

Econometric Papers on the Relationship between Education, Democracy and Macroeconomic Crisis

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'I, Christy Smith 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.'

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Abstract

This thesis seeks to contribute to the existing political and economic literature on the relationship between education and democracy through a series of econometric studies. We have used the Blundell-Bond System-GMM estimator on panel data, pioneered the use of Structural Vector Autoregression analysis on a single time series, and used logistic regression on one of the most balanced and up-to-date cross-country panels. In doing so the scope of our study has ranged from the depth and richness of detail afforded by a case-study approach to the breadth of multi-country analysis; from 1890s France to 2010 Kyrgyzstan, whilst providing a detailed set of examples of country-specific democratic transitions which have occurred over the last forty years. The results of our long run, short run, linear, and nonlinear studies have consistently found that education not only exerts a positive and significant effect on democracy, but that education is the strongest predictor of permanent transitions to democracy.

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Introduction

2014 has been characterised by a large number of student-led pro-democracy movements. In February, Venezuelan students initiated widespread demonstrations against the government's inability to tackle soaring crime rates, hyperinflation and the shortage of basic goods. The movement ended in violence, barricades and bloodshed, leaving many dead, even more wounded and more than a thousand people detained by the police (Nagel 2014). Across the Atlantic, in the same month, a people's revolution of mass-student involvement which had been taking place in Ukraine since November against the government's perceived shift against European integration in favour of closer ties with Russia, resulted in the resignation of President Yanukovich and his government for the second time since the 2004 Orange Revolution. The ensuing conflict has resulted in a bloody civil war. Farther East in September a student-led occupation movement began in Hong Kong against China's Standing Committee of the National People's Congress (NPCSC) decision to disallow electoral reform for 'one person one vote' and instead will continue to pre-elect several candidates through its 1200-member nominating committee prior to public vote. In Africa, in October, protests erupted in Burkina Faso following President Compaore's attempt to change the 2005 constitution and extend his 27-year term, mirroring the student-initiated 2011 uprising against increasing inflation (then joined by the army and workers over unpaid wages). Compaore resigned and an interim government is in place until an election is announced within the next 12 months. Several days later the student "Opposition Youth Movement" in Djibouti began protesting against their President's 15 year reign. Protests have also been ongoing in a number of countries involved in the 'Arab Spring' in 2011 which was a widespread, largely student-led movement that swept across approximately twenty Middle East and North African countries in protest against rising inflation, unemployment and lack of political freedoms, that resulted in the toppling of long-standing rulers in Tunisia, Egypt, Libya and Yemen.

Whilst student activism in its entirety is not the focus of this thesis, the events of 2014 serve as a reminder that students have been at the forefront of a large number of democratic transitions that have taken place over the last 40 years, from the Athens Polytechnic Uprising in 1973 which led to an open anti-military junta revolt in Greece, and the student-led revolution in Thailand the same year, to the 1990 Wild Lilly Student movement in Taiwan for example, and more recently the Tulip Revolution in 2005 in Kyrgyzstan which served as a precursor to their 2010 democratic transition; notwithstanding the role students played in number of transitions in Latin America in the 1980s and 1990s and the democratisation of Eastern Europe after the collapse of the Soviet Union. University students were also the leading instigators of pro-democracy movements in Mali, Benin, Malawi and the Central African Republic in the early 1990s; countries deemed by most statistical measures to have low levels of income and average years of education. These events provide at least anecdotal evidence of the role that education plays in furthering democracy.

The relationship between education and democracy has been one of the most extensively researched throughout the social science literature, largely originating with Lipset's (1959) seminal paper on socio-economic modernisation, which argued that industrialisation, urbanisation, an emerging middle class and rising incomes and education levels set forth the likely requisite conditions for democracy to emerge. Education is said to increase civic participation by increasing the mental ability to process political information, make informed choices and circumvent obstacles to civic freedoms: secondly, by shaping individual preferences for, and benefits of, civic activity; and thirdly, through endowing students with fundamental democratic and pluralistic values (Dee, 2003).

Indeed, recent studies confirm that the level of education strongly predicts mass endorsement of democratic procedures as well as rejection of non-democratic alternatives (Chong and Gradstein 2009, Evans and Rose 2012, Botero et al 2012). In the income-democracy literature it is education that is predominantly viewed as the transmission mechanism through which higher levels of prosperity generate democratic preferences. Furthermore, Davis (1962) and Huntington (1968) explain that higher education in modernising countries may lead to unemployment as labour markets are unable to accommodate this large group of skilled workers. The resulting unmet aspirations may lead to violence and political instability as was the case for the Arab Spring.

Econometric studies have explored the long run education-democracy relationship on large panel datasets using cross-sectional models, specifically using OLS and fixed effects (Glaeser et al. 2004, 2007) and on panel data using system GMM models (Bobbia and Coviello 2007, Castello-Climent 2008, Murin and Wacziarg 2014) with positive results. Education is found to exert a positive and significant effect on democracy. Concomitantly, studies using principally Two-Stage Least Squares (2SLS) regression (Adams-Kane and Lim, 2008, Eicher et al. 2006, Baum and Lake 2003) found that democratic institutions impacted economic growth primarily through increasing education. Furthermore, studies using Three-Stage-Least-Squares (Tavares and Wacziarg 2001, Ulubasoglu and Doucouliagos 2004) found democracy to have a direct positive and statistically significant effect on education. In this regard the endogenous relationship between education and democracy over the long run is noted, though we find few studies which investigate the magnitude and causal direction of the two-way relationship. Only Glaeser et al. (2004, 2007) and Murin and Wacziarg (2014) regress education and democracy directly on each other. The former uses OLS on a cross-section of data to find no effect of initial democratic institutions on the growth in education, but they find initial education to have a positive and significant effect on the growth in democratic political institutions. The latter uses System-GMM on panel data to find that education exerts a positive and significant effect on democracy, but democracy does not produce a significant effect on youth education (a flow variable captured by the average years of schooling of the 5-14 year age group) once the level of economic development is controlled for (proxied by the average years of education in the population aged 25+, a stock variable). Indeed this proxy absorbs all the significance. Murin and Wacziarg (2014) do not investigate if democracy impacts the stock of education in the population. As a result neither paper investigates the nature of the two-way relationship between education and democracy sufficiently. Investigating this complex, endogenous relationship is the principal topic of this thesis. Whilst we are aware of the rich social science literature on the nature of the education-democracy relationship, our thesis takes an empirical econometric approach.

Our first Chapter is thusly motivated. We use the Blundell-Bond System-GMM estimation, which is a more efficient regression model in the presence of endogeneity than OLS, on a panel of 144 countries over the years 1970 to 2005 to find that democratic political institutions and education exert positive and significant effects on one another, contrary to the findings of Glaeser et al (2004, 2007) and Murin and Wacziarg (2014). Our key finding is that education, over and above income, exerts a stronger and in some cases more significant effect on the formation of democratic political institutions than the reverse. In this regard developing countries may be best advised to prioritise improving education over democratic institutional reform.

Prompted by this finding, in our second chapter we develop a case study which extends the analysis beyond the System-GMM regression by investigating the direct education-democracy relationship using strictly time series techniques on a single country, namely France, over a much longer period from 1896 to 1994. To our knowledge

the application of structural vector autoregressive models (SVAR) to this subject has not been tried. The utility of these models lie primarily in a function of the SVAR coefficients, namely the structural impulse response function (SIRF) as a moving-average representation of the system. The SIRF shows how democracy responds to an unexpected structural shock in education; how quickly democracy responds, for how many periods the resulting effect may be significant for and how quickly the effect may dissipate, if at all. This is quite different to the regression analysis that has already been undertaken, which models the linear relationship between democracy and education over time. The estimation results show that shocks to education have a positive and significant effect on democracy that lasts for several years. Furthermore, by drawing upon the contemporaneity restrictions of the SVAR model, motivated by our case-study approach and economic theory, we also highlight the contemporaneous relationship between education and democracy that GMM and VAR models, by extension of the econometrics, cannot address. GMM is a type of instrumental variable regression model which uses lags as instruments for the contemporaneous values and VAR models cannot determine the contemporaneous relationships between the variables without structuralising the VAR to impose restrictions on the error variance-covariance matrix.

The results of our first two chapters however bring us to an interesting juncture. If education exerts a positive and significant effect on democracy and shocks to education exert a positive effect on democracy that remains significant for several years, we are left wondering why some highly educated countries are not democratic. What is the missing link or catalyst required for democratic transition to occur?

Here we turn to the more recent democracy literature, advanced by the unprecedented wave of democratic transitions which occurred in Latin America in the 1980s and across large swathes of Eastern Europe after the collapse of the Soviet Union in the early 1990s. As Przeworski and Limongi (1997) note this new literature has begun to contest the 'old' insofar as viewing democratic transition as a result of actions and not just of economic conditions such as rising income levels, but to the dynamics of political regimes, the role of external actors, neighbourhood effects, economic decline and idiosyncratic factors specific to each country. The econometric studies, which have focused specifically on the instance of democratic transition, have used binary outcome models to analyse the impact of macroeconomic crises such as output contractions (Przeworski and Limongi 1997, Kennedy 2010, Burke and Leigh 2010) and rising inflation (Gasoworski 1995, Havard, Knutsen and Rod 2012, Arezki and Brückner 2011), and neighbourhood effects or 'democratic contagion' (Strand, Hegre, Gates and Dahl 2013, Gleditsch and Choung 2004, Sanborn and Thyne 2013) as catalysts which serve to bring about democratic transition. However there appears to be a shortage of studies investigating the effect that economic crisis has on an educated society to bring about democratic change. Studies either do not include education (Gasioworski 1995, Epstein et al 2006), use enrolment rates (a flow variable) instead of the average years of education (a stock variable, which is preferred) (Burke and Leigh 2010) or use only secondary years of education (Havard, Knutsen and Rod 2012), or they find that the average years of education on the odds of democratic transition is significant, but the effect of income on transition survives and is much stronger (Przeworski and Limongi 1997). Conversely Sanbourn and Thyne (2013) investigate the impact of education (measured by the percentage of the population with some education, as well as completed primary, secondary and tertiary education) on the probability of democratic transition but do not analyse the concomitant impact of economic contraction or inflation as a catalyst.

As a result our third chapter synthesises two bodies of research, those investigating the impact of economic crisis on the odds of democratic transition and those which analyse the role of education, using logistic regression analysis on a panel of 103 countries over the years 1970 to 2012. Our model shows that the odds of switching from a non-democratic to a democratic regime is positively and significantly linked to the level of education and inflation, whilst negatively and significantly related to economic growth. Macroeconomic crisis therefore, in terms of high inflation and economic decline as the inverse of economic growth, serves as a catalyst for educated societies to bring about democratic change, particularly as for permanent transitions (for example, having no subsequent reversal during our time period of investigation) education has the largest log odds coefficient of all our independent variables and therefore exerts the strongest impact on democracy.

This thesis therefore provides a cohesive story on the relationship between education and democracy which builds upon itself by chapter to answer three important questions: does education exert a stronger effect on democracy than democracy exerts on education? The answer is that education is more important. Do shocks to education increase democracy? Yes they do and the effect is positive and significant for several years after. And so, if education does produce democracy, why are some highly educated countries undemocratic? We find the answer is that macroeconomic crisis through output contraction and inflation serves as a catalyst for educated societies to bring about democratic change. We therefore seek to contribute to the existing education-democracy literature by examining the two-way endogenous relationship using SYS-GMM regression using an appropriate analysis specification; pioneering the use of SVAR regression to investigate shocks to education on a single country's time series; and using logistic regression to investigate the odds of democratic transition for educated societies in the presence of macroeconomic crisis with a rich set of examples over the last 40 years.

As the events of 2014 alone have shown, the study of the education-democracy relationship remains one of the most important and relevant of the social science literature. This thesis shows that education is a fundamental determinant of democratic change which has important policy implications. Whilst international agencies and governments have sought to promote democracy and also improved access to education throughout the world, our study shows that it is the latter which requires most attention; that it is education, which over and above income, exerts a stronger and more significant impact on democracy than the reverse; that shocks to education produce positive and significant effects on democracy that last for several years after, and ultimately that democratic transition can only be sustained in an educated society. It is our belief that the answer to the key question we pose, namely why are some educated countries not democratic, is that they are not *yet* democratic but that they most likely will be in time provided educational attainment continues to rise and a catalytic event occurs such as a macroeconomic crisis.

Chapter 1: A Virtuous Circle? The Impact of Education on Democratic Political Institutions

Abstract

This paper seeks to contribute to the existing political and economic literature on the relationship between democratic political institutions and education¹. Using panel regression analysis, we examine the two-way endogenous relationship between 'democracy' and education employing an unbalanced 5-year panel covering the years 1970 to 2005 for 144 countries. Using techniques (System GMM estimator) that allow us to control for the endogenous effects, we find evidence, robust to different specifications, measurements and estimators, that democratic political institutions and education exert positive and significant effects on one another. These results are contrary to the findings of notable economists, including Glaeser et al (2004, 2007), Acemoglu et al (2005) and Murtin and Wacziarg (2014). Our key finding is that education, over and above income, exerts a stronger and in some cases more significant effect on the formation of democratic political institutions than the reverse. On the basis of these results, countries are therefore best advised to invest in education in order to facilitate the development of democratic political institutions.

¹Given that the outcomes of the education system are often referred to as 'human capital' in econometric studies though there are broader aspects to this definition, we use the terms 'education' and 'human capital' interchangeably throughout this paper

1. Introduction

The recent population uprisings across North Africa and elsewhere pay credence to Huntington's (1968) theory of political instability: that revolutions often result from a void between the aspirations of a newly educated group in society, that desires civic participation, and the restrictions imposed by the incumbent political order. Among the myriad factors that coalesced in the case of these countries, the most prominent were high inflation (particularly food inflation rates), high unemployment rates among the bulging, educated urban youth and increasing dissent with government corruption and lack of accountability, popularised through mobile telecommunications and internet social media. In 2010 Tunisia and Egypt had higher proportions of their 25-29 year old populations with completed tertiary education (12.9% and 12.6% respectively) than France (10.7%) the USA (10.1%), the Netherlands (9.5%) and Switzerland (8.1%)² for example, but unemployment rates of 25% among university graduates³. In both countries, it was this frustrated stratum of society who initiated the protests in a similarly styled uprising to the democratisation processes of South Korea and Taiwan decades previous. Whether democracy materialises in these countries is not the focus of this paper, but their experience highlights what modernisation theorists have long asserted: that rising education levels play a key role in the development of a democratic political system (Lerner 1958, Lipset 1959, Almond and Verba 1963, Huntington 1968, 1991).

Beyond the rapidly accumulating anecdotal evidence provided by the 2010-11 democratic movements in North Africa, there is a rich seam of empirical literature providing evidence of the positive and significant effect that education imparts on democracy (see Barro 1999, Glaeser et al 2004, Przeworski 2000, Bobba and Coviello 2007 to name just a few). However, this is not a straightforward relationship, either empirically or conceptually. Indeed, one desirable quality of democracies is their propensity to provide public goods, including education, at higher levels than non-democracies (Deacon 2003, Brown and Hunter 2004). In other words, while on the one hand education begets democracy, on the other hand, the political institutions and policies that emerge in democracies serve to deliver education. It is it would seem a virtuous circle that is further complicated by the tripartite endogenous relationship between institutions, education and GDP. Rodrik (2004:p10) explains that "institutional quality is as endogenous to income levels as anything can possibly be". Firstly, higher income countries demand democratic political institutions. After all, institutional arrangements are set up because the private benefits of their creation are likely to exceed the cost (North and Thomas 1973). In this regard the material conditions prevailing in an economy determine the economic and political institutions that come to fruition, that reproduce themselves and generate particular patterns of development (Przeworski 2005:P4). Secondly, higher income level countries can afford greater inputs into human capital, and more educated labour forces are more productive and generate higher levels of GDP. Thirdly, higher income countries with a more educated workforce and democratic, high quality institutions can continue to provide the necessary institutional framework to generate human capital and likewise the human capital to generate high quality, democratic institutional arrangements.

Therefore, the endogenous relationship between education and democracy highlights one of the most contentious issues in the study of political economy; whether democratisation is a result of economic change, such as rising

² According to the Barro and Lee 2010 dataset

³ World Bank Country Brief: Tunisia. Estimates for Egypt were 20% in 2007 but no recent data is available

income and education levels, or whether economic change is driven by democratic developments within political regimes. This argument features most prominently within the New Institutional Economics literature, where democracy, as a political system, has become almost synonymous with the conceptual analysis and empirical measurement of political (and subsequently, economic) institutions.

