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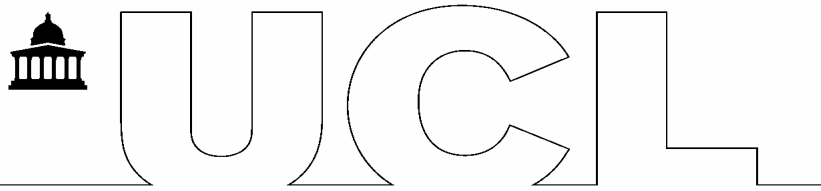

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MACROECONOMIC STABILITY, GOVERNANCE AND GROWTH: EMPIRICAL LESSONS FROM THE POST-COMMUNIST TRANSITION

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Macroeconomic Stability, Governance and Growth: Empirical Lessons from the Post-Communist Transition

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Abstract

Using panel data for the period 1989-2006 we revisit the empirics of economic growth in the context of the post-communist transition. We pay particular attention to the mechanisms of causation and to the potential endogeneity of the macroeconomic stability indicators considered to be important in the existing literature. Carefully employing a variety of econometric techniques we consistently find that macroeconomic instability is bad for economic growth. We find some evidence that institutions of governance are important for economic growth *through* their influence on the macroeconomic environment. That is, good institutions are conducive to macroeconomic stability which in turn positively impacts upon economic growth. We also find, in contrast with other work, that investments in education have had a strong positive impact on growth in transition while other 'standard' economic growth determinants remain less important. These findings are shown to be robust to a variety of econometric approaches, specifications and time spans.

JEL classification: C23, F43, O11, O43, P20
Key Words: Economic growth, macroeconomic stability, institutions, inflation, economic transition

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1. Introduction

The post-communist countries of Central Eastern Europe (CEE) and the Commonwealth of Independent States (CIS) have proved to be a fertile testing ground on which social scientists have been able to explore diverse theories relating to the role of institutions within the political economy. As the short-term evolves into the medium-term, as quantitative proxies for institutions extend their coverage and grow increasingly sophisticated and as more advanced econometric techniques become available we take the opportunity, in this paper, to revisit the empirics of economic growth in transition. In particular, using data for 1989-2006, we examine the role of both traditional factor accumulation variables and variables relating to policy choices. In doing the latter, we make specific claims concerning the links between institutions of governance, economic policy outcomes and economic growth.

To date, there have been numerous attempts to empirically examine economic growth in both transition and non-transition settings. Consistent with the predictions of basic neoclassical growth theories, the majority of economic growth studies covering non-transition economies confirm the positive role played by factor accumulation. That is, a higher investment ratio, higher levels of human capital and lower population growth rates are all associated with higher economic growth (Barro 1991; Mankiw *et al* 1992; Knight *et al* 1993; Islam 1995; Caselli *et al* 1996; Sala-i-Martin *et al* 2004; Barro and Sala-i-Martin 2004). In contrast, at least in the initial period of reform, studies on the transition economies have found these standard variables to be insignificant. Accordingly, much of the research on transition has omitted the standard variables from the growth estimation in favour of a range of 'transition specific' variables (among others see Fischer et al 1996, Havrylyshyn *et al* 1998, Berg *et al* 1999, Fischer and Sahay 2000, Campos 2001, De Melo *et al* 2001, Falcetti *et al* 2006 and Havrylyshyn 2006).

The latter set of variables have tended to reflect the dual transition processes of liberalisation and stabilisation and have generally confirmed the significance of policy related variables, particularly with regard to macroeconomic stability (De Melo *et al* 1996; Aslund *et al* 1996; Loungani and Sheets 1997; Zinnes *et al* 2001; Lawson and Wang 2005; Falcetti *et al* 2006; Havrylyshyn 2006). This in itself is consistent with abundant research based on non-transition economies which has also increasingly incorporated more specifically policy oriented indicators (Lucas 1973; Easterly and Rebelo 1993; Fischer 1993; Barro 1995; Bruno and Easterly 1998).

It is on this common node of the empirical research which we cast our attention in this paper. In particular, given the time elapsed since the 'start' of transition, we now reflect the spirit of

the non-transition literature by (re)incorporating the traditional neo-classical factor accumulation variables while, at the same time, thinking more carefully about how to correctly capture the effects of macroeconomic stability. The majority of studies tackle the latter by including a measure of inflation as the key proxy for the macroeconomic environment. In this paper, we note an important conceptual problem with this approach, in so far as it involves treating a policy output (inflation) as an exogenous policy input. In so doing, it offers little scope for thinking about the precise causal pathways linking macroeconomic stability and economic growth. By focusing on the role played by the institutions of governance we are better able to investigate this relationship.

Using carefully constructed panel data for the period 1989-2006 we find evidence that institutions of governance are important for economic growth *through* their influence on the macroeconomic environment. That is, good institutions are conducive to macroeconomic stability which in turn positively impacts upon economic growth. We also discover, in contrast with other work, that investments in secondary education have had a strong positive impact on growth in transition while other 'standard' economic growth determinants remain less important. These findings are shown to be robust to a variety of econometric approaches, specifications and time spans.

In presenting these findings, this paper augments the existing literature in the following three ways. First, by using more recent data, we are able to offer the first substantive evidence that investment in human capital is becoming a key determinant of economic growth in the post-communist world. Second, in identifying a widely used (input) proxy for macroeconomic stability as a policy *output* variable we are led to investigate its relationship with the wider institutional environment and in doing so learn an important general lesson pertaining to the complex relationship between institutions of governance, macroeconomic stability and economic growth. Third, our econometric approach is the first we know of that establishes a consistent set of results, relating to medium-term economic growth in transition, using pooled OLS, simple effects models, panel instrumental variable models and dynamic panel models.

We proceed as follows. Section 2 presents a brief discussion of the relationship between the institutions of governance, macroeconomic stability, and economic growth in transition economies. In Section 3, we discuss the econometric methodology used to explore this relationship and, in section 4, we introduce the data. Section 5 presents our results and discusses associated policy and research implications. Section 6 concludes the paper.

