis being that clustering around variables which are used in the construction of the official weights may yield results which already account for the sample design issues tackled by the weights.

Finally, weighting affects the interpretation of the independent variables' coefficients. For instance, since most business surveys disproportionately sample too many large firms, an unweighted regression will be driven by the data from these large firms, while a weighted estimate will be driven largely by data from smaller firms. This only applies if the weights reflect the number of firms of different sizes in the population. However, if they are based on firm turnover (the higher the turnover, the higher the weights), then the weighted estimates would be even more sensitive to the data from the larger firms (assuming these have the larger turnovers). For example, the UK retail sector is dominated by a small number of very large firms: under 50 companies account for over 70% of turnover (Haskel and Khawaja, 2003). However, in terms of number of businesses, very small firms dominate to a larger degree than in many other industries. An unweighted estimate would give an accurate view of the main part of production; but it would ignore a whole swathe of companies. In contrast, a weighted estimate would be more appropriate for the bulk of companies, but may be of little use in determining the overall drivers of gross outputs in the sector.

It should therefore be clear that the choice of weighting scheme is not merely a matter of accounting for sample selection probabilities. It also incorporates the form of the estimated relationship, the interpretation of results, and the underlying theory.

6.1.3. Sensitivity of estimates and sampling weights

In the context of the analysis conducted in chapter 5 we can simplify the decisional choice model to become an entrepreneur by including only two independent variables

and a dependent, latent, variable *Y* indicating whether the respondent is an entrepreneur or not.[64] Following Winship and Radbill (1994) we can think of this estimation as pulling together results for two distinct sub-groups of observations *i.e.* males and females:

Males

$$Y = \beta_0 + \beta_1 age + \varepsilon$$

Females

$$Y' = \beta_0' + \beta_1' age + \varepsilon$$

(9)

To illustrate the impact of this stratification, assume that $\beta_0' < \beta_0$ and that $\beta_1' \neq \beta_1$. In other words, the interaction gender*age is correlated with other regressors. The correctly specified model to analyse the whole sample would be:

$$Y'' = \beta_0'' + \beta_1'' age + \beta_2'' male + \beta_3'' (age * male) + \varepsilon$$

(10)

Leamer (1978) points out that the above approach effectively results in a weighted averaged analysis of the two subsamples. The weight being a function of the regressors' covariances for the male and female groups and of the sizes of the two groups. Hence, including sampling weights in the regression may yield very different results as this in practice alters the sizes of the sub-groups.

Table 23 below reports results from the following models: Model 1 and 2 capture the 2 equations in (9); Model 3 is a pooled regression of Model 1 and 2; Model 4 is expressed in (10) above; Model 5 includes country and year dummies; Model 6 and 7 interact the survey weights with each regressor (see 6.3 for a description of this approach); and, Model 8 is the weighted version of Model 4.

[64] The operational definition of being an entrepreneur within GEM is given in Chapter 5. For a more general discussion of entrepreneurship see Chapter 2.

Table 23. An illustration of the effect of weighting

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)
H.G.E	(male=1)	(male=0)						
gemage	-0.00936***	-0.0135***	-0.0103***	-0.0134***	-0.00931***	-0.0124***	-0.00964***	-0.0134***
	(0.000614)	(0.000750)	(0.000443)	(0.000745)	(0.000881)	(0.000909)	(0.000991)	(0.000876)
male				0.291***	0.207***	0.246***	0.188***	0.324***
				(0.0384)	(0.0418)	(0.0550)	(0.0597)	(0.0464)
male_x_age				0.00400***	0.00360***	0.00246*	0.00397**	0.00451***
				(0.000963)	(0.00105)	(0.00147)	(0.00156)	(0.00116)
w_male						0.0412	0.0197	
						(0.0382)	(0.0411)	
w_age						-0.00105*	0.000399	
						(0.000587)	(0.000538)	
w_male_x_age						0.00171	-0.000453	
						(0.00113)	(0.00117)	
country dummies					Y		Y	
year dummies					Y		Y	
GEM weights								Y
Observations	15635	11117	31694	26752	26752	26725	26725	26723
Pseudo R2	0.0039	0.0088	0.0045	0.0161	0.1728	0.0164	0.1728	0.1728

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

So, in the above example, we can see that once the gender effect is included in the model (both in its additive and multiplicative form) the impact of including the official weights is minimal. In particular, β_1 is the same in the pooled regression with the gender dummies (Model 4) as it is in the model which uses GEM's official sampling weights (Model 8), but its standard error is larger in the weighted model. On the other hand, both β_2 and β_3 differ in the weighted model.

Note that the gender dummy variable plays a dual role in this context. First, it has a meaningful economic interpretation as it causes a shift in HGE – for example, because in some countries women still have a more limited participation in the production process; the purpose of dummies being to qualify variables and improve the efficiency and robustness of estimates. However, it also represents the sampling characteristics of the data, where its role is to give appropriate weight to the different sampling strata so that the "better fit" model can be estimated accurately.