The New Institutional Economics (NIE) meta-paradigm is an economic growth theory rooted in transaction cost economics, property rights economics and principal agent and public choice theory which has gained credence in recent years. NIE's essential idea is that the success of a market system is dependent upon the political and economic institutions that facilitate low-cost transacting and credible commitment, measurement and enforcement of contracts that underlie exchange in product and factor markets to generate economic growth. North (1993) defines institutions as the "formal rules (statute law, common law, regulations), informal constraints (conventions, norms of behaviour, and self-imposed codes of conduct), and the enforcement characteristics of both". He explains that the institutions of a successful economy have a system of political-judicial institutions that provide the rule of law, enforcement of property rights, and a stable price level. Furthermore, he explains that institutions are created to serve the interests of those with the bargaining power to create new rules and are therefore determined by the political system: "It is exceptional to find economic markets that approximate the conditions necessary for efficiency. It is impossible to find political markets that do; because it is the polity that defines and enforces property rights it is not surprising that efficient economic markets are exceptional" (North 1993, P4). Williamson (2000) also explains in his conceptual hierarchy of institutions that the institutional environment is designed by "the executive, legislative, judicial, and bureaucratic functions of government as well as the distribution of powers across different levels of government. The definition and enforcement of property rights and of contract laws are important features" (Williamson 2000: P597). Acemoglu et al (2005) also argue that economic institutions are endogenous to political institutions, which determine the constraints and incentives of political actors: "Examples of political institutions include the form of government, for example, democracy vs. dictatorship or autocracy, and the extent of constraints on politicians and political elites" (Acemoglu et al 2005, P390).

Democracy has been found to exert a positive and significant effect on private property rights institutions and economic institutions (Savoia et al. 2004, Clague et al. 1996, Acemoglu et al 2005, Feng 2003). Therefore measures of democracy are used in econometric analyses as a proxy for good political and economic institutions. In political studies, democracy is used as a variable in and for itself, determining whether democracy as a political system generates economic growth. Economic and political studies determining the impact of institutions or democracy on economic growth or education use the same empirical measures of democracy (most often, Polity IV and Freedom House) and are essentially one and the same. In this chapter, we bridge the divide between these two fields. Ultimately, framed in this way by North (1993), Williamson (2000) and Acemoglu et al (2005), a democratic political system or 'democracy' is endogenous to democratic political institutions, and so (throughout the thesis) we will use the terms democracy and democratic political institutions interchangeably.

Given the effect that political and economic institutions have in shaping the incentives of political and economic actors, a large swathe of theoretical and empirical literature concurs that "institutions matter", "rule" and are "fundamental" to explaining differences in development levels across countries (Mauro 1995, Knack and Keefer

1995, Barro 1997, Hall and Jones 1999, Acemoglu et al. 2001, Rodrik, Subramanian and Trebbi 2004, Knack and Keefer 2006, Acemoglu and Dell 2009). Glaeser et al (2004) however find that institutions only have a second-order effect on economic growth. The first order effect (and fundamental source of growth) comes from human capital which ultimately shapes both institutional and productive capacities of society. In agreement, Przeworski (2005: P530) asks, if political and economic institutions are endogenous and shaped by prevailing conditions, “how can we tell whether what matters are institutions or the conditions?”

This brings us back to the political economy argument between education and democracy, and to the focus of this chapter: once we net out the endogenous effects of income, do democratic institutions produce, or are they produced by, education? In which direction is causation stronger and more significant? Put in more practical policy terms, would countries be better advised to invest in education in the first instance, to generate economic development and achieve democratic institutional outcomes as a result, or should countries committed to promoting economic and human development prioritise democratic reform first?

We situate our research within the political economy literature that explores the complex direct (democracy-education) and indirect (conditioned by income and growth) relationships between education and democracy. Through this, we contribute in the following three ways: firstly, we use panel (and dynamic panel) data methods applied to a worldwide dataset; secondly, we pay particular attention to conceptual and empirical issues of endogeneity and unobserved heterogeneity, in particular through netting out the endogenous impact of income and growth; thirdly, we contribute to the often overlooked but crucial area of political economy research articulating the relationship between democratic political institutions and education, without restrictive a priori assumptions about the direction of causality. Using techniques (System GMM estimator) that allow us to control for the endogenous effects, we find evidence, robust to different specifications, measurements and estimators, that democratic political institutions and education exert positive and significant effects on one another. These results are contrary to the findings of notable economists, including Glaeser et al (2004, 2007), Acemoglu et al (2005) and Murin and Wacziarg (2014). Our key finding is that education, over and above income, exerts a stronger and in some cases more significant effect on the formation of democratic political institutions than the reverse. On the basis of these results, countries are therefore best advised to invest in education in order to obtain democratic political institutions.

We proceed as follows: Section 2 further motivates our approach through a survey of related literature; Section 3 details our data, describes our econometric approach and presents our empirical specifications; Section 4 discusses the results in the context of our initial motivations; and Section 5 concludes.

2. Literature Review

There are well-established theoretical arguments predicting that democratic political institutions will produce improved levels of education. Countries with better institutions, more secure property rights, and less distortionary policies will generate greater investment in human (and physical) capital and will use these factors more efficiently to achieve a higher level of income. Indeed, given the forward-looking nature of investment in education, human capital is inherently endogenous to the policy and institutional environment it is borne out of, in that the returns on

decisions taken today depend on the prevailing and future institutional framework. In aggregate terms this simply implies that democracies lead to higher levels of human capital in so far as people vote for better education for themselves and their children (Tavares and Wacziarg 2001, Acemoglu and Robinson 2000) and more generally democracies provide superior basic services, such as health and education, compared with non-democracies (Baum and Lake 2003). Galor and Mountford (2008) theorise further that the 'Great Divergence' in income per capita levels across countries can be attributed, in part, to the emergence of institutions that promoted the formation of human capital in European countries.

Intuitively compelling though these arguments are, theoretically, causation could operate in the opposite direction. A voluminous political science literature documents precisely this. Education determines the effectiveness of political participation, even in democratic societies (Lauglo and Øia, 2007). Educational attainment is associated with "elite-challenging" behaviour that identifies and punishes corrupt behaviour. This indicates that even in democratic societies, the quality of political institutions can vary with the level of education. Education is argued to promote democracy both because it enables a "culture of democracy" to develop, and because it leads to greater prosperity, which is also thought to cause democratic political development. Easterly et al (2006) and Heyneman (2000) argue that education contributes to social cohesion by providing a forum where the idea of social contracts between individuals and the state are introduced, appropriate behaviour in upholding them and the consequences of breaking them is taught. Lipset (1960) argues that both economic growth and human capital accumulation cause institutional change. Modernisation theory argues in favour of an economic-social development connection. Its earliest proponents in the age of enlightenment nursed the concept that technological advancements and economic changes would enable subsequent changes in moral and cultural values. Durkhiem's idea of social evolution, much like Rostow's stages of economic development, viewed societies as progressing through stages of increasing social interconnectivity and solidarity. In this regard, the influence of human capital on institutional development is convincing.

It is clear, just from this brief review of the theoretical literature, that there are strong reasons to expect democratic political institutions to beget education and education to beget democratic political institutions. Understanding the nature of this relationship and the extent to which it may be a virtuous circle, encompassing ever-increasing levels of human capital, democratic institutional quality and economic well-being could therefore hardly be more important and it would seem, may turn out to be primarily an empirical question.

Turning then to the empirical literature, we find a wealth of indirect evidence, emerging through the institutions-growth or human capital-growth literature, concerning the relationship between institutions and human capital. Given the aforementioned endogenous relationship between income, institutions and human capital, it is no wonder that the indirect relationship between institutions and human capital has emerged in the growth literature.

Adams-Kane and Lim (2008) using cross-section and panel data in a Two-Step Two-Stage Least Squares (2-step SLS) Generalised Method of Moments (GMM) model find that institutions⁴ impact economic growth primarily through their effect on human capital. Specifically, they find that human capital has a positive and significant effect

⁴ Proxied by Worldwide Governance Indicators (Kaufmann, Kraay and Mastruzzi 2007)

on GDP per capita only at medium-high governance levels, where the institutional arrangements are in place to render investments in human capital productive. Similarly, Eicher et al. (2006) using cross-section data and a 2SLS model find the effect of institutions⁵, on output is also largely captured by its effect on the productivity of inputs. Institutions increase the productivity of physical capital, but reduce that of human capital. Thus institutions matter most for countries with low levels of human capital and least for those with high levels of educational attainment. They argue that this provides evidence of possible overinvestment in human capital. Furthermore they argue that improving institutions in countries with low levels of capital investment will have little effect on output.

Baum and Lake (2003), using panel data and a 2SLS model, in finding that democracy has no statistically significant direct effect on growth, also argue that any effect of democracy is largely indirect through increased life expectancy in poor countries and increased secondary education in non-poor countries. Farr et al. (2000) using panel data and an Ordinary Least Squares (OLS) model find that institutions⁶ impact output only in so far as they influence investment in physical (for lower income countries) and human (for high income countries) capital as well as total factor productivity. Indeed, as with a range of empirical studies, the inclusion of some control for institutions in the growth equation increases the coefficient on human and physical capital and increases the explanatory power of the model. Mamoon and Murshed (2007) using cross-section data and IV and 2SLS models, find that human capital influences economic development by improving the working of institutions. This means that institutions and human capital are complementary and any improvement in levels of education will promote the institutional quality of the country and vice versa. Human capital is therefore as important in explaining per-capita and growth differentials as democratic political institutions.

Aside from these important but indirect results, there are a number of empirical studies which have regressed democratic political institutions directly on human capital. Tavares and Wacziarg (2001) using panel data and OLS, Three-Stage Least Squares (3SLS) and Seemingly Unrelated Regression (SUR) models found democracy (measured by Freedom House's Political Rights index) to have a positive and statistically significant effect on the production of human capital. However the effect was higher when the rate of physical capital accumulation was high and the rate of population growth was low. Ulubasoglu and Doucouliagos (2004) using panel data and Error Components Three-Stage Least Squares (EC3SLS) and Error Components Generalised Method of Moments (ECGMM) models found political freedom (proxied by the Political Rights and Civil Liberties measures) and economic freedom to have a positive and significant effect on human capital at the 1% significance level.

Stasavage (2005) found that African governments which were elected democratically spent more on primary education than those that were not. However there was no effect on spending on universities. Ansell (2006) using 2SLS and fixed effects found that the long run effect of a country becoming democratic was an increase in public spending on education of between 0.81% and 1.23% of GDP which is a 20-30% increase in the average budget of his dataset. However, Glaeser et al. (2004) using cross-section data and OLS and Instrumental Variables (IV) models find no effect of initial institutions (using the Polity IV polity measure) on the growth in years of schooling.

⁵ Proxied by Hall and Jones' (1999) measure of institutions which includes data from the ICRG on law and order, bureaucratic quality, corruption, the risk of expropriation and government repudiation of contracts.

⁶ Proxied by Gwartney, Lawson and Block (1996) measure of Economic freedom and Freedom House's political rights and civil liberties indices.

A few studies have regressed human capital on institutions. Campos and Nugent (1998) using panel data and OLS and 2SLS models find a nexus of relationships between democratic political institutions and economic growth through human capital. Human Capital has a positive and weakly significant effect on institutional development, and when institutions and human capital appear in the same equation, the explanatory power and significance of each variable on output is increased. Barro (1999) using the Political Rights index as a measure of democracy in panel data from 1960 to 1995, finds that an additional year of average (primary) schooling increases the political rights index. Glaesar et al (2007) find that education has a positive and significant effect on democracy (measured by Polity IV's index of democracy) in OLS cross-section and panel regressions with fixed effects. Glaeser et al (2004) using cross-section data find that initial levels of schooling (average years of schooling from Barro and Lee 2001) are a strong predictor of improving institutional outcomes (when using the democracy index, autocracy index, or constraints on the executive variable from Polity IV).

In contrast to the studies above which have found a positive and significant relationship to exist between education and democracy, Acemoglu et al. (2005), find that when using fixed effects and the difference GMM estimator to control for country specific effects, the coefficients on education (average years of schooling from the Barro and Lee 2001 dataset) are negative and insignificant. They argue that the relationship between education and democracy is driven by omitted factors which influence both variables, and that there is not a causal relationship between them.

However, Glaeser et al (2007) find that the average years of schooling measure from the Barro and Lee 2001 dataset, used by Acemoglu et al (2005) is highly persistent, such that with this variable education is insignificant using fixed effects. However, when they use university and secondary school enrolment rates from the Banks (2004) dataset, the data is not nearly as persistent, and this allows them to identify a positive relationship using fixed effects, contrary to Acemoglu et al (2005).

Shedding light on this, Castello-Climent (2008) explains, as do Bobba and Coviello (2007), that when variables are highly persistent and measured with error, the fixed effect estimator, by exploiting the within country variation in the data, may exacerbate the measurement error bias. He explains how Hauk and Wacziarg (2006) show in cross-country growth regressions with persistent variables, that the gains accruing from reducing omitted variable bias under fixed effects are more than offset by an increase in the exacerbation of the measurement error bias, which makes using fixed effects in this context unadvisable. The difference GMM estimator may also suffer from a problem of weak instruments, biasing the first difference GMM estimator towards its fixed effect counterpart. Therefore, to address these shortcomings, Hauk and Wacziarg (2006) use the System GMM estimator which reduces the potential biases and imprecision associated with the first difference estimator when variables are persistent. When Castello-Climent (2008) controls for country-specific effects and takes into account the cross-country variation in the data, their results are akin to Barro (1999), Glaeser et al (2004, 2007), Papaioannou and Siourounis (2008) and Murin and Wacziarg (2014) who provide evidence of a positive impact of education on democracy. Bobba and Coviello (2007) use panel data and OLS and System GMM models to find that past levels of education have a positive and significant effect on democracy (measured by Freedom House's Political Rights variable) at the 1% significance level.

Given the wealth of evidence indicating that there are significant effects in both directions it is somewhat surprising that the literature focuses on particular forms of endogeneity and omitted variable bias, but rather overlooks the possibility of simultaneity. That is, it does not specifically investigate the magnitude and causal direction of the two-way relationship between education and democracy. In fact, only the Glaeser et al. (2004, 2007) and Murtin and Wacziarg (2014) papers described above investigate the two-way causation between these variables by regressing them directly on each other. As already highlighted, Glaeser et al (2004, 2007) use OLS cross-section and IV methods with average years of schooling data to find that there is no effect of initial institutions on education, but they find initial education levels to have a positive and significant effect on democratic political institutions. When they use panel fixed effects with secondary enrolment data they find the same positive and significant relationship from education to democracy but not the reverse. We use a more efficient regression model in the presence of endogeneity, namely the Blundell-Bond System GMM estimation (advocated by Castello-Climent 2008 and Bobba and Coviello 2007), instead of OLS; we employ panel data instead of cross-section data; we use an improved and updated human capital variable which captures the average years of schooling of the population aged over 25 (Barro and Lee 2010 educational attainment dataset) and not just the enrolment rates; and through these measures, we provide for more efficient and informative results. Whilst Murtin and Wacziarg (2014) also use System GMM on panel data, their regression function is misspecified. Their regression analysis finds that only the stock of education (average years of education in the population aged over 25, which they use as a proxy for economic development) is a significant predictor of the flow of education (average years of schooling of the age group 5-14 years) and democracy loses its previous significance once this stock of education variable is added to the regression. But Murtin and Wacziarg (2014) do not investigate if democracy impacts the stock of education itself. Our regression analysis is correctly specified in this regard. As a result we build upon and extend the analysis of both Glaeser et al (2004, 2007) and Murtin and Wacziarg (2014) papers to uncover the two-way endogenous relationship between democratic political institutions and education and to motivate further questions pertaining to this relationship that we go on to explore in the subsequent chapters.

3. Data and Descriptive Statistics

This study is based on data procured from publicly available country-level information relating to macroeconomic, social, political and institutional variables. The data is sourced from the World Bank Development Indicators, April 2010 online edition, the Polity IV data series (version 2009) and the Summer-Heston Penn World Table (version 6.3) among other sources. The empirical analysis is based on a panel data set covering 144 countries and 35 years (1970-2005) in 5-year averages providing 1,154 observations. Since the data were not available for all 144 countries for each year over the sample period (notably in the tails), the sample is therefore an unbalanced panel.