2. Institutions, Macroeconomic Stability and Economic Growth

Macroeconomic stability has long been identified as one of the main determinants of economic growth in both transition and non-transition settings (Lucas 1973; Easterly and Rebelo 1993; Fischer 1993; De Melo *et al* 1996; Aslund *et al* 1996; Barro 1995; Loungani and Sheets 1997; Bruno and Easterly 1998; Zinnes *et al* 2001; Lawson and Wang 2005; Falcetti *et al* 2006; Havrylyshyn 2006). In the bulk of this literature, the relevant empirical proxy for macroeconomic stability is an inflation variable, which is typically shown to have a negative and significant impact on economic growth.

One of the main contentions of this paper is that, while surely the macroeconomic environment is crucial for economic growth, the use of inflation as a proxy for it deserves much more cautious treatment. On the one hand, inflation is likely to be endogenous to economic growth, while of equal importance, inflation is itself an output variable. The endogeneity of inflation has several potential sources. First, some omitted variable may be correlated with both growth and inflation: for example, oil price shocks have been linked with movements in both price and output. Second, any apparent link between growth and inflation may simply be a spurious one rather than being indicative of some underlying causal relationship. This may be of particular importance when considering the post-communist economies, in which, following the initial 'shock' inflation/growth has declined/increased over time for reasons associated with transition specificity rather than a bivariate causal link. Third, there may be factors contributing to a positive relationship between inflation and output: for example, if external shocks to money or to the aggregate demand for goods cause output fluctuations this pattern may emerge (Barro 1995). Fourth, the growth and inflation relationship may suffer from simultaneity: inflation may impact growth but reverse causality may also exist in that inflation may be determined by past rates of economic growth. For instance, under a situation of rapid growth, money demand increases and fiscal authorities are able to maintain balance without recourse to printing money. In other words, high economic growth itself may contribute to macroeconomic stability. Indeed, this is an observation consistent with that of Mickiewicz (2005, pp.126-131) in the case of transition countries.

Aside from these possible sources of endogeneity we note, more fundamentally, that inflation is a policy output variable. That is, it is the product of some set of policy measures and therefore shouldn't sit alongside, for example, factor inputs in an economic growth equation. As Rodrik (2005) argued, in regard to growth regressions, if we fail to distinguish policy effort from policy outcomes when measuring potential growth determinants we are unlikely to learn much from such experiments. Campos and Horvath (2006) give further succour to this argument in drawing the distinction between policy inputs and outputs, while the

empirical work of Loyaza and De Soto (2002) and Glaeser *et al* (2004) is consistent with this line of reasoning.

Notwithstanding the studies noted above, the overwhelming preponderance of growth studies have overlooked the fact that macroeconomic stability is an endogenous policy output measure, and instead focused explicitly on the direct link between macroeconomic stability and growth. A few studies have tried to control for the presence of endogeneity, either by taking initial values, or by making use of instrumental variables. Barro (1995) suggests two different instrumental variables: lagged inflation and prior colonial status (former Spanish and Portuguese colonies).[1] Guerrero (2006), proposed previous experience of hyperinflation as an instrumental variable on the grounds that significantly lower inflation is associated with the post-hyperinflation period. In both cases there is some evidence that, when making adjustments for the presence of endogeneity, the adverse affect of inflation on long-run growth holds. However, both studies also illustrate the difficulties of identifying appropriate instruments, correlated with inflation but uncorrelated with economic growth. Mickiewicz (2005) instruments inflation with a fiscal balance indicator, an index of political rights, and an economic reform index and finds that inflation has an unambiguously negative effect on economic growth. De Melo *et al* (2001), also estimate a system of equations in which central bank independence is considered as a possible instrument for inflation, as the former exhibits a strong negative relationship with the latter (Grilli et al 1991; Cukierman 1992; Barro 1996).

Learning from these studies, in this paper, we argue that while macroeconomic stability is important for growth, the policy inputs that determine that stability are related to institutions of governance. Thus, among the many candidates for instrumenting inflation, we concentrate on the role of the institutional environment. Before detailing how we deal with this econometrically it is worth visiting briefly the underlying argument linking institutions and economic stability. In doing so we draw on three of the Kaufman (2007) indicators of institutional quality: 'corruption'; 'political stability'; and 'government effectiveness'.[2]

Corruption, measured (Kaufmann *et al* 2007) as "the extent to which public power is exercised for private gain as well as capture of the state by elites and private interests", is related to macroeconomic stability through a parallel mechanism. Specifically, the more corrupt countries are, the greater the costs of tax collection (Al-Marhubi 2000). Other things being equal, government revenues will be reduced and public spending will rise and the

[1] Both lagged inflation and colonial experiences appeared to be predetermined and also related to the current inflation rate. However, there were serious shortcomings with these instruments: in the case of the former, without using more distant lags (e.g. via GMM) there is a serial correlation problem; in the case of the latter the former colonial status shows no correlation with inflation in the later period (1990s).

[2] We discuss these indicators in more detail in section 4.

propensity for the government to pursue seigniorage, instead of taxes, is eventually associated with accelerating inflation (Cukierman *et al*, 1992).

Kaufmann *et al* (2007) define 'political stability' as "the perceptions of the likelihood that government will be destabilised by unconstitutional or violent means." Abundant research has found an empirical link between political and macroeconomic stability. Satyanath and Subramanian (2004) argue that while macroeconomic instability is normally determined by conflict, openness, and political institutions, the most robust relationship is the one involving political institutions (democracy). They argue that an increase of the democracy indicator (measure of openness of political system) by one standard deviation can reduce instability nearly fourfold. Similarly, Mickiewicz (2005) also finds that democracy has played an important role in stabilising macroeconomic conditions in the transitional countries of post-communist Europe.