Winship and Randall (1994) also show how experimenting with weights can be useful in indicating whether a model is underfitted. Suppose we estimate the model $Y = \beta_0 + \beta_1 X_1 + \varepsilon$ when we should have specified $Y = \beta_0' + \beta_1' X_1 + \beta_2' X_2 + \varepsilon$ (hence, omitting X_2). The expected value for β_1 in the underfitted model would be:

$$E(\beta_1) = \beta_1' + s_{21}\beta_2' \tag{11}$$

where s_{21} indicates the regression slope of X_2 on X_1 and is equal to:

$$s_{21} = \frac{\text{cov}(X_2, X_1)}{\text{var}(X_1)} \tag{12}$$

As shown below, both the numerator and the denominator in the above equation will be sensitive to the inclusion of weights in the model. This will affect the value of s_{21} which will in turn alter the size and bias of β_1. The formulae for the weighted and unweighted covariance and variance in (XX) above are:

$$\text{cov}(X_2, X_1) = \frac{\sum (X_{i1} - \bar{X}_1)(X_{i2} - \bar{X}_2)}{n}$$

$$W\,\text{cov}(X_2, X_1) = \frac{\sum W_i (X_{i1} - \bar{X}_1)(X_{i2} - \bar{X}_2)}{\sum W_i}$$

$$\text{var}(X_1) = \frac{\sum (X_{i1} - \bar{X}_1)^2}{n}$$

$$W\,\text{var}(X_1) = \frac{\sum W_i (X_{i1} - \bar{X}_1)^2}{\sum W_i}$$

(13)

From this it clearly follows that there will be no difference between the weighted and unweighted analysis only when all observations have the same weight. So the only time when the weighted OLS (WOLS) and OLS will yield the same estimate for β_1 is when $s_{21} = 0$ which indicates no omitted variable bias β_2 or, in the above example, when results from Model 4 are identical to those produced by Model 8.

6.2. Weights in GEM

A description of the Global Entrepreneurship Monitor dataset was given in the previous chapter. This section will hence focus on the sampling approach used and the weights associated with it.

Generally, GEM uses simple random sampling in that computers generate random landline phone numbers which are then used to contact respondents. Hence, no stratification is used in the majority of cases greatly limiting the role played by weights compared to other datasets.[65] However, this approach clearly relies on landlines covering the vast majority of the country, otherwise sizeable portions of the

[65] For instance, the Annual Respondents Database of the Office for National Statistics is stratified on region, size and industrial sector of firms. Individual respondents are then randomly selected within each stratum (although, in some cases, with a probability of selection of one). This means that a weight calibrates observations across three dimensions: region, industry and size. On the other hand, a survey designed using a simple random sample – assuming it was large enough – would not require any weights.

population may automatically be excluded. Hence, for some developing countries, survey design is more complex in that specific geographic clusters will be sampled resulting in a more complex survey design. In this sense, the weights included in GEM also fulfil the purpose of harmonising these different approaches.

GEM's weights are computed so that, overall, each observation is weighted up to its true population importance. In all cases, this process involves scaling up (or down) along two dimensions: age and gender. In other cases, for example where more complex survey designs were implemented, other variables, such as geographic distribution, ethnic background and educational attainment, are also used in the computation of weights (Reynolds et al., 2005). Overall, four distinct weights are included:

(1) WEIGHT: Original weights provided by the survey research vendor, re-centered (adjusted) so that the average value for the sample for each year equals 1.0, (the sum of the weights equals the sum of the cases).

(2) WEIGHT_L: Original weights adjusted so they are only available for those aged 18-64, an estimate of the age at which individuals are assumed to be active in the labor force and the only age range included in all national samples by survey vendors. These weights were re-centered for each country for each year.

(3) WEIGHT_A: Original weights were adjusted so they are only available for those aged 18 and older, considered an appropriate range for assessments involving informal investors, many of whom are older and retired from the labor force. These weights were re-centered for each country for each year.

(4) WEIGHT_P: The population sampling ratio estimated from the total number of adults aged 18-64 in the population, divided by the total number of adults in the sample in this age range. This is convenient for estimating the total number of individuals in the population involved in business creation and management activities. The number of cases assigned the derived weights is reduced from the total sample because of the restriction on age. Most important are the omissions of those under age 18, included in many countries where those under age 18 are assumed eligible for the labour force (Quill et al., 2006).

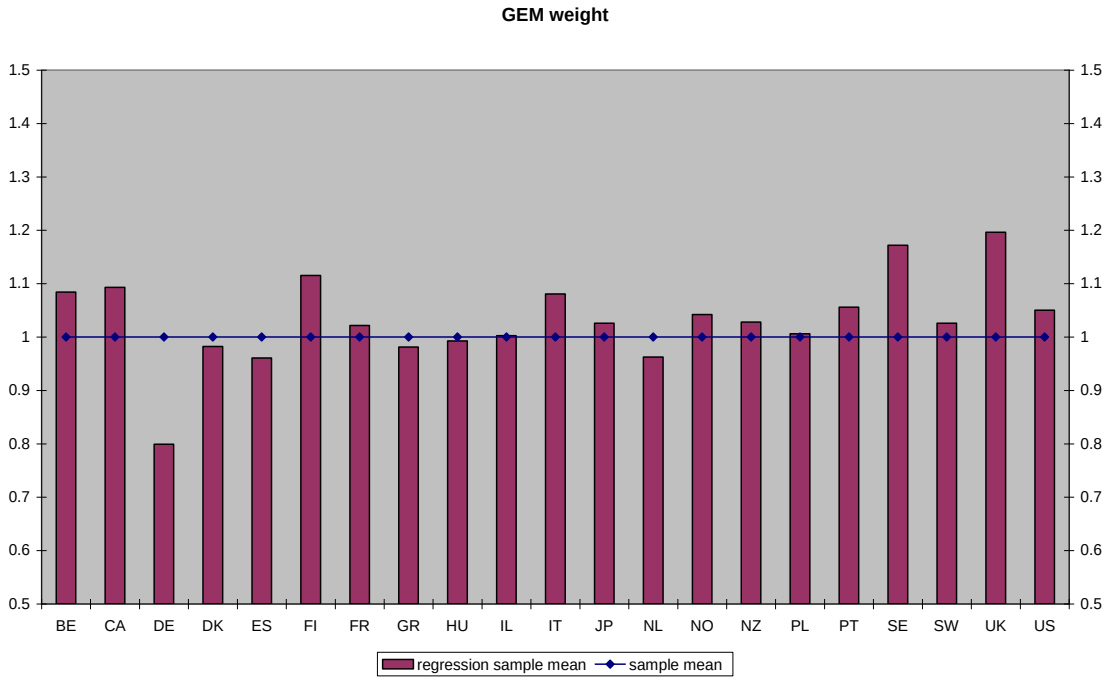
Throughout this chapter, when the term weight is used it will be referring to the first weight (1) in the description above. A table detailing summary statistics for GEM's weights for all countries covered by the survey is included in Annex 2.