It is widely known that a number of problems are to be encountered in modelling data for a worldwide dataset, not least those which encompass technical problems arising from poor statistical coverage in some countries and methodological problems related to the use of data for such a diverse group of countries in a single regression equation. As Baum (2006:P122) explains, there are also a number of limitations to econometric analysis. With regard to regressions, the first drawback is the fragility of the explanatory variable both to robust correlations with

the dependent variable, as well as the significance of coefficients to the choice of explanatory variables. Secondly, cross country regressions suffer from an omitted variable bias due to unobserved heterogeneity, which is often corrected using panel techniques. However, the cross-country variation may be measured in a more robust way, while cross-time variation is prone to measurement errors as infrequent changes in the explanatory variables can lead to attenuation bias. Thirdly, endogeneity is the most serious concern of empirical research leading to inconsistent estimates of the coefficient and of other parameters. Studies take initial values of the dependent or instrumented values to tackle this but there are no ideal solutions. IV techniques as well as dynamic panel data models based on Generalised Method of Moments are often used to address unobserved heterogeneity and endogeneity problems in regressions.

3.1 *Political Institutions and Human Capital*

As we have seen there are a multitude of measures capturing democratic political institutions available to empirical researchers, but rather than simply adopting our favoured proxy, we instead take our leave from Williamson's (2000) conceptualisation of the hierarchy of institutions which provides us with an ordered conceptual framework in which to evaluate the appropriateness of measures which attempt to capture the distinctive properties of democratic political institutions. Williamson's (2000) classification views institutions in different interconnected levels, the highest level imposes constraints on the level below it and so forth in a cascading effect, further complicated through feedback effects from the lower to higher levels. At the top level, Level 1, are the institutions of the social structure of society, for example, informal social norms, customs, religion, traditions which define how a society conducts itself; at Level 2 is the institutional environment or 'the rules of the game'. This level houses polity, judiciary, bureaucracy, which define the overall institutional environment. Below, at Level 3, is the governance or 'play of the game' which concerns itself with the private structure of a country and contractual relationships; lastly, at Level 4, are institutions related to allocation mechanisms and distribution of resources in society.

Williamson's framework makes clear that the institutional environment at level 2 is determined by the political system therefore empirical measures which capture the political system appropriately capture the institutions that govern incentives of political and economic actors. Empirical measures which capture lower order effects, such as at Level 3 and Level 4 (for example, the World Bank's Doing Business Index, the International Country Risk Guide and the Transparency International measures) are too far removed from the political system and capture a dimension distinct from the high level political institutions. Likewise, the degree of enforcement of property rights, political instability and corruption are outcome variables; products of the institutional arrangements (Jütting 2003). It is therefore measures reflecting the higher level, such as democracy measures, which best capture the key aspects of 'political institutions'. As aforementioned, Acemoglu, Johnson and Robinson (2004) agree that these high level political institutions influence economic institutions, which then in turn determine economic outcomes. Their logic is as follows: economic institutions of secure property rights and perfect markets structure incentives to invest in physical and human capital and efficient technology and also determine the allocation and distribution of resources efficiently. However, whichever group has more political power is likely to secure the set of economic institutions that it prefers. This builds on North's hypothesis that "institutions are not usually created to be socially efficient, [but] are created to serve the interests of those with bargaining power to create new rules" (North 1990: p16). Thus

economic institutions are endogenous to the political set up, notably the form of government, for example democracy vs. dictatorships. Following Williamson, Acemoglu, North and others, in our empirical modeling, we seek proxies for high level political institutions as those that most plausibly impact the emergence of the outcomes in which we are interested. As a result we do not investigate the various sub-components of democracy, such as media freedom

Munck and Verkuilen (2002) evaluate nine data sets that produce these high level measures of political institutions and democracy⁷, including the most popular Polity IV and Freedom House measures, and find that they all suffer from important weaknesses. Concentrating on the two indices mentioned, Munck and Verkuilen (2002) criticise Freedom House's inclusion of irrelevant attributes in its definition of democracy (e.g. socioeconomic rights," "freedom from gross socioeconomic inequalities," and "freedom from war" p9) and conflation: the inclusion of many components under its two attributes "political rights" and "civil rights" with such little thought about the relationship among components and between components and attributes. Polity IV is contrastingly criticised for its minimalist definition that omits measures to capture political participation by the public. Its focus is mostly on competition and regulation of political groups and not on informal forms that restrict or distort voting behaviour.

Both measures are criticised for their poorly justified (in the case of Freedom House) and convoluted (in the case of Polity IV) aggregation procedures; Freedom House, for its equal weighting of components and only recently providing the disaggregate data; Polity IV, though it provides a weighting scheme, it includes redundant attributes (competitiveness and regulation of participation both measure the extent to which elections are competitive) which leads to double counting when the scores from the five components of the index are aggregated into two scores for Democracy and Autocracy. Both indices are praised for their comprehensive empirical scope however Polity IV's strengths are typically identified as being preferred. In particular, it provides clear and detailed coding rules and it identifies attributes of office and agenda setting through its 'constraints on the executive' variable. Munck and Verkuilen (2002) conclude that no single index of the nine reviewed satisfactorily responds to the challenges (they set themselves) of conceptualising, measuring and aggregating their democracy indices. They highlight that the Freedom House dataset is particularly problematic whilst Polity IV is not among the strongest in those areas.

In certain regards though, the Freedom House measures have been preferred to Polity owing to differences in conceptualisation; Polity focuses on competitive elections and participation in political institutions, Freedom House on individual rights and civil liberties. As McClintock and Lebovic (2006) explain, the variance in scores for emerging democracies is considerably less for the Polity measure compared to Freedom House scores which reduces the likelihood of significant correlation coefficients. However, given the weaknesses of these measures, should scholars desist from using them? No. As Munck and Verkuilen (2002: P31) conclude: "having a data set on democracy, even if it is partially flawed, is better than not having any data set at all and . . . scholars should use what they have at their disposal."

⁷ However we have already established through the arguments of North (1993), Williamson (2000) and Acemoglu et al (2005) that political institutions are endogenous to the political system and so we shall use the terms 'democracy' and 'democratic political institutions' interchangeably

We take all of these factors on board when constructing our dataset and use both the Polity2 measure created by the Polity IV project (2009 version) as our democratic political institutions variable and Polity IV's constraints on the executive⁸, and also Freedom Houses' Political Rights and Civil Liberties⁹ scores for robustness purposes. The Polity2 variable minuses Polity IV's measure of autocracy from its measure of democracy on a 21-point scale, where scores of -10 to -6 represent autocracy, -5 to +5 anocracy, and 6 to 10 democracy. Polity IV does so to provide a convenient, quantitative measure of general regime effects in the spirit of Eckstein and Gurr (1975) whose theory argued that elements of democracy and autocratic authority could co-exist in any regime. Polity2 is coded taking into account several features of a country's political institutions, such as the openness and competitiveness of executive recruitment, the constraints placed on the chief of the executive, and the competitiveness and regulation of political participation. Because this measure captures the high level effects of political institutions implied by North (1993), Williamson (2000) and Acemoglu et al (2004 and 2005) we believe it is the best empirical measure to use. However, the Polity IV user manual itself suggests caution when interpreting the middle of the Polity spectrum as it muddles various combinations of democracy and autocracy scores into the same Polity value.

As we have highlighted above, both the Polity IV and Freedom House measures we use are constructed from underlying sub-indices which each capture differing aspects of democracy. In the case of Freedom House, the political rights index is constructed from the scores of its three components: electoral process, political pluralism and participation, and the functioning of government. The civil liberties score is similarly derived from the freedom of expression and belief, associational and organisational rights, rule of law and personal autonomy and individual rights categories. Whilst econometric analysis could be conducted using these underlying components individually, as plausibly the different components could be more or less important at higher or lower levels of income and education, we follow the existing literature in using the aggregate measure. As Treier and Jackman (2007) explain "a good measure of democracy should identify the appropriate attributes that constitute democracy, each represented by multiply observed indicators; we should have a well-conceived view of the appropriate level of measurement for the indicators and the resulting scale; and we should properly aggregate the indicators into a scale without loss of information". They further note that "most scholars agree that democracy is multifaceted and hence not well characterized by a single indicator". Treier and Jackman's (2007) paper, which applies formal, statistical measurement models to the Polity IV indicators, does however highlight the fact that democracy is a latent variable which cannot be measured directly, though indicators of democracy are available which may be measured with error. The "errors-in-variables" problem is quite consequential when found in the independent variable, leading to biased and inconsistent parameter estimates, and potentially invalid hypothesis tests. Despite

⁸ Polity IV's constraint on the executive variable refers to the extent of institutionalized constraints on the decision making powers of chief executives on a scale of 1 to 7, with 1 representing unlimited authority and 7 representing executive parity (with the legislature for example) or subordination. Polity IV explain that: "A mature and internally coherent democracy, for example, might be operationally defined as one in which (a) political participation is unrestricted, open, and fully competitive; (b) executive recruitment is elective, and (c) constraints on the chief executive are substantial." (Polity IV Project: Dataset Users' Manual P15)

⁹ Freedom House's Political Rights index measures the degree of freedom in the electoral process, political pluralism and participation, and functioning of government. Numerically, Freedom House rates political rights on a scale of 1 to 7, with 1 representing the most free and 7 representing the least free. The Civil Liberties index measures freedom of expression, assembly, association, and religion and is presented on the same 1 to 7 scale. We transform both Political Rights and Civil Liberties Indices so that 1 represents least free and 7 is most free.

the considerable measurement error they find in the latent levels of democracy underlying the Polity scores, Treier and Jackman (2007) conclude that replication studies using a proper accounting of measurement uncertainty have not found that the effect of democracy on some outcome of interest is rendered insignificant. Treier and Jackman (2007) explain this is because in many studies the estimated effects of democracy are very strong, and can withstand any increased parameter uncertainty due to the propagation of uncertainty arising from the imperfect measurement of democracy; and because the statistical models being deployed are relatively simple (e.g., in linear form). They argue that there simply isn't enough information in the Polity indicators to support particularly elaborate models using non-linear functional forms or highly interactive specifications of the way democracy structures outcomes. As a result, we acknowledge that the underlying components of our democracy measure may contain measurement error, and therefore the composite index must also be measured with error (though in aggregate it captures the multifarious aspects of democracy), and agree with Treier and Jackman (2007) and Munck and Verkuilen (2002) that until such time that we have more and/or better indicators of democracy the aggregate Polity indicator is our variable of choice.

For our human capital variables, we draw upon the Barro and Lee (2010) educational attainment dataset. Barro and Lee's (2010) study constructed measures of average years of schooling at all levels—primary, secondary, and tertiary, though we will use the total average years of schooling measure. The data is constructed at 5 year intervals between 1960 and 2010 for 146 countries and provide a reasonable proxy for the stock of human capital. Our choice of measure for human capital deserves further explanation here, particularly as the usual practise considers adult literacy rates and school enrolment ratios as proxies. Wossman (2000: P5) provides a clear overview of the weakness of these two measures; the former, because it fails to capture investments in education beyond basic literacy, (implying that those investments do not add directly or increasingly to the productivity of the labour force); and the latter, because as a flow variable, it only captures the human capital acquired by current students who may or may not enter the labour force in the future, and certainly does not capture net flows of human capital as older workers retire. Clearly then, measures of human capital that quantify the accumulated educational investment in the labour force do better, so average years of schooling is a popular and commonly used proxy. It too is not spared criticism however, as it implies that productivity differentials among workers are proportional to their total and unweighted years of schooling, also regardless of in which country those years of schooling took place.

Wossman's (2000) analysis finds that measures of educational attainment obtained via the perpetual inventory method (starting with the directly observed figures on school attainment and estimating changes from these benchmarks on the basis of levels of educational attainment from surveys and censuses) is one of the most effective measures of the stock of human capital. It does not obviate the quality of education concern across countries or remove measurement error but it goes a long way toward providing a closer proxy for the stock of human capital. As Barro and Lee (2010: P3) explain, their average of years of schooling measure is constructed by taking into account the fraction of the age group having attained a particular education level and its corresponding duration in years, they then formulate the average number of years of schooling of that age group and that age group's share in the population. In order to obtain the information on educational attainment, their dataset uses approximately 599 census/survey observations for the distribution of educational attainment in the population over

age 15 by sex, 5-year age group and level of (complete and incomplete) education as benchmark figures on school attainment. They find 64 observations are available for 1960, 85 for 1970, 90 for 1980, 91 for 1990, and 68 for 2000. They fill in missing observations across the 1950-2010 time period by forward and backward extrapolation with appropriate time lags of the census/survey observations on attainment. Criticisms still exist: the forward extrapolation method assumes that the distribution of educational attainment is identical between one age group and the age group five years younger. Furthermore, the backward extrapolation assumes no educational increases between age 25 and 59. Lastly, the dataset captures the human capital of the total and not working population. However this dataset presents a greatly improved methodology and calculation over previous versions (1993, 1996, 2000) and is the most up to date educational attainment dataset that provides a stock measure for human capital.

3.2 *Other Variables:*

Our GDP per capita variable, capturing and controlling for income levels, is the real gross domestic product divided by midyear population. Its unit is constant 2005 PPP US dollars from the Penn World Table (version 6.3). We use investment as a share of real GDP per capita in constant prices from the same dataset. The latter, as gross capital formation, comprises (in most cases) private investment spending as its largest portion and is therefore expected to yield a positive effect on democracy through private companies' influence on political decision making and political accountability. As North said, "institutions are not usually created to be socially efficient, [but] are created to serve the interests of those with bargaining power to create new rules" (North 1990: p16). Similarly, higher investment should lead to increased employment which may negatively impact education decisions.

We use openness, from the Summer-Heston Penn World Tables, calculated as exports plus imports divided by GDP as the total trade as a percentage of GDP in constant prices. The export and import figures are in national currencies from the World Bank and United Nations data archives. This variable is considered to capture the impact of openness on both institutions and human capital. In this regard, it is treated as a measure of knowledge transfers across countries. There is mixed empirical evidence on the effect of trade liberalisation on democracy, some authors have noted a negative relationship (Li and Reuveny 2000, Rigobon and Rodrik 2005) whilst others, taking into account endogenous variables and the simultaneity problem find a positive one (Lopez-Cordova and Meissner 2008; Vogel 2006; Doucouliagos and Ulubasoglu 2008). We expect to find a positive relationship, since greater economic openness is associated with more information flows and transnational contacts, such that we would expect the diffusion of democratic ideas across borders. Furthermore, we expect to find a positive relationship between trade openness and education, as previous authors have found a strong positive relationship between openness and education spending as a percentage of GDP (Basu and Bhattarai 2008; Cartiglia 1997; Ansell 2006).

We also take from the WDI 2010, public education expenditure as a percentage of GDP which follows from the logical argument that greater financial inputs into education should increase educational attainment. Whilst total education spending (public plus private contributions) would be much more informative, the data does not exist for our full dataset. According to the OECD indicators, Education at a Glance 2010, total private contributions to education at the secondary level (as a percentage of total education spending in 2007) ranged from nil and 0.1% in

Sweden and Portugal respectively to highs of 22.2%, 22.8% and 21.9% in South Korea, Chile and the UK. In terms of tertiary education, the ranges were 3.0% and 3.5% in Norway and Denmark, and 85.6% 79.3%, 68.4% and 64.2% in Chile, South Korea, the USA and the UK respectively. Without taking private education expenditures into account, the analysis will suffer from omitted variable bias but the data is not available.

The rents from oil and natural gas liquids¹⁰, taken from the World Bank's Adjusted Net Saving dataset, are also included to observe the role of natural resources. We normalise this variable by dividing the data by population. Natural resources have both a direct positive role which contributes to an increase in income, and an indirect negative role which has high correlation with over-consumption, dynamics of de-industrialisation, corruption and a negative effect on human capital formation.

The inclusion of a natural resource variable in both our institutions and human capital regressions merits further discussion. Capturing natural resource abundance within our dataset is necessary to control for the level of GDP per capita which results from natural resource utilisation, and thus is unaccounted for by Human Capital achievement. In addition, the use of a natural resources type variable in our equations could be used as a proxy for barriers against institutional and regime reform as mentioned in the studies of Beck and Laeven (2005) and Sonin (1999). Ross (2001) highlights three reasons why oil has anti-democratic properties: because oil revenues enable governments to use low tax rates and patronage to relieve pressures for greater accountability; they increase funding for internal security; and they fail to bring about the social and cultural changes that accompany economic growth from productive sources that tend to produce democratic government. Ross (2001) finds that oil harms democracy more in oil-poor countries than in oil-rich ones and when oil exports are a small fraction of the economy, and it drops as the country grows more reliant on oil. He argues that large oil discoveries have no antidemocratic effects in advanced industrialized countries, such as Norway, Britain, and the U.S., but may harm or destabilize democracy in poorer countries.