Our key argument, combining the above themes, is that it is the 'institutions of governance' that are most closely linked with macroeconomic stability. According to Kaufmann *et al* (2007), governance is defined as "the quality of public and civil service, independence from political pressures, quality of policy implementation, and the credibility of government." This is important since it reflects the ability of the government to collect taxes, and thus removes the need (or temptation) to rely on seigniorage to increase its revenue. On the other hand, less effective governance is likely to result in low tax collection and more prevalent tax evasion, contributing to increased budget deficits and higher inflation. A recent World Bank Report (2007) supports this view, comparing the public spending and taxation in the transition group with those in comparator countries in Asia and Africa, and demonstrating that government spending and taxation reforms have positive effects on the public finances. Furthermore, it is argued that higher public spending would lead to macroeconomic instability and lower economic growth, only when institutions are weak. With lower quality governance institutions, money is less likely to be well-spent and higher tax and/or fiscal deficits will eventually distort the business environment and threaten macroeconomic stability.

There is indeed a growing and convincing body of evidence emerging that points towards the strong causal link between institutional settings and macroeconomic stability. This body of literature, stemming from attempts to detail the conceptual, political economy linkages at play, has prompted the development of increasingly sophisticated quantifiable measures that attempt to capture institutional structures empirically. This makes our task of identifying potential 'input' instruments for inflation more achievable. We turn to this in section 4, after first explaining our econometric approach.

3. Econometric Methodology

Endogeneity, as introduced in the previous section, and unobserved heterogeneity are among the classical problems facing any empirical research into economic growth. It is therefore essential that any such research addresses these issues carefully and systematically. For this reason, in this section, we devote a little time to the task of identifying these potential pitfalls. In particular, in section 3.1 we address the problem of unobserved heterogeneity through the use of simple effects models; in section 3.2, we treat inflation as an endogenous policy output measure and thus employ a 2SLS approach; finally, in section 3.3 we use both first-differenced and system GMM to attenuate potential endogeneity across the range of growth determinants.

3.1. Unobserved Heterogeneity: Effects models

Growth regressions have become a somewhat inveterate feature of empirical work in long-run macroeconomics in recent times. Examples abound, stemming from the original work of Barro (1991) and Levine-Renelt (1992), incorporating independent variables derived from both growth theories as well as from macro- and microeconomic policy variables. The early examples utilise cross-country regressions measuring long-run 'equilibrium' values while, more recently, improved data sets and econometric software have facilitated a preponderance of panel-based empirical growth studies. In the latter, real GDP per capita growth is typically regressed on a number of explanatory variables, as per equation 1, in which subscripts *i* and *t* denote country (*i* = 1, 2, ….25) and year (*t* = 1989, 1990….2006) respectively:

$$G_{i,t} = \beta_0 + \beta_1 \ln(Y_0)_{i,t} + \beta_2 X_{i,t} + \varepsilon_{i,t} \qquad \text{(Eq 1)}$$

G_i represents the average annual growth rate; $\ln(Y_0)$, incorporated as a test of Solow convergence, is the log of initial GDP per capita; $X_{i,t}$ is a list of control variables derived from theories of economic growth supplemented with empirically plausible policy variables. The latter, which in broad terms, can be mapped back onto the variables identified as being 'growth determinants' in Sala-i-Martin *et al* (2004) include: (a) macroeconomic stability proxied by inflation; (b) variables capturing processes of economic or political liberalisation such as trade openness.

Panel data analyses have clear advantages over the earlier cross-section approaches in so far as they allow for differences in individual country effects, while also controlling for unobserved heterogeneity (Islam 1995). Specifically, the error term in equation 1 can be decomposed into a country-specific effects term (c_i) and a stochastic error term ($u_{i,t}$).

$$\varepsilon_{i,t} = c_i + u_{i,t} \quad \text{(Eq 2)}$$

This composite error tends to be serially correlated due to the country effects in each time period. If country effects (c_i) are thought to be correlated with $u_{i,t}$, then the goal should be to eliminate this effect through the 'fixed effects model'. However, if country effects (c_i) are uncorrelated with each explanatory variable in all time periods, then eliminating this would result in inefficient estimators. In that case, the so-called 'random effects model' is more appropriate.[3] In keeping with the literature, the Hausman test (1978) is available to guide the choice between these effects models.

3.2. Endogenous policy variables: Instrumental variables models

With the use of panel techniques then, we are able to go some way towards removing the problem of unobserved heterogeneity. However, one of our key empirical interests, inflation, is still empirically troublesome since, as explained in section 2, it is still almost certainly endogenous to the process of economic growth. In particular, thinking of inflation as a policy output variable, it is easy to imagine the existence of a simultaneity bias rooted in a process of joint determination.

In this situation, instrumental variables approaches in the form of two-stage Least Squares (2SLS), is one of the popular procedures.[4] Valid instruments must be strongly correlated with the endogenous variable (the 1st criterion for IV), but be completely uncorrelated with the error term (the 2nd criterion for IV). If we can identify such instruments then we are in a position to explore whether inflation, as a growth determinant, is robust to the attenuation of an inherent endogeneity. Given our discussion, logic dictates that we need to instrument inflation (a policy output) with some other policy input variable(s).

In section 2, we forwarded the argument that macroeconomic stability is substantially determined by the institutional environment. We argued that effective institutions of governance are associated with macroeconomic stability and the direction of causation is from the former to the latter (Satyanath and Subramanian 2004). In the transition context then, a stable macroeconomic environment is a reflection of the degree of commitment by the political authorities to a programme of stabilisation. This being so, we cannot consider stabilisation itself to be an exogenous policy tool (Campos and Horvath 2006; Falcetti *et al* 2006). Indeed, the inflation-economic growth transmission mechanism can be summarised as

[3] The ideal random effect assumptions include all of the fixed effects assumptions plus the additional requirement that c_i is uncorrelated with all explanatory variables in all time periods (Wooldridge 2002).