6.2.1. Weighting and missing values

One consideration which is seldom made is that the presence of missing values may skew the distribution of the weighting variable. As mentioned, sampling weights fulfil a particular task in that they inflate or deflate particular cells to the importance they would have in the original population but, in reality, when one carries out econometric analysis one invariable ends up analysing some sort of subsample. This is mainly because of missing data. Consider a dataset on personal income which consists of a random sample of 100 respondents from a population of 1,000. Assume that the only stratification is related to the gender of the respondents and, in the population, exactly half of the subjects are males and half are females. Assume also, however, that 60 males were sampled while only 40 females were. This survey design involves applying a weight of $\left(\frac{60}{1{,}000}\right)^{-1}$ and $\left(\frac{40}{1{,}000}\right)^{-1}$ or .83 and 1.25 for males and females respectively. These would be the "official" weights included in the dataset. Suppose that there were 15 observations missing for one of the variables of interest in the model spread across the gender dimension as follows: males = 5, females = 10. It is plain to see that this requires for the weights to be fine-tuned given that the new probabilities of selection are now $\left(\frac{55}{1{,}000}\right)^{-1}$ and $\left(\frac{30}{1{,}000}\right)^{-1}$. The correct weights in this example should be .91 and 1.67 for males and females respectively. In other words: the official weights of a dataset are only accurate if the analysis carried out involves using all observations or a random sample of the dataset. In practice, the distribution of missing values is usually correlated with one or more variables in the dataset (and, more often than not, to one of the dimensions used in the survey design; for instance, for firm-based datasets, size or industrial sector). Hence, the assumption that one's "regressions-ready" sample is a random sample of the original dataset is often violated.

In the analysis below, only a very small subset of all the observations in GEM is used because of missing data and because of the way various variables were computed. We isolated all the cases included in our regressions and produced summary statistics for the weight variable. As can be seen from the figure below, the weights we are actually applying in our regressions have a different mean from the original ones (which, as mentioned, was 1 for each country).

Figure 11. Weighting and missing values



From this it follows that, in many cases, the official weights applied in the regressions models are likely to be imprecise. One approach would be to recalibrate the weights depending on the pattern of missing values and to use these adjusted weights. However, as shown in the trivial male/female example above, one effect may be to increase the impact of groups which have been undersampled to an extent that may be undesirable.

6.3. Testing the significance of weights

In order to establish whether the weighted estimates of the regression models are significantly different from the unweighted ones, we used DuMouchel and Duncan's (1983) method of testing the significance of survey weights on the regressions analyses. The test requires one to add an extra set of regressors to the

regression model of interest. These extra regressors are defined by the product of the weights and the original regressors. The test is based on the difference between the unweighted coefficients and the coefficients of the extra regressors in the same regression:

$$\Delta = \beta_{unweighted} - \beta_{weighted} \tag{14}$$

The test is whether delta is essentially zero. This is equivalent to an unweighted F test of whether the coefficients associated with these new extra regressors are jointly significant. We also experiment with clustering the standard errors in different ways following the discussion in the previous section.

In all we report five specifications for Model 2 and Model 5 presented in the previous chapter where we tried to explain High Growth Entrepreneurship (HGE) using two alternative variables. For the probit model (Model 2) the dependent variable is *Gazelle*=1 if entrepreneurial entry occurs with the expectation of having at least 30 employees within five years; for the ordered probit (Model 5) we use *HGE*, which expands entrepreneurs' expectations into 10 values ranging from 0 (if the respondent does not envisage to employ any additional members of staff within the next five years) to 9 (if she thinks 30 or more people will be employed). The following specifications were run (corresponding to each column from left to right in the tables in Table 24 and Table 25):

a) robust standard errors;

b) clustered standard errors around country-year centroids;

c) robust standard errors and the weight variable interacted with each regressor (except for country-level variables which were "imported" into the dataset);

d) clustered standard errors around country-year centroids and the weight variable interacted with each regressor (except for country-level variables which were "imported" into the dataset);

e) clustered standard errors around country-year centroids and official GEM weights (using the option *pweight* in STATA).

For both the probit and the ordered probit, specification (b) above corresponds to the model estimated in the previous chapter, hence it represents our "benchmark".

For the probit models some differences exist between the results produced by different specifications. Generally, the significance and sign of the various regressors remains unchanged; a notable exceptions being, however, that *male* becomes significant at 1% in the weighted model. This is likely to be the most remarkable effect of weighting. Additional findings are: the standard errors for the weighted model (Model 2e) are always larger than for the benchmark model. This confirms general expectations on the effects of weighting. Secondly, when weights are applied following the DuMouchel and Duncan (1983) method (Model 2c and 2d) the coefficients for these interaction variables are always insignificant, suggesting that the model already accounts for the effect of weights and that unweighted models are preferable.