We use inflation measured by the annual increase in consumer prices from the WDI 2010 dataset, however we are aware of the endogeneity problems of inflation with respect to both institutions and human capital. As is oft-explained in growth regressions, inflation may hurt economic growth with a resulting negative impact on inputs to human capital such as educational spending and individual's decisions on work and leisure time. But reverse causality may also exist as inflation itself might be determined by past rates of economic growth, itself a product of human capital improvements and a more productive workforce. Further, some omitted variable may be correlated with both human capital and inflation e.g. institutions and government policy. Indeed, inflation is an outcome of policy not an exogenous input¹¹ and should not be used as an input variable in empirical work owing to the simultaneity problem. Several studies are consistent with this view (Rodrik 2005, Glaeser et al 2004, Campos and Horvath 2006). Similarly, inflation cannot be treated as exogenous in our equations because it is itself an outcome

10 According to the World Bank "an economic rent represents the excess return to a given factor of production. Rents are derived by taking the difference between world prices and the average unit extraction or harvest costs (including a 'normal' return on capital)".

11 Unless it results from an exogenous oil price shock for example and inflation is imported, or results from IMF structural reforms which necessitate overnight price increases as was the case for a lot of developing countries under IMF programmes.

variable. To tackle the endogeneity problem instrumented variables are often used in empirical studies. Gerry, Lee and Mickiewicz (2008) regard government effectiveness as a policy input measure and inflation as an outcome, and instrument the latter with the former in the specification. The institution-growth mechanism flows thus: poor quality institutions lower the effectiveness of government which exacerbates fiscal and macroeconomic stability and *ceteris paribus* this negatively affects growth, which simultaneously lowers the effectiveness of government to provide the necessary inputs for human capital production. In order to capture the non-linear effect of inflation on growth, as previously mentioned, we construct two inflation control variables; inflation² and inflation³. Squaring and cubing the data has the effect of heightening the marginal increases in inflation when it is transformed to the new measures. Small increases in inflation produce large (and even larger for inflation³) increases in the new measures. This has the effect of replicating the negative inflation-growth effect, and separating out the inflation effect at different threshold levels.

Reverse causation between democratic political institutions and inflation may exist. On the one hand, democracies are associated with greater price stability and lower inflation levels (Doucouliagos and Ulubasoglu 2008; Satyanath and Subramanian 2005), yet inflation (particularly food prices) can also influence transitions to democracy (in some cases via a period of nondemocratic regimes e.g. Indonesia (1966), Brazil (1964) and Argentina (1973)¹². The French (1789), Russian (1917), Iranian (1979) and more recently, Tunisian and Egyptian revolutions (2011) were all in some way or other attributed to food inflation. Inflation can also be a by-product of market reforms (e.g. Eastern Europe) and have destabilising effects on democracy at higher levels (Przeworski et al 1996). We may therefore expect to find a positive relationship with democracy at low levels, but a negative relationship at higher levels.

We expect inflation to exert a negative effect on education as inflation undermines the productive capacity of the economy and diverts time resources to leisure instead of human capital utilisation (Basu and Gillman (2009). However, an alternative view is that if young agents expect high inflation to be temporary, they may devote their resources to human capital now and work later expecting better conditions in the future (Heylen et al 2003). Heylen et al (2003) find an inverted U-shape relationship between inflation and human capital, whereby inflation exerts a positive and significant effect on human capital at inflation levels between 15% and 100%, outside of those ranges the effect is insignificantly negative. Therefore we may find different effects on education for our three inflation control variables.

We also include government final consumption spending as a share of GDP as a more standard and alternative input variable proxying for macroeconomic stability. Some researchers have found democracy to be positively related to government size (Doucouliagos and Ulubasoglu 2008; Ansell 2006) as the redistribution of income, as well as the protection of economic freedom and civil and political rights, requires government spending (de Mello and Sab 2002; Pritchett and Kaufman 1998). However economic theory and empirical evidence dictates that inefficiencies and misallocation of resources can result from excessive government spending and involvement in the economy. For this reason we create another variable, government expenditure² to capture government spending at higher levels. We expect low levels of government spending to positively affect democracy, but higher

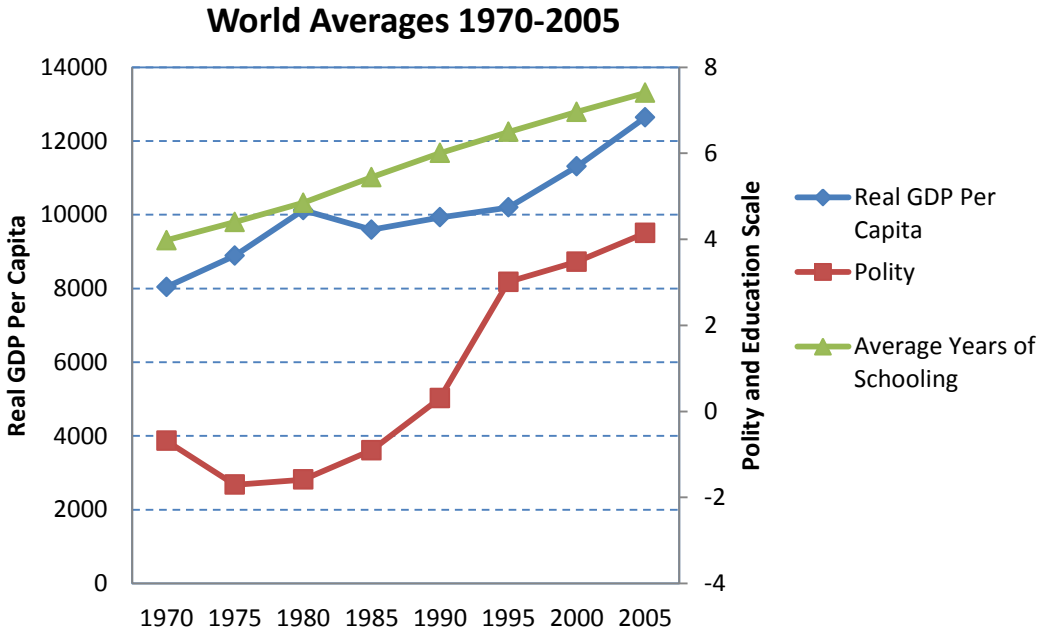
¹² Using Polity IV's measure of democracy

levels to exert a negative effect. We expect the result to be similar for the effect of government spending on education.

3.3 Descriptive Statistics

Before we move to our multivariate and effects analysis it is important to understand the structure and time trends of the data as well as the bivariate relationships between key variables used in our analysis. Figure 1 below illustrates that a sufficiently large number of countries within our dataset underwent a reduction in their Polity2 score between 1970 and 1975; the average score improved only slightly after 1975 then increased gradually and accelerated after 1990 to the end of our sample period in 2005. The accelerating trend toward democracy after 1990 no doubt captures the transition of Eastern European countries from Communism to Democracy after the demise of the Soviet Union. Indeed, in 1970 only 36 countries from 144 were classified as democracies by the Polity IV project, 50 countries were autocracies, 29 were anocracies and 29 displayed no polity value. By 2005, the number of democracies had more than doubled to 78, autocracies had reduced by two-thirds to 17, and anocracies accordingly had risen to 36 and 13 were without a score. Thus, although the variance decreased it remained substantive. Figure 1 also shows that, as expected, the average GDP per capita and average years of schooling values increased linearly over our sample period. The world has become richer, more democratic and more educated, but which of these factors is the driving force behind it.

Figure 1

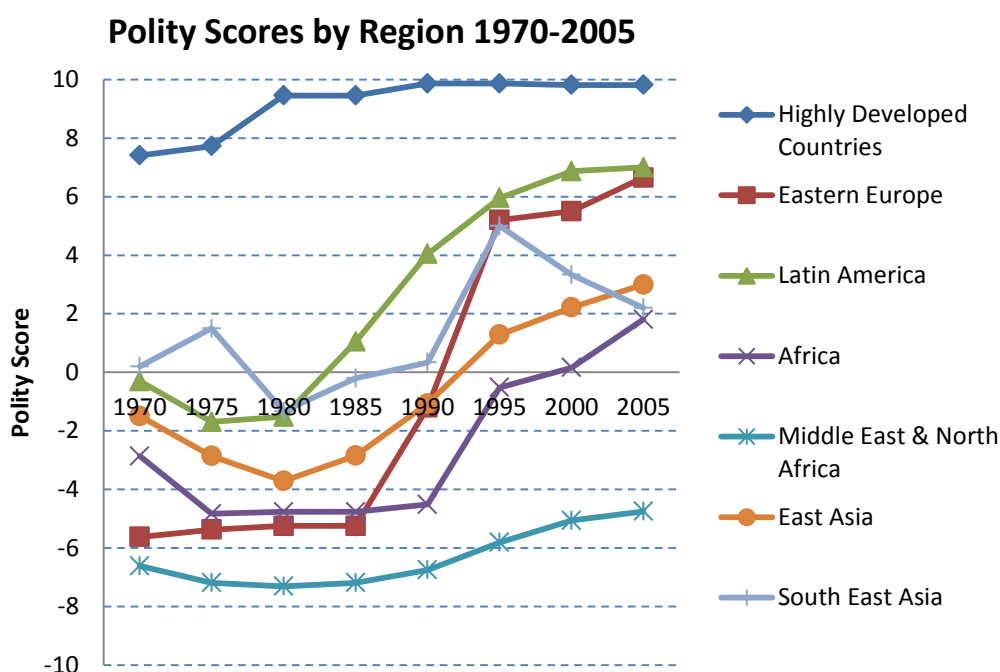


In 1970, only 19 countries had the highest polity score of +10 (comprising the countries of North America, Australasia, some western European countries with Japan, Jamaica and Costa Rica as exceptions) whilst 2 had the lowest possible score of -10, Iran and Saudi Arabia. By 2005 that had changed to 32 and 2 respectively. Interestingly, given the uneven political evolution across countries, and particularly regions and income groups, a

more informed view can be obtained from grouping the countries into their socio-geopolitical regions, shown graphically in Figure 2.

Indeed, once grouped into the World Bank sub-regions¹³, the 144 countries exhibit substantial variance in polity scores throughout the period. In 1970 the mean polity score was -0.6 and the median was -3; a positive skew suggesting that the bulk of the observations were concentrated across the lower values of polity; there were more non-democratic than democratic countries. However, there were a greater number of countries with scores of +10 than any other score, indeed there was a greater proportion of countries with extreme scores, rather than in the middle. By 2005, the range of scores mirrors that of 1970, but with higher mean and median values (4.15 and 7 respectively) and a distribution that has become negatively skewed, indicating a clustering of countries that are 'democracies'.

Figure 2



Notwithstanding the regional distinctions, the upward trend in polity is seen across all regional sub-groups. There are though a small number of countries who exhibit a considerably lower Polity score in 2005 than 1970: Zimbabwe (4 to -4), Swaziland (0 to -9) Sudan (4 to -6) Gambia (8 to -5) Papua New Guinea (9 to 4), Pakistan (1 to -5) and Laos (0 to -7), as well as countries who have fallen 3-4 points below: Fiji (9 to 5) Iraq (-6 to -9) and Malaysia (6 to 3).

Furthermore, polity scores both in 1970 and up until 2005 have been disproportionately located regionally. Excluding the highly developed countries of no fixed region, the highest measures on average are found in Eastern

13 To clarify, Eastern European countries in our dataset comprise: Albania, Armenia, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Poland, Romania, Russia, Serbia, Slovak Republic and Slovenia.

Europe and Latin America, and the lowest measures are found in the Middle East and North Africa and Africa¹⁴. By 2005, the Middle East and North Africa still have the lowest polity scores; indeed when the average score of the countries comprising the region are taken together, the Middle East and North Africa region is the only region whose average polity score is negative over the entire sample period. All other regions have a positive mean, albeit with substantial levels of heterogeneity as shown in figure 3:

Figure 3

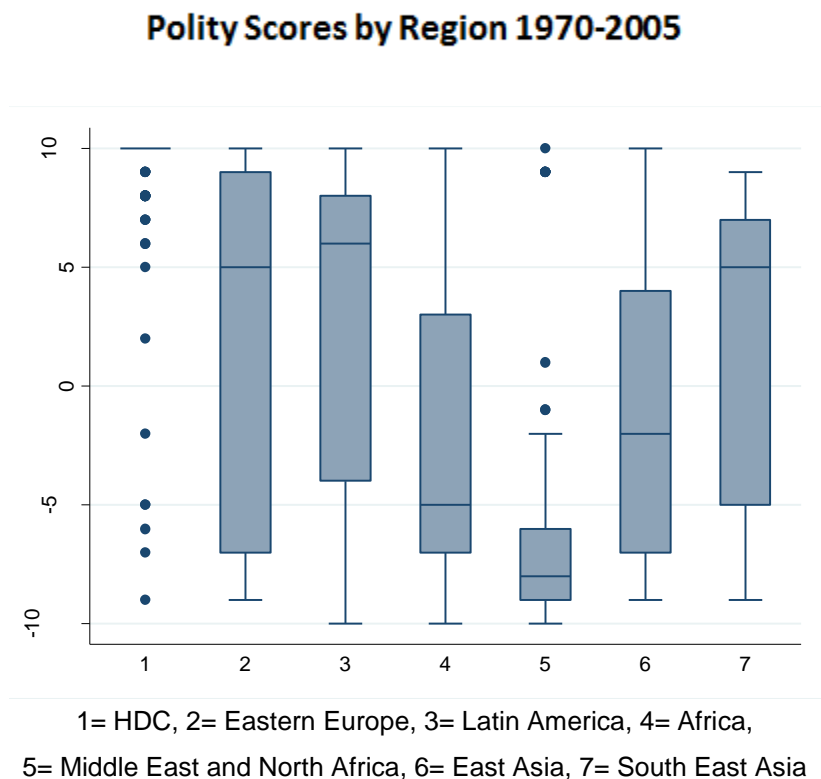


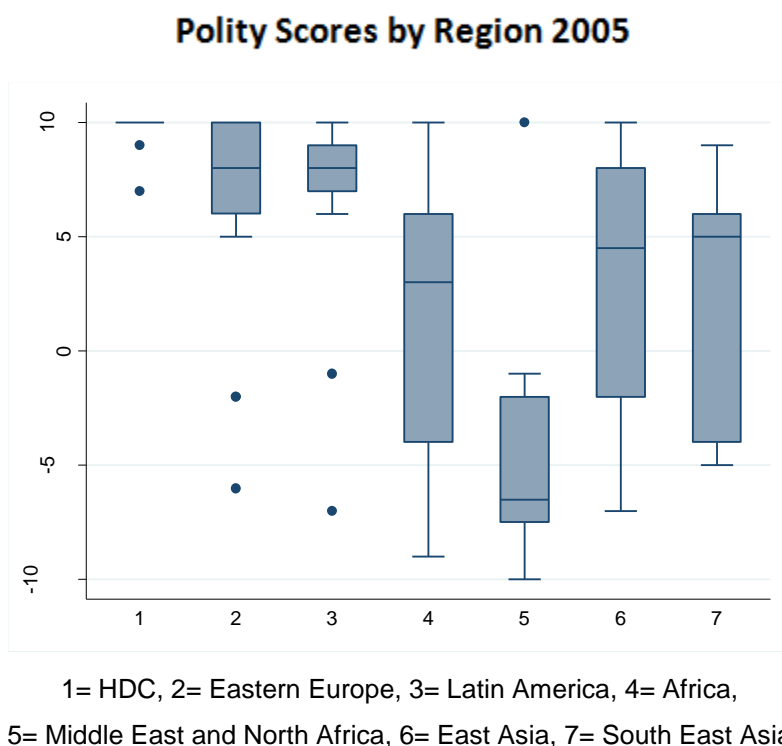
Figure 3 shows that for the HDC, region 1, the median score over the entire sample period is 10 with several outside values. Those are on account of France and Turkey never having obtained a perfect 10 score during our time frame of analysis, and Greece, Spain and Portugal being classified as non-democratic (anocratic for the former and autocratic for the latter two) regimes between 1970 and 1980. In region 2, Eastern Europe, the polity scores over time reflect the transition from communist to democratic regimes, in 2005 only Kazakhstan was still an autocracy, Kyrgyzstan, Albania and Tajikistan were anocracies (polity scores ranging from -5 to +5). Indeed, Eastern Europe reveal the greatest improvement (an average of 13 points) in polity scores between 1970 and 2005, (the large jump from 1990 onward is evident in figure 2), followed by Latin America, an average improvement of 7 points. Region 7, South East Asia shows a marginal average deterioration (-0.75) over the 35 years¹⁵.