[4] According to Wooldridge (2003, pp.512), applying 2SLS to panel data is an appropriate technique to estimate parameters in the presence of unobserved effects and endogeneity in one or more time-varying explanatory variables.

follows: poor quality governmental institutions lower the effectiveness of government, this in turn exacerbates fiscal and macroeconomic instability and *ceteris paribus* negatively impacts upon economic growth. Empirically, we proposed the Kaufman measure of 'government effectiveness', as representing the most generalised measure of public sector institutional quality and, as we show in section 5 (table 3), this is indeed the measure both most *strongly* correlated with macroeconomic stability and most *weakly* correlated with economic growth.

3.3. Generalised problem of endogeneity: Dynamic Panel Models

So far, we have reviewed methods aimed at reducing the effects of unobserved heterogeneity and have discussed the important possibility that inflation, as a proxy for macroeconomic stability, is in fact an endogenous policy output variable. However, in empirical growth applications, it is also possible that other explanatory variables are in fact endogenous. In the spirit of the discussion above we may conceive of identifying instruments for each potentially endogenous variable, yet realistically, the plausibility and appropriateness of 2SLS as a general solution is questionable. Fortunately, with the emergence of more powerful econometric software and more reliable data series, researchers are increasingly able to call upon Generalised Method of Moments (GMM) techniques to produce dynamic panel analysis (Arellano and Bond 1991; Blundell and Bond 1998). GMM techniques are both complex and sophisticated and implementing them requires great caution, we therefore devote a little discussion to the main variants of GMM below.[5]

(a) "Difference" GMM

Difference GMM (Arellano and Bond, 1991), proposes using the lagged values of the dependent variable as instruments for the endogenous variables. Consider the standard panel dynamic model (equation 3), where $Y_{i,t}$ represents GDP per capita, $X_{i,t}$ is a set of 'traditional' explanatory and policy variables, c_i is an unobserved country specific effect, and $u_{i,t}$ is the error term.

$$\ln(Y_{i,t}) = \beta_0 + \beta_1 \ln(Y_{i,t-1}) + \beta_2 X_{i,t} + c_i + u_{i,t} \qquad \text{(Eq 3)}$$

To sweep out the country specific effect (c_i), we take first differences of equation 3.

$$G_{i,t} = \beta_1[\ln(Y_{i,t-1}) - \ln(Y_{i,t-2})] + \beta_2[X_{i,t} - X_{i,t-1}] + [u_{i,t} - u_{i,t-1}] \qquad \text{(Eq 4)}$$

[5] Good applications of GMM techniques can be found in Bond 2002; Hoeffler 2002; and Nkurunziza and Bates 2003. Roodman (2006) presents perhaps the definitive guide to implementing and understanding "Difference" and "System" GMM.

where $G_{i,t}$ now represents $\ln(Y_{i,t})-\ln(Y_{i,t-1})$. In sweeping c_i out of the equation this transformation removes the problem of omitted variable bias but, in so far as $G_{i,t}$ and/or $(X_{i,t}-X_{i,t-1})$ are correlated with the new error term $(u_{i,t}-u_{i,t-1})$, estimates of equation 4 will suffer from endogeneity bias. To overcome this we seek valid instruments for both $G_{i,t}$ and $(X_{i,t}-X_{i,t-1})$.

If $X_{i,t}$ is an endogenous variable, where $E(X_{i,t}\ u_{i,t}) \neq 0$ and $E(X_{i,t-1}\ u_{i,t-1}) \neq 0$ then $E(X_{i,t-1}\ u_{i,t}-u_{i,t-1}) \neq 0$ and therefore a single period lag cannot instrument for $(X_{i,t}-X_{i,t-1})$. However, lags of greater than one period are valid instruments since they satisfy the following condition:

$$E(X_{i,t-2}\ u_{i,t}-u_{i,t-1}) = 0$$
$$E(X_{i,t-2}\ X_{i,t}-X_{i,t-1}) \neq 0 \qquad \text{(Eq 5)}$$

In the growth context, for example, if $X_{i,t}$ is the investment ratio, and current investment is correlated with the current GDP growth rate, then 'standard' approaches will be subject to endogeneity bias. Using difference GMM, and instrumenting investment with values of itself lagged two periods or more, we can expugn this bias (Arellano and Bond 1991; Easterly and Levine 2001; Hoeffler 2002).

(b) "System" GMM

Blundell and Bond (1998) argued that estimators relying on lagged variables are weak instruments if the data in question are close to being a 'random walk'. In this situation, the weak correlation of the lagged value of the regressor ($X_{i,t-1}$ or $X_{i,t-2}$) with its difference ($X_{i,t}-X_{i,t-1}$), affects the asymptotic and small sample performance of the differenced estimator. In these circumstances, 'difference' GMM performs poorly as the coefficient variances are inflated and finite sample bias becomes an issue. To combat these potential problems, 'system' GMM was proposed (Arellano and Bover 1995; Blundell and Bond 1998; Bond 2002). System GMM draws on the same instruments as difference GMM for the regression in differences but for the regression in levels the instruments are specified as the lagged differences of the corresponding variables (Easterly and Levine 2001).

Equation 6 asserts that $(X_{i,t-1}-X_{i,t-2})$, is uncorrelated with the country specific effect, c_i, even though the level of $X_{i,t}$ may itself be correlated. If this is the case, then to obtain consistent GMM estimates, the lagged differences turn out to be the appropriate instruments as equation 7 is satisfied.[6]

$$E(X_{i,t-1}\ c_i) = E(X_{i,t-2}\ c_i) \text{ for all time periods} \qquad \text{(Eq 6)}$$

[6] The same logic applies to the lagged dependent variable, $[\ln(Y_{i,t-1})-\ln(Y_{i,t-2})]$.

$$E[(X_{i,t-1}-X_{i,t-2})\,(c_i + u_{i,,t})] = 0 \qquad \text{(Eq 7)}$$
$$E[(X_{i,t-1}-X_{i,t-2})\,X_{i,,t}] \neq 0$$

System GMM therefore reduces any bias, associated with the weakness of instruments in difference GMM.