The above results are largely echoed by the ordered probit analysis (Table 25). In particular, the standard errors of the weighted model are, again, almost always larger than in the benchmark model (the sole two exceptions being *_Idep2a_2* and *busang_prev*). While the direction of the relationships remains always unaltered, often the significance level of the coefficient changes between the benchmark and the weighted model. Finally, in this case too, the DuMouchel and Duncan (1983) approach of interacting the official weights with the regressors seems to confirm that weighting plays an insignificant role (although the male dummy is significant in one specification at 10% in Model 5d).

It is also interesting to note that the choice between adopting robust or clustered standard errors seems to have a notable impact on estimations. This was particularly the case for the ordered probit model. However, the DuMouchel and Duncan (1983) test fails regardless of whether the model has robust or clustered standard errors (with the exception of the age coefficient made above).

Table 24. Probit model estimates, dependent variable *gazelle* (marginal effects reported)

	Model (2a)	Model (2b)	Model (2c)	Model (2d)	Model (2e)
_Idep2a_2	0.0169**	0.0169***	0.0170**	0.0170***	0.0200***
	(0.00805)	(0.00626)	(0.00806)	(0.00615)	(0.00765)
_Idep2a_3	0.0501***	0.0501***	0.0504***	0.0504***	0.0516***
	(0.0120)	(0.0101)	(0.0120)	(0.0101)	(0.0129)
gemage	-0.000369	-0.000369	-0.000549	-0.000549	0.000416
	(0.000519)	(0.000474)	(0.000617)	(0.000600)	(0.000586)
male_x_age	0.000207	0.000207	0.000690	0.000690	-0.000812
	(0.000602)	(0.000604)	(0.000788)	(0.000685)	(0.000900)
educ_postgra	0.0164	0.0164	0.0110	0.0110	0.0188*
	(0.0102)	(0.0106)	(0.0121)	(0.0126)	(0.0114)
educ_postsec	-0.00817	-0.00817	-0.00580	-0.00580	-0.0122
	(0.00945)	(0.00893)	(0.0101)	(0.00906)	(0.00962)
educ_secpost	0.0217**	0.0217***	0.0197**	0.0197**	0.0324***
	(0.00917)	(0.00798)	(0.00975)	(0.00802)	(0.00953)
male	0.0334	0.0334	0.0188	0.0188	0.0660***
	(0.0219)	(0.0207)	(0.0295)	(0.0245)	(0.0241)
gemwork_dum	0.0124	0.0124	0.0133	0.0133	0.0129
	(0.00759)	(0.00824)	(0.0107)	(0.0117)	(0.00883)
OMESTBBT	0.0173	0.0173	0.0154	0.0154	0.0195
	(0.0117)	(0.0127)	(0.0170)	(0.0120)	(0.0169)
fear	-0.00975	-0.00975	0.00331	0.00331	-0.0166*
	(0.00853)	(0.00904)	(0.0141)	(0.0144)	(0.00990)
financial_freedom	-0.000165	-0.000165	-0.000126	-0.000126	-9.30e-06
	(0.000259)	(0.000293)	(0.000260)	(0.000288)	(0.000290)
busang_prev	0.522*	0.522	0.960**	0.960*	0.497
	(0.300)	(0.465)	(0.489)	(0.529)	(0.477)

[cont. overleaf]

VC_GDP_US_1000	4643***	4643**	4692***	4692**	4722**
	(1264)	(2122)	(1264)	(2118)	(2094)
ipp	0.0585***	0.0585***	0.0578***	0.0578***	0.0567***
	(0.00735)	(0.0177)	(0.00740)	(0.0178)	(0.0184)
delta_gdp_lag1	-0.00738*	-0.00738	-0.00769*	-0.00769	-0.00705
	(0.00409)	(0.00503)	(0.00412)	(0.00501)	(0.00507)
ln_gdp_pc_pp	-0.125***	-0.125***	-0.125***	-0.125***	-0.122***
	(0.0254)	(0.0340)	(0.0254)	(0.0341)	(0.0342)
monopoly	0.0454***	0.0454***	0.0528***	0.0528***	0.0395***
	(0.0117)	(0.0114)	(0.0181)	(0.0136)	(0.0143)
w_age			0.000169	0.000169	
			(0.000362)	(0.000432)	
w_education			0.00215	0.00215	
			(0.00314)	(0.00202)	
w_male			0.0153	0.0153	
			(0.0193)	(0.0149)	
w_male_x_age			-0.000466	-0.000466	
			(0.000544)	(0.000563)	
w_gemwork_dum			-0.00120	-0.00120	
			(0.00774)	(0.00726)	
w_OMESTBBT			0.00149	0.00149	
			(0.0116)	(0.00999)	
w_fear			-0.0128	-0.0128	
			(0.0105)	(0.0103)	
w_busang_prev			-0.413	-0.413	
			(0.374)	(0.284)	
w_monopoly			-0.00556	-0.00556	
			(0.00961)	(0.00688)	
Observations	6938	6938	6929	6929	6933
R-squared	.	.	.	.	.