¹⁴ Preliminary correlation too confirms a negative relationship between polity scores and region where the latter was codified with highly developed countries and Europe listed as number 1 and 2 respectively, Latin America as 3, Africa, and the Middle East and North Africa as 4 and 5, and East and South East Asia as 6 and 7

¹⁵ However, as region 1 has almost no variation in this variable, such that the highly developed countries show no institutional variation in our analysis over the sample period, and region 2, Eastern Europe is mostly missing data prior to 1990, we may find this poses a problem empirically.

The Middle East and North Africa region, region 5, also displays outside values from its 75th percentile and median of -8, namely the consistently democratic scores obtained by Israel ($\geq +9$), low negative scores ranging from -3 to -1 for Algeria, Yemen and Jordan and the positive (though low +1) score obtained by Iran in 2000. Ultimately the boxplot shows that all regions display huge variation in polity scores over the sample period. For illustration purposes figure 4 below shows that by 2005 the within-region variation has largely disappeared in the highly developed, Eastern Europe and Latin American countries. These regions (1, 2 and 3) are mostly democratic with the exception of a few countries. Africa, East Asia and South East Asia still show considerable variation, with highly democratic and undemocratic countries in their midst, however and the Middle East and North Africa region is still largely undemocratic with one exception – Israel¹⁶.

Figure 4

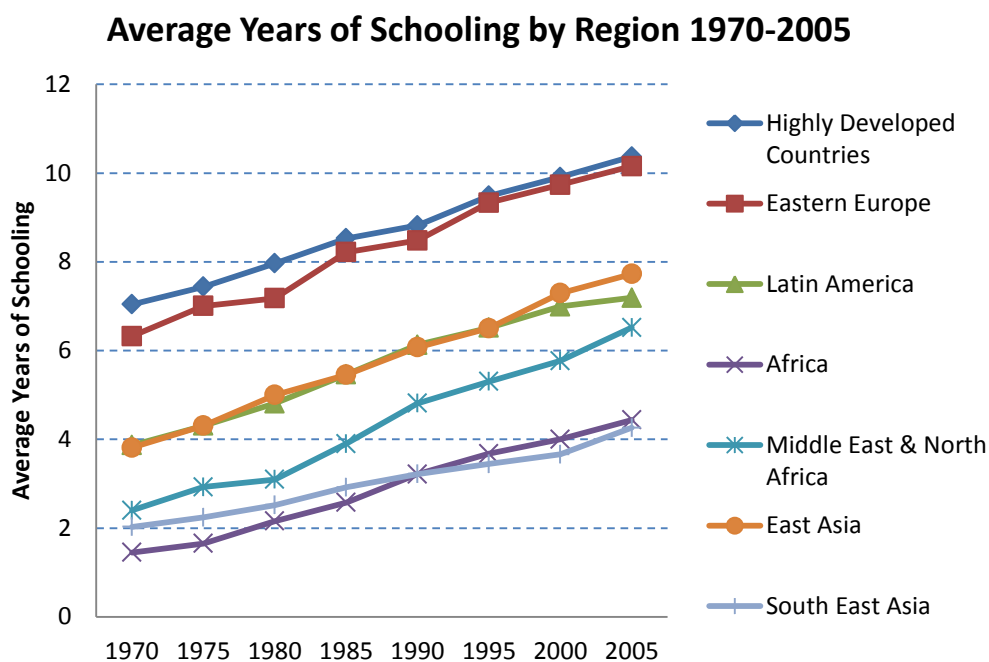


Turning now to our human capital variable, the average years of schooling in the population aged 25 and over, we see a positively skewed distribution in 1970. The mean average years of schooling is 3.97, slightly higher than the median of 3.6. The range in schooling is from 0.19 years in Mali to 10.92 years in New Zealand showing a significant variance of 7.28. By 2005, the distribution has become slightly negative, but the mean has risen to 7.4 years, slightly below the median of 7.9. The range is between 1.07 years in Mozambique to 13.09 in Czech Republic. This shows that the variance has grown to 8.73.

¹⁶ T-Tests confirm that we can reject the hypothesis that all regions have the same polity score over the sample period, 1970-2005. Furthermore the one-way Anova tests show that the greatest difference in polity scores occurs within regions rather than between them, the variances are also not the same. We can reject the null that the polity scores over years are the same. Furthermore, there is a greater difference within years than between them. We cannot reject the null that there are equal variances in polity scores between years.

The Maldives is the only country displaying a lower average years of schooling in 2005 (3.88) than in 1970 (4.05)¹⁷. All other countries have improved, some by more than 1300% (Morocco, from 0.27 years to 3.9) others only by 6% (Brunei, from 6.96 years to 7.41). Over the 35 year period some countries have greatly improved the educational attainment of their population whilst others have not, leading to a widening gulf between the highly and poorly educated countries. Figure 5 below highlights that all regions have experienced a linear improvement in the average years of schooling attained in their populations, though the greatest improvements have occurred in Africa and the Middle East and North Africa.

Figure 5



However, with the exception of the highly developed and Eastern European countries, the disparity across all regions and the ranking order is still evident in 2005, with only Africa having overtaken another region from the lowest starting point in 1970.

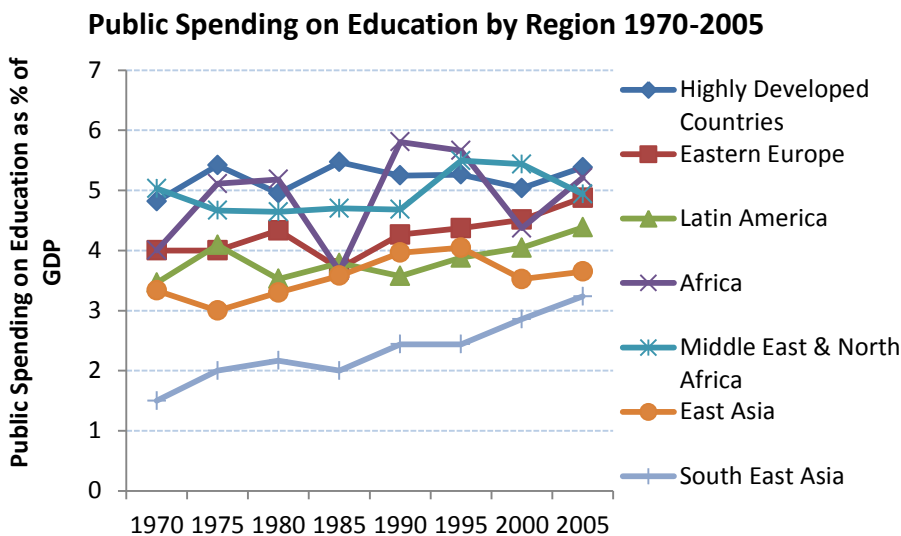
Whether the increases in average years of schooling across countries over time are on account of the trend toward prevailing democratic regimes, or vice versa, is the important question of our study. Looking at the bivariate relationship is instructive: regimes with polity scores of +6 or more do appear to have higher average years of schooling and GDP per capita levels (Table 1). However countries with polity scores below 0 appear to have a similar number of years schooling as those countries above 0 but less than +6. The countries of the Middle East for example, with lower polity scores, appear to spend as consistently a high proportion of public spending on education as a proportion of GDP as the highly developed ‘democratic’ countries (figure 6).

¹⁷ Chile and Yemen do have a value in 1970.

Table 1

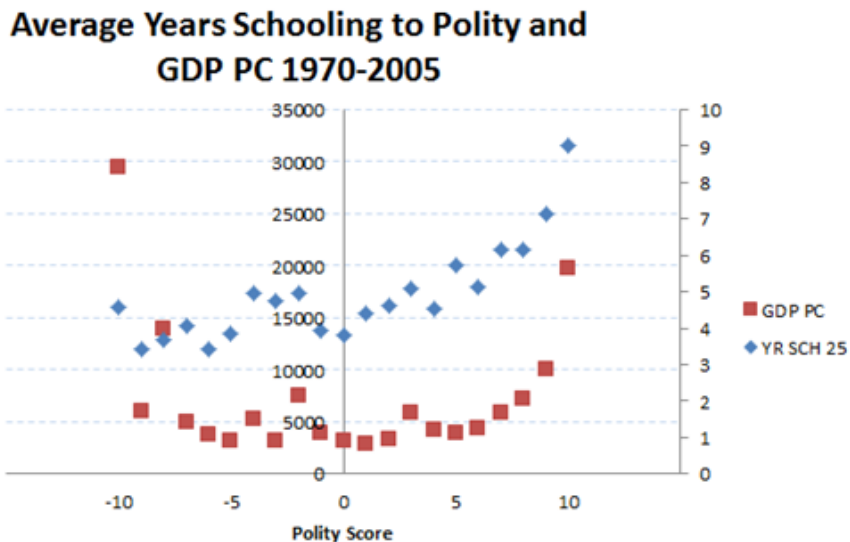
Polity	YR SCH 25	GDP PC	OIL & NGL PC
-10	4.58	29488.49	5171.20
-9	3.41	6000.21	345.18
-8	3.70	13966.17	2142.88
-7	4.05	4936.03	453.53
-6	3.42	3723.18	92.11
-5	3.85	3148.11	28.43
-4	4.96	5266.02	257.08
-3	4.75	3231.34	64.65
-2	4.95	7556.04	13.34
-1	3.96	3898.85	95.35
0	3.79	3112.27	13.70
1	4.40	2867.62	76.56
2	4.64	3264.35	35.58
3	5.07	5907.46	118.14
4	4.52	4293.89	85.09
5	5.72	3869.64	36.26
6	5.12	4369.73	109.05
7	6.17	5819.20	43.89
8	6.15	7176.51	134.84
9	7.14	10085.55	149.79
10	9.01	19831.03	214.24

Figure 6



Indeed, we can show in figure 7 below that there appears to be an association between higher average years of schooling with polity regimes above a score of 5, classified as “democratic” by polity. What is evident is a J-shape relationship, also visible in the GDP per capita data, where more democratic regimes and richer countries (save two exceptions) are associated with higher levels of education.

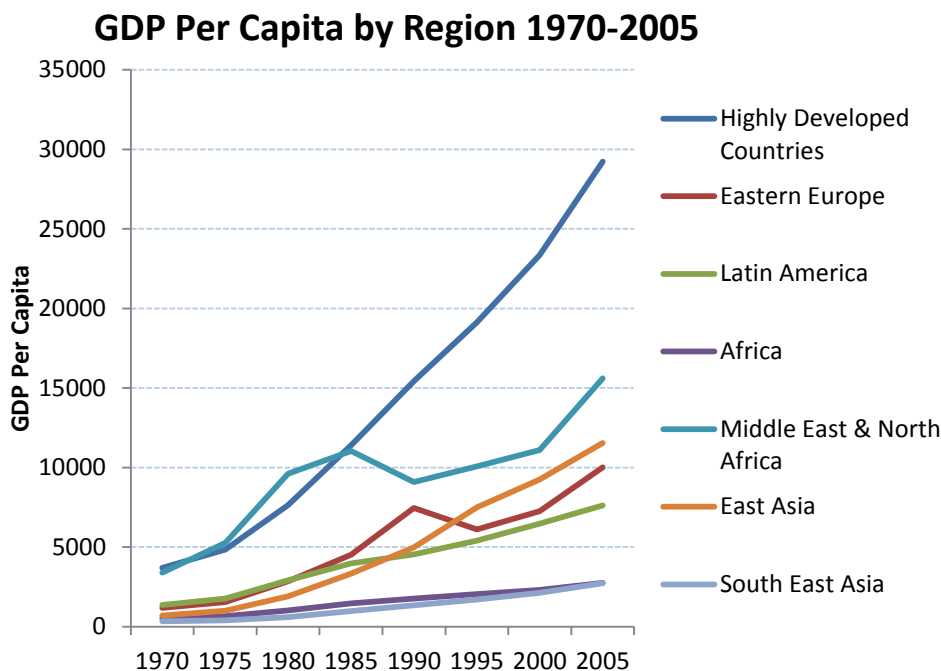
Figure 7



Turning now to GDP per capita, figure 8 below shows the evolution of GDP per capita by region during the sample period. In 1970 GDP per capita ranged from 135.64 USD in China to 13748.79 USD in Qatar. The mean score of 1605.81 USD (the income levels of Costa Rica, Mexico, Singapore and Malta in 1970 for example) is higher than

the median of 763.38 USD, indicating a positive skew (3.82) where the distribution is concentrated on the extreme left-hand side. A greater proportion of countries had very low scores. By 2005, GDP per capita ranged from 354.52 USD in the Democratic Republic of Congo to 62240.72 USD in Luxembourg. The mean is 11667.01 USD (the income levels of Argentina, Croatia and Poland in 2005 for example), higher than the median 7104.73 USD so the skew is still positive (1.39) but we can see the increase of wealth across countries. There are only 2 countries poorer in 2005 than 1970 and that is Liberia (575.67 USD in 1970, 390.36 USD in 2005) and the Democratic Republic of Congo (369.69 USD in 1970, 354.52 USD in 2005). The largest increases in wealth by region between 1970 and 2005 occurred in East Asia; GDP per capita rose by over 1500% from 703.41 USD to 11541.48 USD, followed by Eastern Europe, South East Asia and HDC by approximately 800-900%, and the Middle East, Latin America and Africa by 500-600%¹⁸.

Figure 8



Whilst we can see that the HDC have the highest GDP per capita by region, the Middle East has been in 1970 and throughout until 2005, the second highest. At a glance, figures 9a and 9b below, reveal the rents from oil and natural gas liquids per capita per region and explains the high GDP per capita in the Middle East. Its average rents over the sample period are 3572 USD per capita, almost 6 times that of the second highest region, HDC at 543 USD

¹⁸ Furthermore, the t-tests reveal that GDP per capita scores are not equal across regions, that within-region variation is greater than between region and the variances in GDP per capita between regions are not the same.

Figure 9a

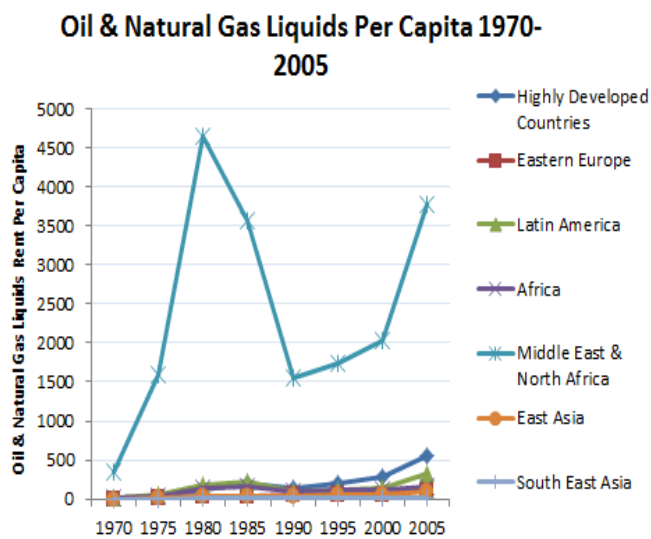


Figure 9b¹⁹

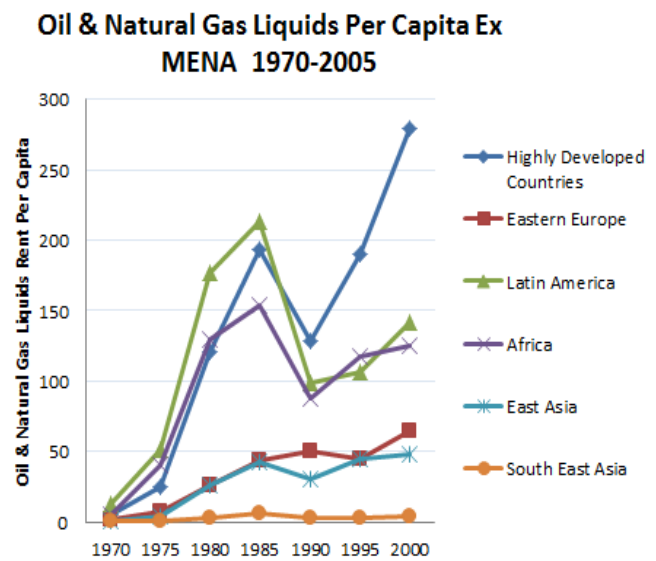


Figure 10

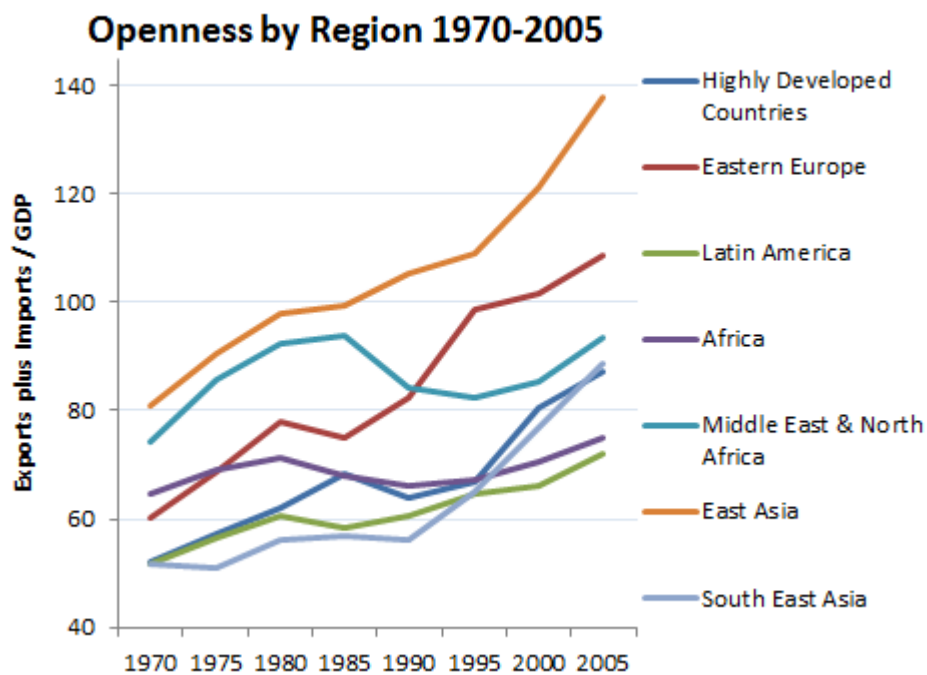


Figure 10 above shows the degree of openness (calculated as exports plus imports divided by GDP in constant prices) of each region, highlighting the export-led growth policies of East Asia (specifically the Asian tigers – Hong Kong, South Korea, Taiwan and Singapore) (Palley 2002).