In order to apply either of the GMM techniques, there are two specification tests that allow the researcher to explore the validity of the instruments: first, is the standard Sargan or Hansen test for over-identifying restrictions; second, is the test for serial correlation in the error term (Arellano and Bond 1991; Arellano and Bover 1995; Blundell and Bond 1998; 2000; Easterly and Levine 2001; Bond 2002). We discuss these along with other implementation issues within our frame of reference in section 5. First though we introduce our data.

4. Data

Empirical research on economic growth generally uses International Financial Statistics (IMF), World Development Indicators (WDI, World Bank), and the Summers-Heston data set (the Penn World Tables).[7] The Summers-Heston data spans from 1950 to 2000, and has thus spurred efforts to explore the empirics of economic growth using panel and dynamic panel techniques.

In this paper, our focus, using predominantly WDI data, is on 25 transition economies of CEE and the CIS.[8] We have data on the transition economies for the period 1989-2006 – a period that might be thought of as representing 'medium-term'. Following the approach of Islam (1995) and Hoeffler (2002), rather than using annual observations from within our data, we construct three-year averages, resulting in six time units.[9] This is appropriate in our case for at least two reasons. First, by averaging over three year periods, we introduce a stability to our data that serves to offset the missing values and measurement errors that pertain to the data on the early stages of transition in particular. Second, if we wish to explore the robustness of our findings using GMM techniques then we need to limit the number of instruments if we are to obtain consistent estimates (Roodman, 2006). By reducing the number of time periods, from 18 to 6, we can constrain the number of instruments used to

[7] Examples abound including Barro (1991), Levine and Renelt (1992), Mankiw *et al* (1992), Islam (1995), Quah (1996), Sala-i-Martin (1997), Barro and Sala-i-Martin (2004) and Sala-i-Martin *et al* 2004, all of which make use of the Summers-Heston data.

[8] We exclude Serbia-Montenegro and Bosnia-Herzegovina, from the 27 countries that the EBRD typically identifies as transition economies in the pan-European region, due to data availability in the early 1990s. Unless stated otherwise our data is derived from WDI.

[9] The six units T1, T2,....T6 are: 1989-1991; 1992-1994; 1995-1997; 1998-2000; 2001-2003; 2004-2006.

obtain the GMM estimates.

As discussed, our growth estimation follows the approach widely used in the general empirical literature: the growth rate is regressed on explanatory variables derived from a combination of growth theories and growth empirics. Accordingly, we estimate economic growth (change in log GDP per capita averaged over 3 year periods) as a function of initial income level, factor accumulations, and economic policies. Specifically:

$$\text{Growth} = \beta_0 + \beta_1*\text{GDPPC} + \beta_2*\text{WPOP} + \beta_3*\text{INV} + \beta_4*\text{SEC} + \beta_5*\text{TRADE} + \beta_6*\text{FUEL} + \beta_7*\text{INF} \quad \text{(Eq 8)}$$

In (8), we use the average value of GDP per capita over three years (GDPPC) to capture the convergence process predicted by Solow (1956; 1957). Population growth is a standard explanatory variable in growth estimates, yet the transition context is rather peculiar in this regard in that transition has played host to a precipitous collapse in the birth rate alongside a steep increase in mortality. Correspondingly, the data indicates that population growth has been low and declining all the way through the transition period. Thus, the *a priori* theoretical expectation regarding the relationship between population and economic growth is unclear. We therefore use the growth of the working age population 'WPOP' as our population change variable. To capture factor accumulation, we use the share of gross fixed capital formation to GDP (INV) and the general secondary school enrolment rates (SEC) to proxy for physical and human capital investments, respectively.[10]

We now turn to our policy related variables. Many studies on economic growth in transition have used the liberalisation index to capture the seemingly imporant impact of transitional reforms (EBRD 1994-2006). However, we take the view that the liberalisation index is inappropriate for this type of analysis as firstly, it is artificially constrained by its lower and upper bounds while secondly, since it is significantly correlated with virtually every relevant independent variable, it is likely to seriously bias the econometric results. We therefore adopt 'TRADE' - the sum of exports and imports of goods and services measured as the share of GDP – as our preferred liberalisation proxy. In particular, TRADE captures the impact of economic openness on growth. In view of the significance of the natural resource sector to many of the CIS countries in our study, we also include a variable to capture this dimension. 'FUEL', which may have a positive or a negative effect, represents the percentage of fuel exports over merchandise exports. Natural resources can contribute directly to an increase of income, but equally may be associated with the well-documented 'Dutch Disease'.

[10] The human capital proxy, the percentage of the population aged from 15 to 18 enrolled in general secondary education, is obtained from the TransMonee, 2007 database, provided by UNICEF, since it allows for greater coverage.

The challenge of capturing the role of macroeconomic stability is central to the contribution of this paper. Consistent with the literature, we use inflation as our proxy for macroeconomic stabilisation during transition.[11] In contrast to the GDP deflator, the CPI includes imported goods and therefore incorporates the surge of imports prompted by the initial external liberalisation associated with transition. As explained above, we regard (input) institutions as the appropriate instrument variable for the (output) proxy – inflation. Among diverse categories of institutions that may affect macroeconomic stability, we follow the methodology of Kauffman *et al* (2007), where six governance indicators range in value from -2.5 to 2.5 with the higher values corresponding to better governance outcomes. These indicators rely on 276 variables[12] to measure institutions across six dimensions of governance: i) voice and accountability; ii) political stability; iii) government effectiveness; iv) regulatory quality; v) rule of law; vi) corruption. Unsurprisingly, the six Kaufman governance indicators are closely correlated with each other, as table 1 demonstrates.

[TABLE 1 ABOUT HERE]

Since these correlations preclude combining indicators we choose to utilise the 'goverrnment effectiveness' variable. According to Kaufmann *et al* (2007, pp.3), 'government effectiveness' measures "the quality of public service, the quality of civil service and the degree of its dependence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies." This includes a variety of exogenous factors associated with the achievement of macroeconomic stability: for example, the ability of the government to collect taxes and the independence of central banks. Therefore, in our 2SLS analysis, we instrument inflation (policy output variable) with government effectiveness (policy input factor). We turn now to a discussion of our empirical results.