*** p<0.01, ** p<0.05, * p<0.1 Robust standard errors in parentheses

Table 25. Ordered probit model estimates, dependent variable

	Model (5a)	Model (5b)	Model (5c)	Model (5d)	Model (5e)
_Idep2a_2	0.0599**	0.0599	0.0626**	0.0626	0.0327
	(0.0280)	(0.0439)	(0.0281)	(0.0433)	(0.0439)
_Idep2a_3	0.178***	0.178***	0.179***	0.179***	0.192***
	(0.0384)	(0.0372)	(0.0385)	(0.0378)	(0.0385)
gemage	-0.00632***	-0.00632***	-0.00681***	-0.00681***	-0.00407*
	(0.00183)	(0.00170)	(0.00229)	(0.00200)	(0.00215)
male_x_age	0.00450**	0.00450**	0.00743**	0.00743***	0.000901
	(0.00217)	(0.00199)	(0.00290)	(0.00258)	(0.00297)
educ_postgra	0.0251	0.0251	0.0107	0.0107	0.0650
	(0.0413)	(0.0449)	(0.0476)	(0.0419)	(0.0472)
educ_postsec	-0.0180	-0.0180	-0.00845	-0.00845	-0.0476
	(0.0408)	(0.0456)	(0.0427)	(0.0453)	(0.0480)
educ_secpost	0.0564*	0.0564	0.0515	0.0515	0.0562
	(0.0334)	(0.0439)	(0.0359)	(0.0479)	(0.0455)
male	0.162*	0.162**	0.0328	0.0328	0.316***
	(0.0868)	(0.0735)	(0.114)	(0.0895)	(0.119)
gemwork_dum	0.172***	0.172***	0.209***	0.209***	0.150***
	(0.0310)	(0.0244)	(0.0480)	(0.0420)	(0.0331)
OMESTBBT	0.135***	0.135***	0.148**	0.148***	0.120*
	(0.0401)	(0.0517)	(0.0638)	(0.0557)	(0.0659)
fear	-0.0538*	-0.0538	-0.0370	-0.0370	-0.0645
	(0.0316)	(0.0361)	(0.0470)	(0.0503)	(0.0487)
financial_freedom	-0.00316***	-0.00316	-0.00315***	-0.00315	-0.00258
	(0.000946)	(0.00253)	(0.000951)	(0.00254)	(0.00251)
busang_prev	3.134***	3.134	2.472	2.472	2.557
	(1.172)	(2.006)	(1.844)	(2.385)	(1.935)

[cont. overleaf]

VC_GDP_US_1000	17999***	17999*	17761***	17761*	18742**
	(6152)	(9710)	(6170)	(9744)	(9410)
ipp	0.154***	0.154**	0.149***	0.149**	0.153**
	(0.0242)	(0.0605)	(0.0244)	(0.0613)	(0.0630)
delta_gdp_lag1	-0.0493***	-0.0493**	-0.0539***	-0.0539**	-0.0401*
	(0.0156)	(0.0243)	(0.0157)	(0.0251)	(0.0222)
ln_gdp_pc_pp	-0.589***	-0.589***	-0.599***	-0.599***	-0.583***
	(0.0826)	(0.153)	(0.0828)	(0.152)	(0.153)
monopoly	0.136***	0.136***	0.0952	0.0952	0.159***
	(0.0408)	(0.0399)	(0.0598)	(0.0581)	(0.0412)
w_age			0.000644	0.000644	
			(0.00141)	(0.00103)	
w_education			0.00630	0.00630	
			(0.0120)	(0.00712)	
w_male			0.113	0.113*	
			(0.0701)	(0.0640)	
w_male_x_age			-0.00260	-0.00260	
			(0.00191)	(0.00177)	
w_gemwork_dum			-0.0395	-0.0395	
			(0.0353)	(0.0320)	
w_OMESTBBT			-0.0148	-0.0148	
			(0.0528)	(0.0446)	
w_fear			-0.0177	-0.0177	
			(0.0330)	(0.0369)	
w_busang_prev			0.732	0.732	
			(1.332)	(0.828)	
w_monopoly			0.0340	0.0340	
			(0.0371)	(0.0279)	
Observations	6938	6938	6929	6929	6933
R-squared	.	.	.	.	.

*** p<0.01, ** p<0.05, * p<0.1 Robust standard errors in parentheses

6.4. Conclusions

Econometric studies tend to be run on data generated by surveys. Statistical theory suggests one should weight any analysis conducted back to its population using an observation's inverse of the probability of selection. However, the design features of the survey (for instance, the sampling techniques adopted) are rarely taken into consideration by researchers. Interestingly, relatively little has been written on the effects of weighting and most notable contributions belong to statisticians rather than economists. Engaging in this debate is important because understanding the impact on weighting ultimately improves the quality of our econometric analysis.

This chapter has two main conclusions.

The first is that the results previously presented in chapter 5 hold regardless of whether the analysis is weighted or otherwise. This adds further corroboration to the conclusions the thesis overall makes. It also contributes to a debate which is emerging among the wide body of researchers using GEM. Our conclusions should hold for anyone using the GEM dataset regardless of their specific research question.

The second contribution is that weighting does not necessarily improve the accuracy of estimation. What seems to be important is to account for survey design, especially sample stratification, by including the relevant variables in the model. If this is done correctly, weights play a minor role. In fact, the exclusion of weights may even be desirable as coefficients' errors become smaller.

Moreover, there are two additional potential points to keep in mind: how should one handle survey design features of merged datasets and how the presence of missing values may alter the accuracy of weighting. More research is needed in this area to reach definite conclusions which can be generalised across datasets generated by different sources.

Conclusions

This thesis bridged various areas of economics which have traditionally developed on parallel paths creating a considerable gap in the literature: the entrepreneurship literature has often undervalued the impact external environment has on creating, or limiting, opportunities for entry; and, on the other hand, mainstream economic studies have trivialised the process through which investment and entry occurs (Acs and Audretsch, 2005). In some ways, entrepreneurship can proxy lack of freedom, if this is the only available option open to an individual, or it can be the ultimate expression of liberty, if one is able to choose and invent his own profession. Whether one falls in the former or latter category is likely to depend on what country one is living in.