¹⁹ Oil and natural gas liquids rents per capita by region are calculated by simple averages

3.4 Hypotheses

So, what can we take from this overview of the literature and available cross-country data? Firstly we can see that over our 35 year sample period the countries in our dataset have become richer, more educated and more democratic. These observations are in keeping with theoretical and empirical literature which suggests a link between all three measures. There is some empirical evidence as well as a theoretical expectation that democratic political institutions are associated with higher levels of human capital than non-democratic ones. However, it would seem that the link between political institutions and human capital is both conceptually and empirically complex. There appears to be a causal relationship in both directions between institutions and human capital but the direction of causation is unclear, both from our data and from the empirical and theoretical literature. The picture is further clouded by the fact that we expect to find that political institutions and human capital have a strong relationship with GDP per capita.

Therefore, from this complex set of interrelationships between democratic political institutions, education and GDP, we distil the following empirically testable hypothesis:

- 1) Firstly, we expect to find a two-way positive and significant causal relationship between democratic political institutions and education, controlling for confounding factors. Though this has not been found previously in the empirical literature, we expect that our use of a more efficient estimator (SYS GMM), which controls for endogeneity and persistence in our variables, will render this relationship apparent.
- 2) Secondly, we expect to find a positive relationship between education and GDP per capita, as well with median levels of government spending; though a negative relationship between democratic political institutions and the rents from oil and natural gas liquids.

3.5 *Econometric techniques and specification*

For our initial analysis we pool the data and employ first, OLS and then effects estimates.²⁰ The least squares method is a general approach to fitting a model of the data-generating mechanism to the observed data. The model is specified by a linear equation with free parameters which specify the intercept and the slope of the regression line. The values of the model parameters are chosen to minimize the sum of the squared deviations of the data from the values predicted by the model, which amounts to minimizing the error term.

OLS estimates have some strong statistical properties, specifically when (1) the data obtained constitute a random sample from a well-defined population, (2) the population model is linear, (3) the error has a zero expected value, (4) the independent variables are linearly independent, (5) the error is normally distributed and uncorrelated with

²⁰ All econometric analysis is performed using Stata version 10.

the independent variables (the so-called homoscedasticity assumption): then the OLS estimate is the Best Linear Unbiased Estimate (BLUE).

Referring to our hypothesis, we focus our attention on the significance of Human Capital to Institutions and estimate the following OLS regression specification in the first instance:

$$\begin{aligned} \text{Polity} = & \alpha + \beta_{i,1} \text{ average years of schooling} + \beta_{i,2} \text{ investment (as a percentage of GDP)} + \beta_{i,3} \text{ real GDP per capita} \\ & + \beta_{i,4} \text{ openness} + \beta_{i,5} \text{ inflation} + \beta_{i,6} \text{ inflation}^2 + \beta_{i,7} \text{ inflation}^3 + \beta_{i,8} \text{ government expenditure (as a percentage of} \\ & \text{GDP)} + \beta_{i,9} \text{ government expenditure}^2 \text{ (as a percentage of GDP)} + \beta_{i,10} \text{ public spending on education (as a} \\ & \text{percentage of GDP)} + \beta_{i,11} \text{ rents from oil and natural gas liquids per capita} + \sum T_t + \sum R_r \end{aligned}$$

where $\sum T$ represent latent variables for Year and Region in order to capture the time and region specific effects; and the subscripts i , t and r represent an individual, time and region specific effect.

We also specify the following regression to uncover the contrariwise significance of Institutions on the creation of Human Capital:

$$\begin{aligned} \text{Average years of schooling} = & \alpha + \beta_{i,1} \text{ polity} + \beta_{i,2} \text{ investment (as a percentage of GDP)} + \beta_{i,3} \text{ real GDP per capita} \\ & + \beta_{i,4} \text{ openness} + \beta_{i,5} \text{ inflation} + \beta_{i,6} \text{ inflation}^2 + \beta_{i,7} \text{ inflation}^3 + \beta_{i,8} \text{ government expenditure (as a percentage of} \\ & \text{GDP)} + \beta_{i,9} \text{ government expenditure}^2 \text{ (as a percentage of GDP)} + \beta_{i,10} \text{ public spending on education (as a} \\ & \text{percentage of GDP)} + \beta_{i,11} \text{ rents from oil and natural gas liquids per capita} + \sum T_t + \sum R_r \end{aligned}$$

OLS cross-sections fail to take account of time and individual variation in behaviour using the following regression specification: $y_i = x_i\beta + u_i + \varepsilon_i$ where u_i is a random disturbance and ε_i is the measurement error. In comparison OLS panel data regression takes the form: $y_{it} = x_{it}\beta_k + z_i\delta + u_i + \varepsilon_{it}$ where x_{it} is a $1 \times k$ vector of variables that vary over individual and time, β is the $k \times 1$ vector of coefficients on x , z_i is a $1 \times p$ vector of time-invariant variables that vary only over individuals, δ is the $p \times 1$ vector of coefficients on z , u_i is the individual-level effect, and ε_{it} is the disturbance term. As a result, the use of panel analysis enables richer hierarchical structures to be used, more complicated models to be formed, and observable and unobservable individual heterogeneity to be controlled for.

The democratic political institutions-human capital relationship can be estimated in a panel data setting for a number of reasons. Dawson (1998: P606) explains that there is value in the analysis of institutions over time, even if institutions change slowly, because 1) changes in democratic political institutions may explain cross-country differences in growth and human capital formation, and likewise, changes in the stock of human capital may

influence institutions over shorter time-frames than believed 2) reverse causation can be controlled by using a time dimension which increases the chances that observed correlation is causation; 3) the trend toward democracy across the world warrants the use of panel analysis. The different parameter values for each country that panel data allows and the control for fixed effects, contrary to cross-section OLS, is important in institutions analysis because cross-country differences in institutions is often thought of as a 'fixed effect' in explaining variations in economic performance and thus human capital formation across countries. Thus using panel data we can pinpoint the role of institutions (Dawson 1998: P606) as they evolve over time. As our descriptive statistics revealed, there is sufficient variation in our democratic political institutions and human capital variables across years and regions for the benefits of panel analysis to be exploited.

Two main approaches to the fitting of models using panel data are known as fixed and random effects regressions which differ in their treatment of u_i . If we have reason to believe that the unobservable individual-level effects are correlated with the regressors, omitted variable bias would result and OLS would be biased and inconsistent. Fixed effects regression (FE) treats u_i as a time-invariant "fixed effect" which in the context of the democracy-education relationship might be the informal social norms, customs, religion, and traditions which define how a society conducts itself which Williamson (2000) considers to be at level 1 in his conceptualisation of the hierarchy of institutions. These factors could simultaneously affect both the formation of democratic political institutions and educational attainment. Alternative fixed effects may be geography or colonial heritage for example. Fixed effects regression relaxes the assumption that the regression function is constant over time and space and permits each cross-sectional unit to have its own constant term. It does so by removing the u_i from the estimation using the within-transformation; it removes panel-level averages from each side of the equation above, noting that z_i and u_i are panel-level averages.

$$y_{it} - \bar{y}_i = (x_{it} - \bar{x}_i)\beta + (z_i - \bar{z}_i)\delta + u_i - u_i + \varepsilon_{it} - \bar{\varepsilon}_i$$

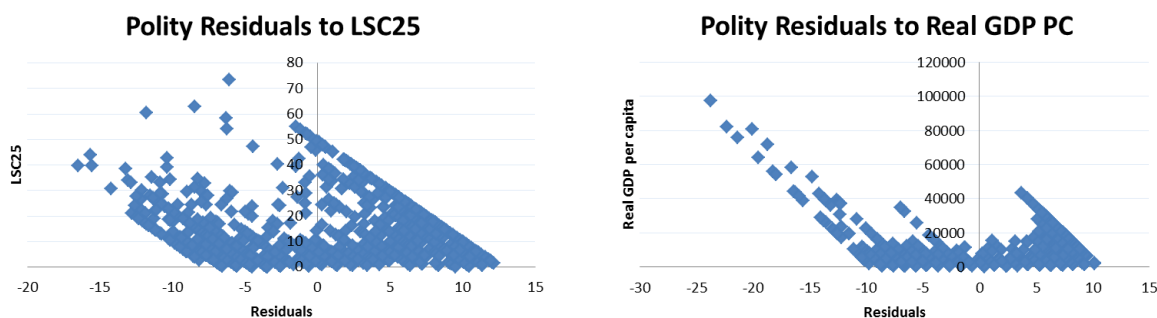
$$\therefore \tilde{y}_{it} = (\tilde{x}_{it})\beta + \tilde{\varepsilon}_{it}$$

In removing the u_i the FE model loses the ability to identify the δ coefficients and the model only has explanatory power if the individual's y above or below the individual's mean is significantly correlated with the individual's x values above or below the individual's vector of mean x values, hence why it is termed the within-estimator since it depends on the variation within the unit. Across-group variation is not used to estimate the regression coefficients, because this variation might reflect omitted variable bias. As a result the practical cost of fixed effects regression is that any characteristic which does not vary over each unit cannot be included in the model. The unit specific intercept term absorbs the heterogeneity in y and x , therefore any unit that is constant over time (e.g. religion, geography) for each unit will be perfectly collinear with the units indicator variable. An F-test of the null hypothesis that the constant term is equal across units can be used to test whether there are distinguishable intercept terms across units. If we reject the null then the FE model is efficient and pooled OLS will produce inconsistent estimates.

In comparison, random effects (RE) regression assumes that the u_i are uncorrelated with the regressors and the overall disturbance term, such that the individual level effects are simply parameterized as additional random disturbances such that $y_{it} = x_{it}\beta_k + z_i\delta + (u_i + \varepsilon_{it})$ where u_i and ε_{it} form a composite error term. As a result the RE model allows for a broader range of statistical inference and the time-invariant variables can also be identified as it uses quasi-demeaning. The RE model is estimated using generalised least squares (GLS) which, like OLS, is a matrix weighted average of the within and between²¹ estimators but it applies the optimal weight λ to the covariance matrix of the between estimator based on the following: $\lambda = \frac{\sigma_\varepsilon^2}{\sigma_\varepsilon^2 + T\sigma_u^2} = (1 - \phi)^2$. $\lambda = 1$ is appropriate if $\sigma_u^2 = 0$ (there are no random effects) then the pooled OLS model is optimal. If $\lambda = 0$, the fixed effects model is appropriate, implying σ_u^2 is much greater than σ_ε^2 . Because the FE model is consistent its residuals can be used to estimate σ_ε^2 and pooled OLS residuals can generate a consistent estimate of $(\sigma_\varepsilon^2 + \sigma_u^2)$, which together are used by GLS to estimate λ . The Hausman test, whose null hypothesis is that the orthogonality conditions imposed by the RE model are valid, is used to access which effects model is the correct one to use.

We therefore conduct static regression analysis on the two specifications highlighted by firstly using pooled OLS as stated and then using effects models to find the most efficient estimations. We have reason to believe that the zero-conditional mean assumption may be violated, implying a problem of endogeneity but also omitted variable and attenuation bias. In figure 12 below we present a scatter graph of the residuals to the fitted values when education or real GDP per capita is regressed on polity.

Figure 12



The distinct diagonal pattern is indicative of a violation in the zero-conditional mean error, which is a result either of omitted variable bias or endogeneity. This violation indicates that the conditions underpinning OLS model estimation will not hold and the results will not be efficient. Furthermore, neither FE or RE regression are efficient in

²¹ The between estimator regresses the group means of y on the group means of x to retain only one observation per unit to ignore the individual-specific variation in the variables that is considered by the within estimator.

the presence of endogeneity or persistence in our variables, or can tackle the correlation between unobserved panel level effects and lagged dependent variables (used if believed that y is also a function of its past levels) which makes the estimators inconsistent. This highlights the need to use a more efficient model, such as the GMM system estimator, which is able to correct for any unobserved country heterogeneity, omitted variable bias, measurement error and endogeneity that is present.

The most likely form of endogeneity within our specification comes from simultaneity bias; that is, both our democracy and education variables are likely to be jointly determined and as a result the error term will be correlated with the independent variable. Neither OLS nor FE and RE regression can tackle this violation of the zero-conditional mean error, and as result true causation between democracy and education cannot be determined which is the key research question of this paper. The estimation of causal effects requires exogenous sources of variation (Acemoglu et al 2008). As our institutions, human capital and GDP per capita variables are all (intuitively) endogenous, the use of a proxy which does not suffer from the same problem should be remedial. The most common approach is to lag the suspected endogenous variables by one or more periods, such that whilst current values of a variable might be endogenous, it is unlikely that past values are subject to the same problem. The primary advantages of using proxies or lags are that they are very simple to use and do not require further use of data. However, (precision of) interpretation is often compromised. Furthermore, as the extent of the endogeneity cannot be gauged, it is difficult to ascertain if this solution is adequate.

The oft-preferred solution for endogeneity is the instrumental-variables (IV) estimator, the most common IV estimator is Two Stage Least Squares (2SLS), to find an instrumented variable that satisfies two properties: the instrument z must be uncorrelated with u but highly correlated with the explanatory variable X in question. The instrument must only influence the dependant variable through the potentially endogenous independent variable. If the zero-conditional mean assumption holds, each explanatory variable can serve as its own instrument $X=Z$, and the IV reduces to the OLS estimator. IV estimation is intuitively appealing and relatively simple to implement on a technical level. The most difficult part lies in the selection of appropriate instruments. According to Rodrik (2004) "an instrument does not a theory make". However, the main advantages of IV estimation are rigor and transparency and amenability to empirical testing.

The presence of heteroskedasticity, however, invalidates the inferences drawn from IV techniques as the standard errors (though not the coefficients) are rendered inconsistent. Furthermore, the diagnostic tests for endogeneity and over-identifying restrictions are also made invalid. Whilst these problems can be partially addressed through the use of heteroskedasticity-consistent or robust standard errors and statistics, the usual approach today when facing heteroskedasticity of unknown form is to use Generalized Method of Moments (GMM) which makes use of the orthogonality conditions to allow for efficient estimation (Baum et al. 2002). Most importantly however most of the time suitable instruments simply don't exist.

Arellano and Bond (1991) devised what's now termed the 'difference' GMM estimator to tackle endogeneity (and simultaneous bias), by using first-differences to remove the u_i (and associated omitted variable bias) and using lagged values of the endogenous variables (which enter the equation in differenced form) as instruments. Several

post-estimation tests, such as the Sargan or Hansen J statistic, can be used to determine if the instruments used are exogenous and therefore causation between democracy and education can be determined. Roodman (2006) cautions that the Sargan/Hansen tests cannot be relied upon too faithfully in the presence of too many instruments, though it is difficult to know how many this constitutes. He emphasises however that the `xtabond2` program in Stata issues a warning when instruments outnumber individuals in the panel, as a minimally arbitrary rule of thumb. And according to other studies' (Windmeijer 2005) findings, the upper limit for the number of instruments is quite generous.