5. Results

Accordant with the logic of our methodology, in this section we present our empirical results in three stages: effects estimates controlling for unobserved heterogeneity; 2SLS estimates attenuating the potential endogeneity of our macroeconomic stability variable; and GMM estimates treating multiple variables as being potentially endogenous. As we will show – the results of each approach are consistent and mutually reinforcing.

[11] Specifically we use the change in the Consumer Price Index (CPI). The CPI is a measure of the average prices paid by consumers for a fixed market basket or bundle of goods and services. We obtain our data from IMF Financial Statistics (2007), since the IMF provides superior coverage.

[12] The data draws on 31 sources constructed by 25 different organisations, covering 213 countries for 1996, 1998, 2000, and annually for 2002-2006.

5.1. Effects models

Following conventional panel procedures we estimate economic growth in transition using both fixed effects and random effects models, before conducting the Hausman (1978) test of whether the individual country unit effects are correlated with the explanatory variables incorporated in the model. Finding that we are unable to reject the null hypothesis (P-value = 0.04), that they are correlated; we are left relying on the consistent, but less efficient fixed effects estimates. The latter allow us to control for omitted variables that differ between countries but that are constant over time. The results (table 2) indicate that, though fixed effects estimates are preferred, there is no qualitative distinction to be made between the two.

[TABLE 2 ABOUT HERE]

The results are broadly consistent with expectations. Initial conditions, though insignificant, have the expected negative sign. The growth in the working population, the investment rate and openness to trade all have the expected positive sign, though again are not significant and the proportion of natural resource exports is positive but insignificant, perhaps reflected the contrary forces of 'Dutch disease' on the one hand and the oil boom on the other. Most promisingly however, education and macroeconomic instability are both highly significant and with the expected signs. This is our first evidence that investment in human capital has a positive impact on economic growth in transition while macroeconomic instability has a negative impact. As discussed above, the latter result is consistent with findings elsewhere. However, until now, there has been little evidence of a significant positive association between investments in education and economic growth in the transition context.[13]

5.2. Panel Instrumental variables models

We have argued above that our proxy for macroeconomic stabilisation – inflation - is not an exogenous input variable but rather is a policy output variable and as such, its incorporation will result in endogeneity bias. This being so, a possible econometric solution can be found in the use of instrumental variable techniques. In our earlier discussion we identified Kaufman's 'government effectiveness' as an intuitively plausible instrument for inflation. Empirically, we find that 'government effectiveness' is significantly and negatively related to macroeconomic instability (inflation) but is consistently unrelated directly to economic growth. Indeed, reproducing the effects estimates of section 5.1, with government effectiveness incorporated, we are unable to discern any significant relationship with

[13] These results are robust to the exclusion of TRADE alone, FUEL alone, and TRADE/FUEL together and to estimates using annual panel observations. Results are available on request from the authors.

economic growth.[14]

Following Wooldridge (2003), we therefore proceed to apply 2SLS to our transition economy panel data. That is, we combine 2SLS with effects models in order to obtain parameter estimates purged of both unobserved effects and endogeneity in the macroeconomic stability variable. Conducting the Hausman test we find no evidence that the individual country unit effects are correlated with the explanatory variables incorporated in the model and so we concentrate our discussion on the results of the random effects instrumental variables regression presented in table 3.

[TABLE 3 ABOUT HERE]

In the first stage regression, where inflation (CPI) is the dependent variable, 'government effectiveness' is strongly and negatively associated with 'CPI', whereas no other variable is significantly related to inflation. This result is not affected by the use of different estimators or of different time spans and is strongly supportive of our earlier discussion, namely that macroeconomic stability is an outcome of sound institutions of governance. In the second stage regression, where the growth rate is again the dependent variable, we purge the endogeneity introduced by the inflation variable by using, in its place, the 'government effectiveness' instrument. Entirely in keeping with the results of simple effects models, we find that initial conditions, the growth of the working population, the investment rate, trade openness and natural resource exports are all insignificant but with plausible signs, while macroeconomic instability and investment in human capital are both highly significant and with the expected sign.[15]

In sum, by revisiting the panel data available for transition countries up to and including 2006, we find evidence that the key determinants of economic growth are human capital investment and macroeconomic stability. The latter result has been widely reported but in this paper we find evidence suggestive of a slightly nuanced explanation. That is, macroeconomic stability is an outcome of effective government institutions and it is this combination of factors which explains differences in economic performance across the transition economies. The former result, regarding education, is a new finding for the transition economies and indicates that as these economies emerge from the 'transitional' process they may converge on 'behaviour' concordant with that observed elsewhere. However, these findings are still open to the

[14] These results are not reported but are available on request from the corresponding author. We note also that the inclusion of government effectiveness as an explanatory variable does not qualitatively effect the results reported in section 5.1.

[15] As before, these results are robust to the exclusion of TRADE alone, FUEL alone, and TRADE/FUEL together and to estimates using annual panel observations. Results are available on request from the authors.

critique levelled at most economic growth estimates, that any one or all of the right hand side estimates may actually be endogenous to the process of economic growth. Therefore, we further investigate the robustness of our results using dynamic panel methods.

5.3. Dynamic Panel Methods

In table 4, we report four sets of dynamic growth regressions mirroring the specifications discussed above: pooled OLS, fixed effects, difference GMM and system GMM. By examining the coefficient on the lagged dependent variable we are able to check the validity and robustness of our GMM results. In particular, the estimate for the lagged dependent variable in the pooled OLS regression (column 1) is likely to be upward biased in so far as it is positively correlated with the unobserved country specific effects (Hoeffler, 2002; Hsiao 1986). In contrast, the fixed effects estimator (column 2), though eliminating the problems stemming from country specific effects is, according to Nickell (1981), likely to produce downward biased estimates of the lagged dependent coefficient. The coefficients, both of which are strongly significant, from these two approaches can therefore be thought of as approximate upper (1.02) and lower (0.20) bounds for the GMM regressions. That is, if the GMM estimates for the lagged dependent variable fall outside of the upper and lower bounds, it suggests some form of bias is also present in the GMM estimates.