We have shown how both the macro and the individual elements are important to develop a thorough understanding of the relationship between competition, entrepreneurship and growth. Macro factors, like the role played by institutions, have to be taken into consideration when studying people's choices, and people's behaviour ultimately determines an economy's performance. Overall, this study has pulled together, and analysed, data collected at three levels of aggregation: individual, sector (or market) and country. At these three levels we have shown how individuals are attracted by gaps in the market; how entrepreneurship is intimately related to competition and competition policy and how the implementation of sound competition policies has been fundamental to economic development for transition economies.

This thesis unified different strands at a theoretical level by offering a new understanding of how different patterns of innovations and entrepreneurship are interconnected. In chapter 1, we have shown that two main innovation and competition processes exist, leapfrog and neck-and-neck, and this fundamentally explains why studies have found the relationship between competition and innovation to be non-linear.

These mechanisms, however, take place within a wider context and, in chapter 2, we have researched how competition policy, or the rules of the game, determine whether individuals decide to become entrepreneurs or to pursue other options. Our results show that the level of competition a new entrepreneur faces in a market is a very

strong determinant of how successful she thinks her enterprise will be. This effect is statistically significant in models which include a plethora of individual and country level characteristics and remains valid across different model specifications. These results provide an empirical foundation of how entrepreneurship and competition determine job creation in new firms which, in turn, will translate into growth for the whole economy.

Competition is something which has never existed in command economies and chapter 3 analysed the pivotal role played by the introduction of competition policy in the transition process. The absence of competitive pressure is perhaps the most differentiating feature of a command economy and while authors have repeatedly picked up on the privatisation process as an obvious step-change, the role of competition policy has been heavily downplayed. Privatisation, *per se*, however, has not always provided a blueprint to productivity gain and it has often resulted in efficient monopolies simply changing hands - from the governments to the oligarchs - without societal welfare benefitting from this exchange. The injection of competition, however, benefits a system regardless of ownership and policies in countries planning vast privatisation programs should be aimed at encouraging a level playing field ahead of auctioning off public assets. In the end, we have shown, the implementation of competition policies has been more relevant for growth than privatisation.

The analysis of specific policies, however, also requires an understanding of how the relevant institutions operate. Hence, in chapter 4, we unpacked the meaning of competition policy by studying the inner workings of the UK's Office of Fair Trading as a regulator of mergers. We chose the UK as, together with the US, it has a strong tradition in the application of antitrust laws and its effectiveness is attested by the very high scores awarded by the Global Competition Review. The inner workings of such an institution are usually off-limits to economists but, in this case, we were able to utilise a purposely built dataset in which individual merger cases are the unit of observation. Since the first step in a merger case is to delineate a market, the analysis in this chapter falls within the second tier of disaggregation.

Chapter 4 makes two important contributions to the thesis. Firstly, it shows that the mechanisms suggested by Bain's structure-conduct-performance paradigm are indeed

correct and that particular market structures and high levels of concentration are likely to raise competition concerns. Of course, it could be argued that the very *raison d'être* of a national competition authority is based on this approach and this is why some Chicago School observers (as mentioned in the introduction, Greenspan and Posner would be two obvious examples) would argue for national competition authorities to be abolished. However, the very fact that no single advanced economy has ever seriously considered such steps should be enough to dispel these doubts. On the other hand, some developing countries are deeply afflicted by the social costs associated with cartels and other anti-competitive practices. Secondly, it proposes a methodological approach which can be applied to the analysis of other jurisdictions. Although similar studies have been carried out for some countries (for instance, as mentioned in the chapter, for US, Italy and Mexico) what is still missing is one overarching cross-country effort to benchmark institutions. The benefit of such an effort would be to confirm, or reject, findings from the Global Competition Review. Chapter 4 provides an empirical blueprint for future research in this area.

Finally, chapter 4 confirms the notion that this is one area of policy where economics and law have acted in symbiosis. As discussed in previous chapters, the development of competition policy has always been dictated by our understanding of the functioning of markets; what we demonstrate in chapter 4 is that the actual application of these policies (or at least in the realm of merger enforcement in the UK) also closely follows prescriptions made by competition economics.

Chapters 5 and 6 analysed how an individual's characteristics and the features of the environment around her determine the high growth entrepreneurship (HGE). The chapter's main findings hence relate mainly to the individual and country level.

At the individual level the most significant result, which ties together the main theory advocated in this thesis, is that HGE is related to leapfrog innovation (described in chapter 1). This is confirmed by respondents' views that lower levels of competition, and hence the ability to generate temporary monopoly profits, are associated with higher expected growth. This is in line with the theory advocated by Casson (2003) and Binks and Vale (1990).

At the institutional level, we confirm that country-specific variables still play a major role in determining HGE. This, of course, is in line with the institutional economics school (Willimason, 1985; North, 1990) and supports efforts aimed at understanding the way specific institutions operate (which is effectively the objective of chapter 4).

Some clear policy conclusions can be drawn from our work. Developing countries should see competition as a powerful way to maximise efficiency and should challenge cartels and other malpractices. As we saw in chapter 3, there is a blurred line between various policies and the timing of specific reforms may have an impact in determining a country's ability to grow. Ultimately, politicians and officials in developing countries must understand that protecting competition is not the same as protecting competitors (Motta, 2004).

For developed countries, the challenge remains to enforce competition laws which are strong and consistent and to encourage entrepreneurship – especially the type which is likely to result in high growth through innovation.

At the time of writing, President Obama in addressing the American people irrevocably stated that never again will his administration let a bank become "too big to fail."[66] The government's ability to protect start-ups and new entrants will guarantee that some of today's entrepreneurs will become tomorrow's Microsofts.