It was found in later work however that lagged levels are often poor instruments for the first differenced variables, especially when the variables are highly persistent. Blundell and Bond (1998) modified the "difference" estimator to include lagged levels as well as lagged first differences as instruments to create the "system" GMM estimator. The system GMM estimator performs better than the difference GMM estimator because the instruments in the levels model remain good predictors for the endogenous variables in this model even when the series are very persistent (Windmeijer 2005). Given that persistence has been found by previous authors in earlier versions of our education variable, Barro and Lee's (2010) average years of schooling, (Glaeser et al 2004, 2007 and Castello-Climent 2008) and our democratic political institutions variable (Bobba and Coviello 2007, Castello-Climent 2008) this is important to us. Logically, human capital today, just like democracy today, is likely to be a function of past levels of education and the political structure. In both cases, these are institutions that evolve slowly over time. That is, institutions build upon their own foundations and are not contemporaneously (or newly) determined year by year. We have found ourselves that correlations between 10 year intervals of our education variables are never less than 95 per cent, so we too have found (descriptive) persistence, or serial correlation, in our model, and as SYS GMM is the more efficient estimator in this instance, SYS GMM will be our model of choice. In the presence of persistence in the dependent variable, it is necessary to incorporate lags of the dependent variable into the SYS GMM model. Neither OLS nor effects models are consistent estimators in dynamic settings (Windmeijer, 2005).

A final point must be made here about whether to use levels or differences in the variables of interest in our regression. This is not a trivial issue and is highlighted in Acemoglu et al (2008)'s study on the relationship between income and democracy. Whilst they find, using fixed effects regression in levels on panel data between 1960 and 2000, that there is no statistically significant effect of income on democracy, they argue that logically the correct specification for the income-democracy relationship may be with fixed growth effects. Using changes in income on cross-sectional data using OLS regression, they find a positive correlation between income and democracy over 500 years, though the size of the coefficient is greatly reduced when they include a range of historical variables in the regression. They conclude that the positive cross-sectional relationship between income and democracy today is the result of societies embarking on divergent development paths at certain critical junctures during the past 500 years. In this regard they argue that even in the absence of a simple causal link from income to democracy, political and economic development paths are interlinked and are jointly affected by various factors. Whilst Acemoglu et al (2008) use both levels and first differences regression they use the data transformation relevant for the different dimensional data they use. The interpretation of the coefficient under first differences is that the absolute change in democracy is a linear function of the absolute change in income, which is necessary using cross-sectional data. Using panel data in levels, it would be that democracy is a linear function of income. Econometrically however

Plosser and Schwert (1978) argue that if the data are measured over intervals which are relevant for the economic theory which underlies the econometric model, it should not matter whether the levels or the differences are used to estimate the regression parameters as long as there is no serial correlation in the residuals. The changes in variables are related in the same way as the levels of these variables except for the constant term and the error structure. If the errors are stationary then the levels regression will produce an unbiased and consistent estimate of the coefficient on the independent variable, whilst first differencing would result in the error structure becoming a first-order moving-average process MA(1) which implies first-order autocorrelation. First differencing in this case introduces a unit-root into the moving-average structure of the disturbances which will result in a biased estimate of the independent variable's coefficient (unless of course the independent variable is a random walk then the first difference of the independent variable will be serially uncorrelated, and the estimate of the coefficient is unbiased and efficient even with autocorrelated disturbances). If however the error structure is non-stationary and follows a first-order autoregressive process and the regression is estimated in levels instead of first differences then the estimate of the coefficient on the independent variable will be inconsistent.

In the context of a dynamic specification (our preferred model in order to account for persistence in the democracy and education variables), Bond et al (2002) explain that in the context of a first-order autoregressive model with unobserved individual specific effects η_i and serially uncorrelated disturbances v_i the model reduces to a random walk when $a = 1$: $y_{it} = ay_{it-1} + (1-a)\eta_i + v_{it}$, $|a| \leq 1$ for $i = 1, \dots, N$ and $t = 2, \dots, T$. As we have mentioned, for $a < 1$, OLS produces an upward bias and inconsistent estimate due the correlation between the lagged dependent variable and the omitted individual-specific effect, whilst for $a = 1$ OLS is consistent. Regardless of the true value of a , within-groups estimation gives a downward biased estimate which becomes inconsistent as N becomes large for a fixed T . Difference GMM eliminates the individual-specific effect through first-differences and uses suitably lagged levels of the series as instruments for the equation in first differences. However if the series is highly persistent, or in the extreme case is a random walk, $y_{it} = ay_{it-1} + v_{it}$, there is no correlation between $\Delta y_{it-1} = v_{it}$ and lagged levels of the series, so difference GMM cannot identify a even in large samples. System GMM imposes a restriction on the initial conditions (y_{i1}) and only considers models where $a < 1$ however under the following assumptions this also applies to a unit root case: $E[(y_{i1} - \eta_i)\eta_i] = 0$ if $a < 1$ and $Var(y_{i1}) < \infty$ if $a = 1$. The first restriction ensures Δy_{it} is uncorrelated with η_i for stationary processes and the second restriction ensures that y_{it} is correlated with Δy_{it} for nonstationary processes. Then regardless of its true value, the parameter a is identified using lagged differences Δy_{it} dated $t-1$ and earlier as instrumental variables for the levels equation. For $a < 1$ there is the additional information in the first differenced equations and both sets of moment conditions are combined in the System GMM estimator. The Sargen/Hansen post-estimation tests and the AR(2) test statistic also enable us to determine the correct lag structure of the instruments to use to ensure there is no autocorrelation in the disturbance term. As a result System GMM should provide efficient estimates of our parameters of interest, as Plosser and Schwert (1978) explained, by ensuring that there is no serial correlation in the error structure.

Returning to economic theory in order to bring accountability to the econometrics, we believe that the correct regression specification is in levels in any case. That is, higher levels of education, which necessarily correspond to increasing levels of sophistication from primary to secondary to tertiary years, should produce higher levels of democracy through the mechanisms we have described in section 2. A regression in differences would question if the amount of change in education, though it may still be at very low levels (indeed growth levels in education would be much larger at lower ends of the spectrum) produces a change in democracy, which seems less plausible in the education-democracy relationship, particularly where the presence of democracy is ultimately measured in levels in political datasets. Hall and Jones (1999) provide valid arguments for the use of levels as opposed to rates of growth in their economic growth regressions which apply to our context. Firstly, levels implicitly capture differences in growth rates over the long run, which is more useful than growth rates over the period for which we have data. Secondly, differences in government policies are often associated with differences in levels, not economic growth rates, which apply to the education context. Lastly growth rates in education across countries across years may reflect transitory differences whilst the purpose of our study (and theirs in the economic performance context) is to explain the variation in long-run democratic political institutions by studying the direct cross-sectional relationship over time with our variables of interest in levels. We therefore follow Castello-Climent (2008) and Bobba and Coviello (2007) in using levels regression, and as explained, the System GMM estimator will provide efficient and consistent results when correctly specified.

4 Results and Discussion

4.1 OLS and Effects Models

We begin by presenting the estimates of our static pooled OLS and effects results²². It is important to note from the outset that the data has been standardised for ease of comparability between variables, therefore all coefficients refer to standard deviations²³. This is particularly important as we wish to compare the magnitude of the effect of education on democracy with the reverse. Democracy is measured by Polity IV's Polity2 score. Education is measured through Barro and Lee's (2010) Average Years of Schooling. Year dummies were included in all regressions but are not reported here to save space.

Table 2 presents the OLS results and provides evidence in support of our first hypothesis, in that democratic political institutions and education are each found to have positive and highly significant effects on one another at the 0% level.

²² We found that by including region dummies, to control for the average differences across regions in any observable or unobservable predictors and thus regional heterogeneity, the region controls absorbed all the cross-sectional variance. As we showed in our descriptive statistics section, there is a surprisingly large amount of variation within regions over the time period and so such an effect is unsurprising (Plumper et al 2005). We therefore proceed with year variables only.

²³ The mean is subtracted from the value and then the difference between the individual value and the mean is divided by the standard deviation of the value.

<u>Table 2: OLS</u>			
	<u>Polity</u>		<u>Edu</u>
	(I)		(IV)
Dependent variable is democracy:		Dependent variable is education:	
Avg Yrs Edu for over 25s	0.50**** (0.053)	Polity	0.34**** (0.035)
Investment	-0.05 (0.043)	Investment	-0.04 (0.034)
Real GDP Per Capita	0.32**** (0.065)	Real GDP Per Capita	0.61**** (0.049)
Openess	-0.14**** (0.034)	Openess	0.07* (0.034)
Inflation	-0.45 (0.3070)	Inflation	0.87**** (0.244)
Inflation ²	2.17 (-1.693)	Inflation ²	-4.00** (1.616)
Inflation ³	-2.86 (2.794)	Inflation ³	5.69* (2.991)
Government Expenditure (% of GDP)	-0.06 (0.113)	Government Expenditure (% of GDP)	0.35**** (0.086)
Government Expenditure ² (% of GDP)	-0.04 (0.107)	Government Expenditure ² (% of GDP)	-0.23*** (0.077)
Public Spending on Education (% of GDP)	-0.03 (0.029)	Public Spending on Education (% of GDP)	-0.01 (0.025)
Rents from Oil and Natural Gas Liquids Per Capita	-0.44**** (0.083)	Rents from Oil and Natural Gas Liquids Per Capita	-0.22**** (0.04)
Constant	0.22 (0.150)	Constant	-0.26** (0.117)
Observations	527	Observations	527
R-squared	0.48	R-squared	0.66
Adj. R-squared	0.47	Adj. R-squared	0.65

Standard errors in parentheses

Significance levels: **** p<0.001, *** p<0.01, ** p<0.05, * p<0.1

Similarly, we find support for our second hypothesis, that real GDP per capita is positively associated with both polity and education. Also as expected, rents from oil and natural gas liquids per capita have a negative impact on the development of political institutions as well as on education. Somewhat surprisingly, openness has a negative and highly significant impact on political institutions but a positive and weakly significant impact on education. The model may be picking up the Asian export-orientated economies and the oil-exporting Middle East countries that are undemocratic. Government expenditure as a percentage of GDP, as predicted, has a positive and significant effect on education at low-medium levels but a negative effect at higher levels, indicating, as economic theory dictates, that inefficiencies and misallocation of resources can result from excessive government spending and involvement in the economy. Lastly, we find that public spending on education as a percentage of GDP has no effect on education. Again, this is surprising but as we do not have data for private spending on education, this proxy for financial inputs into education may be incomplete.

As explained in section 3.4, however, OLS estimators are only “best linear unbiased estimators” if the (rather strict) Gauss-Markov assumptions are met. If there are nonlinearities, heteroscedasticity or endogeneity present, the standard errors of the OLS estimators will be invalid and any statistical inference drawn from them will be meaningless. Given that we expect a degree of unobserved country heterogeneity, that is, unobserved effects at individual country level, OLS estimators will be inefficient. However panel data methods offer a solution to this problem. Not only do they control for heterogeneity, panel data methods are more informative with more degrees of freedom and less collinearity and more efficient estimators, they also permit the study of individual dynamics by allowing time specific and individual effects. As previously explained, fixed effects models assume that unobserved country heterogeneity is constant over time and correlated with the independent variables. This constant is removed from the data through the within estimator to remove the time invariant components (and therefore the heterogeneity) of the model. In random effects, the heterogeneity is assumed to be uncorrelated with both the independent variables and the error term and is treated as an additional random disturbance. Given that effects models control for unobserved heterogeneity, we turn to the more efficient effects estimators. Tables 3 and 4 present both fixed and random effects estimates. In the fixed effects regression in Table 3 education and democracy no longer exert significant effects on one another. The insignificant effect education on democracy under fixed effects is consistent with the finding of Acemoglu et al (2005), Glaeser et al (2007) and Castello-Climent (2008). Whilst income is still significant for democracy, its coefficient has switched to a negative sign compared to OLS. The adjusted R-squared is also considerably smaller at 0.07 compared to 0.47 previously. As we have highlighted, within-estimation sweeps out the individual time-invariant specific effects which may be important for the education-democracy relationship. Furthermore the estimator only has explanatory power if there is sufficient variant within the unit. These factors may explain why when either democracy or education is the dependent variable there is no relationship apparent. The Hansen tests²⁴ suggest that random effects estimator is appropriate for our purpose.

²⁴ The Hansen test P-value was 0.09 when Democracy is the dependent variable; 0.64 when Education is the dependent variable.

Table 3: FE				Table 4: RE			
	Polity		Edu		Polity		Edu
	(I)		(IV)		(I)		(IV)
Dependent variable is democracy:		Dependent variable is education:		Dependent variable is democracy:		Dependent variable is education:	
Avg Yrs Edu for over 25s	-0.02 (0.09)	Polity 0.00 (0.027)		Avg Yrs Edu for over 25s	0.41**** (0.062)	Polity 0.10**** (0.027)	
Investment	0.01 (0.041)	Investment -0.07*** (0.022)		Investment	0.02 (0.04)	Investment -0.08**** (0.024)	
Real GDP Per Capita	-0.49**** (0.102)	Real GDP Per Capita -0.08 (0.057)		Real GDP Per Capita	-0.02 (0.077)	Real GDP Per Capita 0.17**** (0.052)	
Openness	0.06 (0.078)	Openness 0 (0.043)		Openness	-0.08 (0.056)	Openness 0.03 (0.04)	
Inflation	-0.31 (0.211)	Inflation 0.20* (0.116)		Inflation	-0.37* (0.217)	Inflation 0.24* (0.125)	
Inflation ²	2.28* (1.295)	Inflation ² -1.1 (0.711)		Inflation ²	2.48* (1.341)	Inflation ² -1.32* (0.769)	
Inflation ³	-3.80* (2.254)	Inflation ³ 1.69 (1.238)		Inflation ³	-3.99* (2.342)	Inflation ³ 2 (1.342)	
Government Expenditure (% of GDP)	-0.05 (0.128)	Government Expenditure (% of GDP) 0.05 (0.07)		Government Expenditure (% of GDP)	-0.05 (0.122)	Government Expenditure (% of GDP) 0.14* (0.073)	
Government Expenditure ² (% of GDP)	0.07 (0.117)	Government Expenditure ² (% of GDP) -0.02 (0.064)		Government Expenditure ² (% of GDP)	0 (0.115)	Government Expenditure ² (% of GDP) -0.1 (0.068)	
Public Spending on Education (% of GDP)	0.05 (0.034)	Public Spending on Education (% of GDP) 0.01 (0.019)		Public Spending on Education (% of GDP)	0.03 (0.032)	Public Spending on Education (% of GDP) 0.01 (0.02)	
Rents from Oil and Natural Gas Liquids Per Capita	0.07 (0.062)	Rents from Oil and Natural Gas Liquids Per Capita 0.05 (0.034)		Rents from Oil and Natural Gas Liquids Per Capita	-0.15**** (0.055)	Rents from Oil and Natural Gas Liquids Per Capita 0 (0.035)	
Constant	-0.1 (0.103)	Constant -0.44**** (0.052)		Constant	0.07 (0.117)	Constant -0.38**** (0.085)	
Observations	527	Observations	527	Observations	527	Observations	527
R-squared	0.28	R-squared	0.73	R-squared	102	R-squared	102
Adj. R-squared	0.07	Adj. R-squared	0.65	Adj. R-squared	0.42	Adj. R-squared	0.46

Standard errors in parentheses

Significance levels: **** p<0.001, *** p<0.01, ** p<0.05, * p<0.10

In Table 4 we continue to see that democratic political institutions and education are positive and significant determinants of one another when the random effects model is used in place of OLS. However the coefficients have reduced in size, particularly for polity. Real GDP per capita still has a positive effect on education but no longer on democracy, highlighting that by taking into account country specific effects the RE model has picked up that there were a number of rich countries in our dataset that were not democratic; so a strict relationship between GDP per capita and democracy could not exist. The openness, inflation and government expenditure variables have lost virtually all significance, however investment now exerts a negative and highly significant effect on education compared to OLS though the coefficient remains small. We highlighted previously that investment may have a negative impact on education as higher private investment spending could lead to improved job growth and impact further education decisions.

Whilst the random effects model provides an improvement over OLS, effects models still cannot remedy the problem of endogeneity between our regressor and independent variables, notably between education and GDP per capita and democratic political institutions. We therefore turn to our System GMM models.