[TABLE 4 ABOUT HERE]

With column 1 and 2 confirming that there is a dynamic process at work we then address the problem of endogeneity within our model, first through difference GMM (column 3) and then through system GMM (column 4). Specifically, in each case we consider that the investment ratio and the human capital proxy, *as well as* the macroeconomic stability variable, are endogenous to the process of economic growth. In terms of our upper and lower bounds we find that the difference GMM estimate of the lagged dependent variable, 0.20, is similar to that of the fixed effects estimate presented in column 2, while the system GMM coefficient, 0.98, is just below the upper bound presented in column 1. Blundell and Bond (1998), demonstrate that the difference GMM estimator suffers large finite sample biases such that, if the instruments available are weak, difference GMM estimates are downward biased as with the fixed effects estimates. The evidence of table 4 is cautiously supportive of this finding and, since the corresponding system GMM estimate falls below the upper bound, we consider that the system GMM approach may be the preferred approach for our purposes. Indeed, between these estimators, the system GMM has been preferred in many studies for logic mirroring that which we have applied (Blundell and Bond 1998; Easterly and Levine 2001; Hoeffler 2002; Nkurunziza and Bates 2003).

Notwithstanding these comments, any GMM estimate must have valid instruments and be correctly specified. In both of our GMM estimates, the Hansen test fails to reject the assumption that our instruments are valid and the (Sargen) autocorrelation test results are consistent with the assumption that our models are correctly specified. In particular, since the differenced residuals are expected to follow an MA(1) process (Arrelano and Bond 1991), we concentrate on the AR(2) autocorrelation results. These test the null hypothesis of no second order autocorrelation which, if present, would indicate that our GMM estimates are inconsistent. The P-value for AR(2) in the difference and system models is 0.306 and 0.955, respectively and therefore we are content that our specification is valid.

Concentrating on the system GMM for the reasons forwarded above, table 4 provides strong evidence supportive of the findings derived from simple effects models and 2SLS approaches and of our *a priori* expectation that the growth process is indeed dynamic. Specifically, we find once again that macroeconomic stability and investment in human capital is important for economic growth in the transition economies while, even allowing for their potential endogeneity, investment, trade openness, natural resource exports and growth of the working population have ambiguous effects on economic performance for this set of countries.
Finally, there is a further transition specificity, regarding the inflation-economic growth relationship, which merits consideration. It is well understood that at the start of the transition process there was a concurrent output decline and hyperinflation which may lead us to the erroneous conclusion that hyperinflation caused recession and thus that macroeconomic stability should result in economic recovery. This is not the effect we want to be capturing in this paper. Indeed, the explanation for and implication of the initial price hikes is quite distinct from subsequent inflationary episodes occurring across parts of the post-communist world. In order to confirm our findings therefore, we estimate our model without the first two time periods, covering 1989-1994, and are thus able to observe the role of inflation in the later stages of transition. Reassuringly, our results are confirmed as we find once more that macroeconomic stability and education are significant and positive determinants of economic growth.

In sum, our empirical results centre on arguments made along two core dimensions: macroeconomic stability and the role of human capital. Our results are not sensitive to different econometric approaches, assumptions, specifications or time spans and are robust to a range of different panel approaches.

6. Concluding Discussion

In this paper we have systematically revisited the determinants of economic growth in transition, taking a longer data series than previously available, assessing the impact of factor accumulations in a potentially more appropriate way, incorporating a role for institutions of governance and carefully employing three different econometric approaches to attenuate unobserved heterogeneity and potential endogeneity. Our main results are consistent and mutually reinforcing across econometric specification and technique and taken together they are persuasive of: a) the importance of macroeconomic stability for economic growth in transition; b) the growing impact of human capital investments on economic growth; c) the vital role that institutions and good governance play in generating economic stability and; d) the importance of further research into the role of other factor accumulations, particularly investment, in contributing to economic growth.

Macroeconomic instability, as proxied by inflation, is always statistically significant and with a negative impact on economic growth. Inflation, it seems, is definitively bad for economic growth in transition. However, inflation itself is in fact a policy output, the inclusion of which is likely to introduce simultaneity bias into our growth estimates. We therefore go further, instrumenting inflation with Kaufman's 'government effectiveness' variable. We find that inflation is determined by effective governance, even though the latter cannot be linked directly to economic growth. That is, good governance is important indirectly through its association with the kind of institutions that facilitate a stable macroeconomy.

Our results regarding investment in human capital are different from those provided by other studies on growth in transition, in which education is generally found to be insignificant. The explanation for this lies in the fact that we are using different measures. Most previous studies take the value of *initial* education to estimate the human capital-economic growth relationship. It should come as little surprise that levels of human capital characteristic of the end of the communist period transpire not to be appropriate for the market-based economy. Indeed, Laporte and Schweitzer (1994) argue that a higher level of initial education is meaningless for, or perhaps even detrimental to, economic growth since the social sciences and the humanities endured particular neglect during the central planning period. Much greater emphasis was placed on political and philosophical beliefs at the expense of subjects like economics, management, business, law, and sociology. By way of contrast, in this paper, we take three year averages of the secondary school enrolment rate on the grounds that constant investment in education during the transition is more likely to have a significantly positive impact on economic growth. The raw data supports this thesis. Countries achieving high economic growth during the transition, such as Estonia, Poland, Albania, and Latvia,

show a significant increasing trend in secondary education enrolments. On the other hand, the poor performers in terms of economic growth - Tajikistan, Georgia, and Turkmenistan – exhibit a decreasing or constant trend in educational enrolments.