In many ways the role played by financial and banking institutions is of paramount importance since it directly affects the performance of other sectors and of consumers overall. Still, for banks to grow and develop further, two crucial elements are needed: competition and entrepreneurship. In this sense, current economic developments in this area are consistent with the key message of this dissertation. In the context of banking, entrepreneurship involves both entry, from individuals and firms operating in different sectors, and innovation. In some ways retail banking may seem to be more of a neck-and-neck market while commercial banking has often been characterised by the introduction of new products, or processes, which have leapfrogged existing practices. Future research in this area would clarify what the entrepreneurial

[66] " Never again will the American taxpayers be held hostage by a bank that is too big to fail" B. Obama as reported in *The Wall Street Journal*, 22-24 January 2010, Vol. XXVII No. 248.

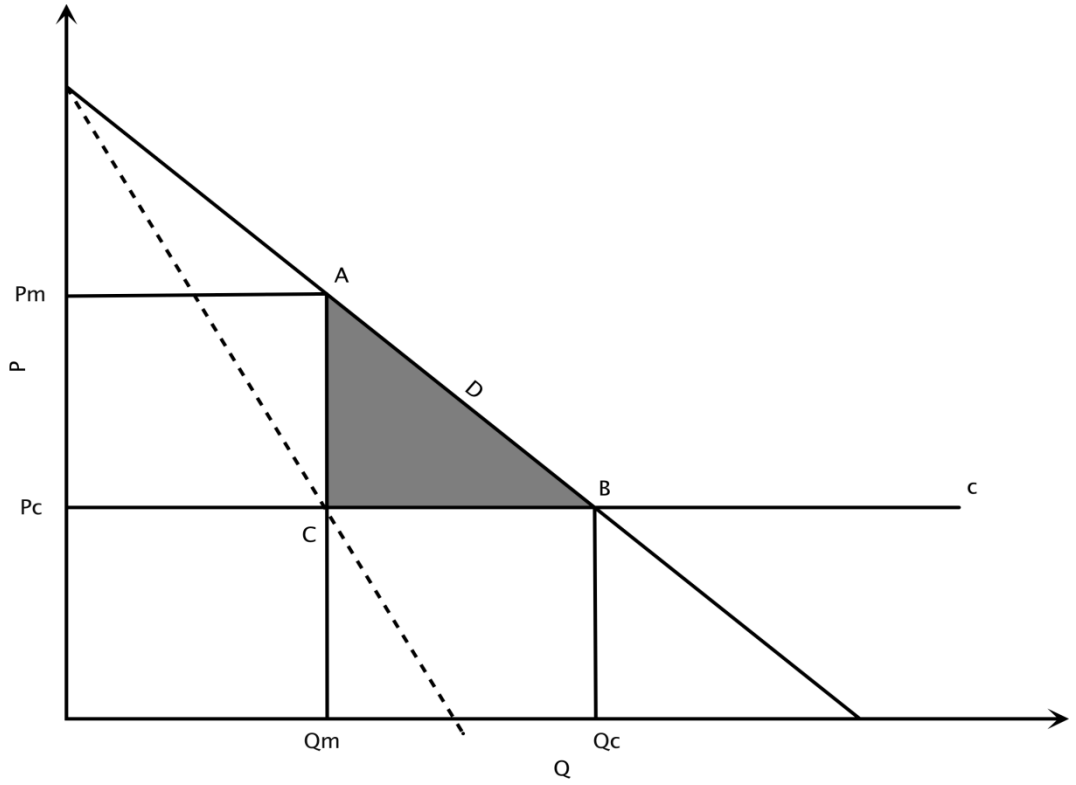
mechanisms at work in this sector are and what policies could be developed to sustain or to even strengthen them.

The financial sector is also worth concluding this thesis on given that it requires some degree of scrutiny from both a regulatory and a competition approach. This, of course, is also the case for some other industries like, for instance, utilities. Within these contexts, two complex, and often conflicting, objectives of governments' industrial policies become apparent. On the one hand, governments have a duty to protect consumers by upholding standards and guaranteeing certain levels of quality (at times even prices) which involves regulation. On the other hand, it is vital for governments to also protect the process of inter-firm rivalry helping to move markets towards their equilibriums which requires competition policy. Ultimately, we feel, striking a balance between these two seemingly conflicting aims holds the key to unlocking a country's full potential.

Annex 1: Competition and efficiency

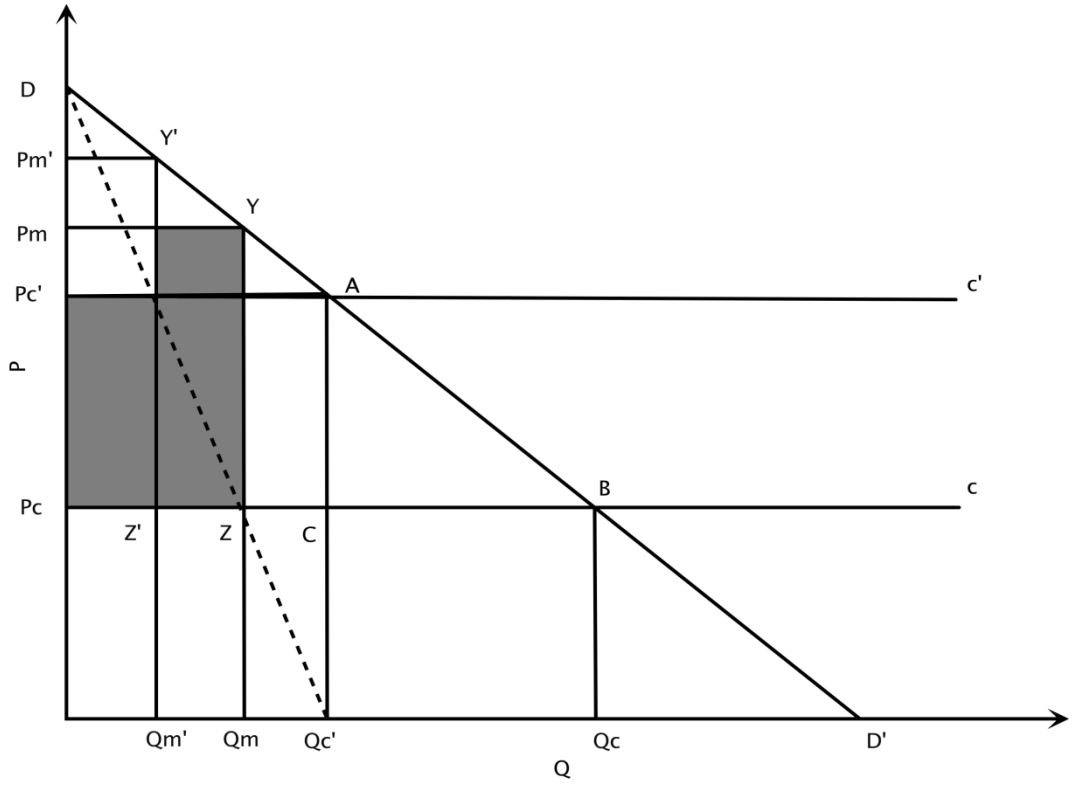
Consider the typical textbook example of allocative inefficiency illustrated in Figure 13 where a monopolist with constant marginal costs *c*, facing a downward sloping demand curve *D*, prices at *Pm*, where marginal costs equals marginal revenue (the dotted line in the graph). This price is, of course, higher than the one found under perfect competition which would be *Pc* (or where price equals marginal cost) and results in smaller quantity of goods being produced $Qm<Qc$. Under perfect competition the overall welfare (defined as the sum of producers' and consumers' surplus) will be given by the large triangle bounded by *PcB* and the intersect of the price axis and the demand curve (in the case of perfect competition, welfare will solely be made-up of consumers' surpluses since there will be no profits for producers). Under a monopoly, however, the producer now also derives surpluses given by the triangle bounded by *PmA* and the intersect of the price axis and the demand curve, while consumers' welfare scales back to the rectangle *PcPmAC*. This results in a net-efficiency gain represented by the triangle *ABC* which is also known as the deadweight loss. It is worth noting that although this description has contrasted monopoly against perfect competition, this approach also explains intermediate statuses since a welfare loss occurs in any market where price is above marginal costs.

Figure 12. Loss of welfare under monopoly



Additional welfare losses may result from producers being productive inefficient. Production inefficiency occurs when goods or services are not produced at the lowest possible costs if, for instance, a firm is burdened by x-inefficiencies (managerial slack). In this case, the market is not operating along its production possibility frontier and hence welfare (and in the long term growth) are reduced. This is illustrated in Figure 13 where a monopolist produces at a cost c' while under perfect competition firms would produce at c where $c' > c$. In the previous figure we saw how allocative inefficiency results in the welfare loss of the triangle *ABC*, however, given the difference in productive efficiency, additional welfare loss also occurs because of the monopolist having higher costs which is represented by the shaded area in Figure 13 below.

Figure 13. Additional loss resulting from productive inefficiency



Annex 2: Summary statistics for GEM weights[67]

Country	Mean	Min	Max	s.d.
AR	1.000	0.085	7.032	0.653
AT	1.000	0.069	11.227	0.846
AU	1.000	0.001	7.377	0.625
BE	1.000	0.155	3.174	0.292
BR	1.000	0.154	3.608	0.287
CA	1.000	0.031	10.939	0.883
CH	1.000	0.046	31.157	1.788
CL	1.000	0.604	5.895	0.343
DE	1.000	0.000	13.672	0.763
DK	1.000	0.344	3.706	0.251
EC	1.000	0.777	1.331	0.168
ES	1.000	0.000	16.957	1.255
FI	1.000	0.000	4.832	0.472
FR	1.000	0.000	8.022	0.523
GR	1.000	0.069	5.079	0.532
HK	1.000	0.841	1.360	0.087
HR	1.000	0.302	4.905	0.444
HU	1.000	0.386	1.817	0.276
IE	1.000	0.377	9.673	0.398
IL	1.000	0.398	6.058	0.328
IN	1.000	0.000	4.149	0.878
IS	1.000	0.631	1.622	0.136
IT	1.000	0.038	9.183	0.387
JM	1.000	0.379	12.279	0.554
JO	1.000	0.482	13.462	0.882
JP	1.000	0.740	2.552	0.127
KR	1.000	0.798	1.397	0.068
LV	1.000	0.703	1.583	0.198
MX	1.000	0.124	28.872	1.137
NL	1.000	0.335	4.907	0.472
NO	1.000	0.514	3.005	0.229
NZ	1.000	0.223	3.591	0.488
PE	1.000	0.774	1.209	0.144
PL	1.000	0.292	5.339	0.335
PT	1.000	0.580	1.802	0.123
RU	1.000	0.203	3.460	0.269
SE	1.000	0.067	8.073	1.043
SG	1.000	0.050	4.780	0.126
SI	1.000	0.646	2.044	0.187
SW	1.000	0.197	8.184	0.537
TH	1.000	0.175	8.395	0.654
UG	1.000	0.101	12.334	0.879
UK	1.000	0.003	11.044	1.153
US	1.000	0.000	6.269	0.512
VE	1.000	1.000	1.000	0.000

[cont. overleaf]

[67] No weights are available for Ireland or Taiwan, based on all available observations in GEM (1998-2005).

ZA	1.000	0.012	8.176	0.833

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