In terms of the other factor accumulation variables known to be important for economic growth in developed and/or developing economies are results pose more questions than answers since, although the signs on the variables are plausible enough, at no time are they statistically significant. We feel that, since physical investment in particular has been one of the main determinants of rapid growth elsewhere in the world, this merits further investigation. Several avenues show promise: it may be that there is some complex relationship between investment and inflation which our data cannot detect; more plausibly still, as argued by Mickiewicz (2005), it is the quality of investment, rather than the quantity that matters in the transition context; finally, there may be a transition specific story relating the impact of investment to the appropriateness of institutions. These are interesting and important lines for future research but are outside the scope of this paper. It is also worthy of comment that we have utilised an openness measure instead of the (more common) liberalisation indicator. We choose to do this on the grounds that it is less subjective and less sensitive to measurement error and not because we are denying the importance of microeconomic reforms in transition. Rather, our story is in the spirit of Mckinnon (1993) who argues that microeconomic, macroeconomic and institutional aspects are closely and inextricably linked. To the extent that we are able to capture this, we do so in our 2SLS estimation which confirms that government effectiveness leads to macroeconomic stability, which in turn is a main determinant of economic growth.

Finally, it is worth reflecting that empirical growth studies must be treated with caution due to the ever present possibility of heterogeneity and endogeneity, data inconsistency, and the potentially biased selection of variables. Moreover, these issues become potentially more worrisome in the case of transition economies. These concerns inform our systematic approach and our caution in interpretation. However, as Falcetti *et al* (2006) suggest, although we cannot yet have a clear understanding of the long-term determinants of growth in transition economies, investigating growth patterns in these important economies will rightfully continue to be fruitful areas of research as the transition from the command economy structures progresses. Ultimately, as we seek more generally to understand and refine economic growth models in a world in which institutions and structures are known to be ever more important, the research community should not ignore the lessons to be learnt from the unique setting provided by the transition economies of Central and Eastern Europe and the Former Soviet Union.

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Tables

Table 1. Correlation Matrix of Six Governance Indicators

	VA	PS	GE	RQ	RL	CC
VA	1.00					
PS	0.75	1.00				
GE	0.82	0.83	1.00			
RQ	0.87	0.79	0.93	1.00		
RL	0.82	0.85	0.98	0.92	1.00	
CC	0.78	0.82	0.97	0.88	0.98	1.00

Source: Kaufmann *et al* (2006)

Note: i)VA: Voice and Accountability; ii)PS: Political Stability; iii)GE:Government Effectiveness; iv)RQ:Regulatory Quality; v)RL: Rule of Law; vi)CC: Control of Corruption

Table 2. Basic Model (Fixed and Random Effects)

	T1 – T6 (1989-2006)	
	FE (n = 82)	RE (n = 82)
ln(GDPPC)	-5.20	-0.15
	(5.78)	(0.62)
WPOP	0.97	0.39
	(1.35)	(0.67)
INV	0.004	0.05
	(0.51)	(0.12)
SEC	0.51***	0.19***
	(0.17)	(0.06)
TRADE	0.04	0.005
	(0.04)	(0.02)
FUEL	0.22	0.03
	(0.14)	(0.03)
CPI	-0.02***	-0.02***
	(0.004)	(0.003)
Hausman Test	Chi Sq = 14.41 Prob(Chi Sq) = 0.04	

Data Source: WDI (2007); IMF(2007); TRANSMONEE (www.unicef.org)

Table 3. Panel 2SLS Estimation (IV: Government Effectiveness)

	T1 – T6 (1989-2006)	
	Fixed Effects (n = 68)	Random Effects (n = 68)
1st Stage Regression		
ln(GDPPC)	-290.42	23.47
	(193.51)	(20.91)
WPOP	31.79	2.16
	(40.29)	(15.13)
INV	1.98	2.42
	(6.79)	(2.75)
SEC	5.28	-0.06
	(6.54)	(1.28)
TRADE	-0.57	0.57
	(2.09)	(0.44)
FUEL	1.62	0.17
	(3.37)	(0.77)
Gov Eff	-97.62***	-90.79***
	(57.79)	(31.82)
2nd Stage Regression		
CPI	-0.03	-0.03**
	(0.02)	(0.01)
ln(GDPPC)	8.46	-0.49
	(8.90)	(0.52)
WPOP	-0.62	-0.65
	(1.47)	(0.51)
INV	-0.17	0.14
	(0.22)	(0.10)
SEC	-0.08	0.15***
	(0.20)	(0.04)
TRADE	0.02	-0.001
	(0.06)	(0.02)
FUEL	0.23**	0.03
	(0.11)	(0.03)
Hausman Test	Chi Sq = 5.57 Prob(Chi Sq) = 0.59	

Data Source: WDI (2007); IMF(2007); TRANSMONEE (www.unicef.org)

Table 4. Growth Estimation of Transition Economies

DV: $\ln(gdppc)_{i,t}$	**(1) Pooled OLS (n = 79)**	**(2) Fixed Effects (n = 79)**	**(3) DIF-GMM (n = 55 / IV = 15)**	**(4) SYS-GMM (n = 79 / IV =24)**
$\ln(gdppc)_{i,t-1}$	1.02***	0.20**	0.20	0.98***
	(0.02)	(0.09)	(0.26)	(0.03)
WPOP	0.01	0.01	0.05	0.05
	(0.02)	(0.02)	(0.07)	(0.03)
INV	0.004	0.01***	0.003	0.006
	(0.003)	(0.003)	(0.01)	(0.007)
SEC	0.003***	-0.002	-0.03*	0.01***
	(0.001)	(0.005)	(0.02)	(0.004)
TRADE	-0.001	-0.002	0.002	-0.001
	(0.0004)	(0.001)	(0.006)	(0.001)
FUEL	-0.001	0.004*	-0.006	-0.0004
	(0.001)	(0.003)	(0.008)	(0.002)
CPI	-0.0003**	0.0001	-0.00008	-0.001***
	(0.0001)	(0.0001)	(0.0003)	(0.0004)
AR(1)			0.207	0.366
AR(2)			0.306	0.955
Hansen			0.726	0.260

Data Source: WDI (2007); IMF(2007); TRANSMONEE (www.unicef.org)

Notes: All standard errors are corrected for heteroskedasticity. Each regression includes time dummies which as not of direct interest to us in this context are excluded for ease of exposition.

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