4.2 *Static and Dynamic SYS GMM Models*

As explained in section 3.4, system GMM is our preferred model owing to its efficiency in the presence of endogeneity and persistence. We present our static SYS GMM results in Table 5 below alongside Dynamic SYS GMM results including a lagged dependent variable in Table 6. In using SYS GMM we treat all variables (save year variables) as endogenous and use a lag (2 .) structure. The second lag of the instruments were the first available that were not correlated with the error term or the error term's lag. We present the AR(2), Hansen-J, and Difference-in-Hansen, statistics at the bottom of the tables and in all instances we see that all three statistics are not significant, indicating respectively that there is no second-order serial correlation in the residuals, the model specification is correct and all overidentified instruments are exogenous and the system-GMM instruments are exogenous and they increase the Hansen J-test.

In Table 5 below we see that education and democracy still have positive and highly significant effects on one another when the SYS GMM model is used. In fact the results are similar to the random effects model. Real GDP per capita still has a positive effect on education at the 5% level with a coefficient of 0.35, though the effect is slightly less than that caused by Polity, with a coefficient of 0.41. The education coefficient on democracy is very large however, 1.08 and at the 0% significance level, and investment now exerts a positive effect on democracy and a negative effect on education, as we would expect. Oil and natural gas liquids rents per capita continue to exert a negative effect on democracy, albeit at the 5% level instead of the 1% level in the RE model, although the coefficient is larger now at 0.25 instead of 0.15. Government spending continues to exert a positive and significant effect on education at the 10% level.

Given that persistence in our variables can only truly be controlled for by including the lagged dependent variable in the regression, we turn to our dynamic SYS GMM model in Table 6. We still find that education and democracy exert positive and significant effects on one another (albeit at the 1% significance level instead of 0% witnessed in

the OLS, RE and Static SYS GMM models) even when controlling for the effect that previous levels of, for example, education and democracy, exert on current values. For example, the data highlights that education has a positive impact on democracy even when the persistency of democracy is controlled for. After all, democratic political institutions build upon their own foundations and are not contemporaneously determined every year. Furthermore human capital today is likely to be a function of past levels of education, but democracy still exerts a positive impact on contemporary education. The key difference between the dynamic and static system GMM models is that Real GDP per capita and investment lose all significance in the dynamic model; the only significant effects on education are caused by previous levels of education, the lagged average years of schooling, and polity. This indicates that including lagged education absorbs the significance of GDP and other variables. Similarly in the dynamic model, only education and previous levels of democracy, the lagged polity score, have a positive and significant impact on polity.

Ultimately, what is strikingly apparent across all four models, OLS, RE, SYS GMM and Dynamic SYS GMM, is that the coefficient on polity is always smaller than the coefficient on education. That is, for the same significance level, education exerts a larger impact on democracy, than democracy exerts on education, even when controlling for Real GDP per capita and persistence.

As discussed in section 3.1, we use Polity IV's constraints on the executive, and Freedom Houses' Political Rights and Civil Liberties scores as alternative measures for democratic political institutions for robustness purposes. We also use secondary enrolment rates instead of the average years of schooling measure for education. In doing so we find the same results; education and democracy exert positive and significant effects on one another and, more interestingly, that education exerts a larger effect on democracy than democracy exerts on education. This is evident in tables 7 and 8.

Table 7 shows that for all measures of democratic political institutions and both measures of education, the effect of education on democracy is greater than the reverse. For example, a 1 standard deviation increase in education (measured by the average years of education) results in a 1.08 standard deviation increase in the polity score, whereas a 1 standard deviation increase in polity produces a 0.41 standard deviation increase in education. Similarly, a 1 standard deviation increase in secondary enrolment rates produces a 0.81 standard deviation increase in polity, where as a 1 standard deviation increase in polity produces a 0.36 standard deviation increase in education. The same relationship is apparent in the dynamic specification in Table 8.

<u>Table 5: SYS GMM</u>				<u>Table 6: DYN SYS GMM</u>			
	<u>Polity</u>		<u>Edu</u>		<u>Polity</u>		<u>Edu</u>
	(I)		(IV)		(I)		(IV)
Dependent variable is democracy:		Dependent variable is education:		Dependent variable is democracy:		Dependent variable is education:	
Avg Yrs Edu for over 25s	1.08**** (0.132)	Polity	0.41**** (0.078)	Avg Yrs Edu for over 25s	0.41*** (0.126)	Polity	0.13**** (0.039)
Investment	0.23* (0.115)	Investment	-0.18** (0.087)	L.Polity	0.69**** (0.082)	L.Avg Yrs Edu for over 25s	0.76**** (0.108)
Real GDP Per Capita	-0.05 (0.17)	Real GDP Per Capita	0.35**** (0.116)	Investment	0.07 (0.068)	Investment	-0.08 (0.047)
Openess	-0.11 (0.146)	Openess	0.17 (0.104)	Real GDP Per Capita	-0.1 (0.079)	Real GDP Per Capita	0.02 (0.056)
Inflation	0.78 (0.928)	Inflation	0.09 (0.655)	Openess	-0.05 (0.066)	Openess	0.07 (0.057)
Inflation ²	-0.73 (6.186)	Inflation ²	-2.14 (4.429)	Inflation	0.59 (0.654)	Inflation	-0.62* (0.345)
Inflation ³	-3.83 (11.737)	Inflation ³	5.39 (8.163)	Inflation ²	-1.67 (4.473)	Inflation ²	3.85* (2.278)
Government Expenditure (% of GDP)	-0.04 (0.329)	Government Expenditure (% of GDP)	0.34* (0.206)	Inflation ³	1.94 (8.07)	Inflation ³	-5.53 (4.093)
Government Expenditure ² (% of GDP)	-0.1 (0.276)	Government Expenditure ² (% of GDP)	-0.3 (0.189)	Government Expenditure (% of GDP)	-0.13 (0.176)	Government Expenditure (% of GDP)	0.05 (0.118)
Public Spending on Education (% of GDP)	-0.01 (0.098)	Public Spending on Education (% of GDP)	-0.06 (0.046)	Government Expenditure ² (% of GDP)	0.07 (0.149)	Government Expenditure ² (% of GDP)	-0.02 (0.101)
Rents from Oil and Natural Gas Liquids Per Capita	-0.25** (0.12)	Rents from Oil and Natural Gas Liquids Per Capita	-0.09 (0.083)	Public Spending on Education (% of GDP)	-0.03 (0.049)	Public Spending on Education (% of GDP)	-0.01 (0.021)
Constant	0.42* (0.249)	Constant	-0.21 (0.19)	Rents from Oil and Natural Gas Liquids Per Capita	-0.03 (0.042)	Rents from Oil and Natural Gas Liquids Per Capita	0.02 (0.056)
Observations	527	Observations	527	Observations	495	Observations	491
Instruments	92	Instruments	92	Instruments	92	Instruments	92
Number of countryid	102	Number of countryid	102	Number of countryid	102	Number of countryid	101
AR(2)	0.321	AR(2)	0.696	AR(2)	0.878	AR(2)	0.298
Hansen J Statistic	0.473	Hansen J Statistic	0.595	Hansen J Statistic	0.207	Hansen J Statistic	0.632
Difference-in-Hansen	0.4	Difference-in-Hansen	0.14	Difference-in-Hansen	0.991	Difference-in-Hansen	0.601

Standard errors in parentheses

Significance levels: **** p<0.001, *** p<0.01, ** p<0.05, * p<0.1

Table 7: SYS GMM				
	Average years of Education for 25-60 year olds		Secondary Enrolment Rates	
	Dependent variable is Democracy: Independent variable is Education	Dependent variable is Education: Independent variable is Democracy	Dependent variable is Democracy: Independent variable is Education	Dependent variable is Education: Independent variable is Democracy
Polity	1.08****	0.41****	0.81****	0.36****
Political Rights	0.97****	0.54****	0.70****	0.38****
Civil Liberties	0.92****	0.65****	0.65****	0.44****
Constraints on Executive	1.03****	0.38****	0.76****	0.34****

Table 8: DYN SYS GMM				
	Average years of Education for 25-60 year olds		Secondary Enrolment Rates	
	Dependent variable is Democracy: Independent variable is Education	Dependent variable is Education: Independent variable is Democracy	Dependent variable is Democracy: Independent variable is Education	Dependent variable is Education: Independent variable is Democracy
Polity	0.41***	0.13***	0.31***	0.13**
Political Rights	0.46****	0.15***	0.24***	0.12**
Civil Liberties	0.52****	0.23***	0.32****	0.16**
Constraints on Executive	0.36**	0.11***	0.22**	0.15**

5. Conclusion

In this paper we sought to contribute to existing political and economic literature on the relationship between democratic political institutions and education. Using panel regression analysis, we examined the two-way endogenous relationship between them on an unbalanced panel covering the years 1970 to 2005 for 144 countries. We explored static pooled OLS and effects models, as well as static and dynamic System GMM models that allowed us to control for the endogenous effects, to find evidence, robust to different specifications, measurements and estimators, that democratic political institutions and education exert positive and significant effects on one another. These results are contrary to the findings of notable economists, including Glaeser et al (2004), Acemoglu et al (2005) and Murtin and Wacziarg (2014). As we explained, these studies suffer from inadequate and incorrect econometric specifications. In the former case, OLS is unable to control for the endogeneity between education and democracy, in the next case, the first difference GMM estimator suffers from a problem of weak instruments, biasing the estimator towards its fixed effect counterpart which exacerbates the measurement error of highly persistent variables, such as education (Hauk and Wacziarg 2006). Lastly, the latter claims that only the stock of education (average years of education in the population aged over 25, which they use as a proxy for economic

development) is a significant predictor of the flow of education (average years of schooling of the age group 5-14 years) and democracy loses its previous significance once this stock of education variable is added to the regression. But Murin and Wacziarg (2014) do not investigate if democracy impacts the stock of education itself. Our regression analysis is correctly specified in this regard. As a result our study used the System GMM estimator which reduces the potential biases and imprecision associated with the first difference estimator when variables are persistent, and used a correct specification for our purpose. Our results therefore concur with the findings of Bobba and Coviello (2007) and Castello-Climent (2008), that education exerts a positive and significant effect on democracy when using the same econometric specification. However our study extends beyond them to investigate the concomitant impact of democracy on education.

Our key finding is that education, over and above income, exerts a stronger but equally significant effect on the formation of democratic political institutions than the reverse. For identical significance levels, causation is stronger from education to democracy than from democracy to education. In some cases, notably the dynamic system GMM regression specification using the freedom house democracy indicators, education exerted a larger and more significant effect on democracy than the reverse. Returning then to the political economy argument between education and democracy, our findings for this chapter indicate that countries are therefore best advised to invest in education in the first instance to generate economic development and achieve democratic institutional outcomes as a result, rather than prioritising democratic reform first. Further investigation is required to ascertain if this policy advice holds across the thesis as a whole. What is of fundamental importance to the empirical study of the education-democracy relationship is an understanding of the statistical conundrum that is presented by their endogeneity. Therefore we wish to look in more detail at how democratic and educational profiles co-evolve over longer periods of time, beyond our cross-country analysis here over the years 1970-2005. In Chapter 2 therefore we turn our focus to one very long and interesting case study time series, namely that of France to explore this relationship further.

Chapter 2: The Relationship between Education and Democracy in France: A Structural VAR Analysis

Abstract

This study investigates the relationship between education and democracy in France using Structural Vector Autoregression (SVAR) analysis on an annual dataset between the years 1896 and 1994. The estimation results show that shocks to education have a positive and significant effect on democracy in France. The existing econometric literature using the Blundell-Bond (1998) GMM estimator finds evidence of a significant relationship between past levels of education and levels and changes in democracy. Our SVAR analysis compliments and extends this body of literature by using Structural Impulse Response Functions (SIRFs) to trace out the pathway of the response of democracy to a shock in education. Furthermore, by drawing upon the contemporaneity restrictions of the SVAR model, motivated by our case-study approach and economic theory, we also highlight the contemporaneous relationship between education and democracy that GMM and VAR models, by extension of the econometrics, cannot address.

1. Introduction

The education-democracy relationship is one which has been richly explored theoretically and, more recently, empirically throughout the social science literature. Education's imputed role is explained simply thus: it increases civic participation. The mechanisms through which it does so are firstly, by increasing the mental ability to process political information, make informed choices and circumvent obstacles to civic participation; secondly, by shaping individual preferences for, and benefits of, civic activity; and thirdly, through endowing students with fundamental democratic and pluralistic values (Dee, 2003). A wealth of evidence confirms that people with a higher educational attainment participate more fully in political activities, from voting to engaging in demonstrations; a relationship which holds at the individual level even when controlling for age, gender and income (Campante and Chor, 2011). Putnam (2001) claims that "education is by far the strongest correlate that I have discovered of civic engagement in all its forms". However, Davis (1962) and Huntington (1968) explain that higher education in modernising countries may lead to unemployment as labour markets are unable to accommodate this large group of skilled workers¹. The resulting unmet aspirations may lead to political instability and violence. This particular tenet was witnessed throughout the 'Arab Spring' in 2011, as it was the educated, largely unemployed (and frustrated) stratum of society who initiated the protests in similarly styled uprisings to the democratisation processes of South Korea and Taiwan decades previous. In this regard, the influence of education on democracy is convincing.

Indeed, recent studies confirm that the level of education strongly predicts mass endorsement of democratic procedures as well as rejection of non-democratic alternatives (Chong and Gradstein 2009, Evans and Rose 2012, Botero et al 2012). Studies also show that democracy only leads to positive economic benefits in countries with high education levels (Duch and Whitten 2003), as well-educated citizens are much more likely to have median voter preferences that favour growth-compatible public goods. Further, that the correlation between democracy and quality of government is only significant in countries with high levels of education (Fortunato and Panizza 2011). In the income-democracy literature it is education that is predominantly viewed as the transmission mechanism through which higher levels of prosperity generate democratic preferences, as the modernisation theorists propose.

Given the importance of education to democracy, recent economic literature has explored the relationship empirically on large panel datasets using cross-sectional time-series models, specifically using OLS and fixed effects (Glaeser et al. 2004, 2007) and system GMM models (Bobba and Coviello 2007, Castello-Climent 2008, Murin and Wacziarg 2014) with positive results. Education is found to exert a positive and significant effect on democracy. The contrary finding of Acemoglu et al's (2005) Arellano-Bond 'difference-GMM' paper, that no relationship exists, has been attributed to the weak instrument problem of the difference-GMM estimator when a series is highly persistent, which characterises education and democracy data. The majority of these studies investigate the effect of education on democracy, with only Glaeser et al. (2004) and Murin and Wacziarg (2014) addressing a possible two-way relationship. However they find that democracy is not a significant predictor of

¹ A recent study finds a cointegrating relationship between education and unemployment in Turkey, for example (Erdem and Tugcu, 2012).

education, or certainly not once income levels are controlled for. The central contribution of our first chapter, and the result that sets it apart from existing research, is that we found a significant two-way relationship between education and democracy even after controlling for income levels.

Our current study extends the analysis beyond the system-GMM regression models referred to above by investigating the direct education-democracy relationship using strictly time series techniques. To our knowledge the application of structural vector autoregressive models (SVAR) to this subject has not been tried. The utility of these models lie primarily in a function of the SVAR coefficients, namely the structural impulse response function (SIRF) as a moving-average representation of the system. The SIRF shows how democracy responds to an unexpected structural shock in education; how quickly democracy responds, for how many periods the resulting effect may be significant for and how quickly the effect may dissipate, if at all. This is quite different to the regression analysis that has already been undertaken, which models the linear relationship between democracy and education over time. SIRFs can provide a much richer understanding of the education-democracy relationship, both over short and longer time periods. Furthermore, by drawing upon the contemporaneity restrictions of the SVAR model, we can also highlight the contemporaneous relationship between education and democracy that GMM and VAR models, by extension of the econometrics, cannot address. GMM is an IV model, using lags as instruments for the contemporaneous values and VAR models cannot net out the contemporaneous relationships between the variables without structuralising the VAR to impose restrictions on the cross-equation error variance-covariance matrix.

The use of a SVAR model in our study is also motivated by economic theory and our articulation of the recursive nature of the education-democracy relationship. Structural econometric models, as defined by Hurwicz (1962) “allow us to predict the effect of interventions, such as deliberate policy actions, or changes in the economy or in nature of known types”. Our study is therefore well-suited. We concentrate our analysis on one country, namely France for a number of reasons: firstly because it is the only highly developed country to have temporarily lost its perfect “+10” Polity Index score which as such a unique case merits investigation; secondly, owing to the quality of data available, which we detail in the upcoming sections, with which we can undertake rich and meaningful analysis over a much longer time frame than our other studies; and lastly, whilst we sacrifice the consistency of cross country approaches by focusing one country alone we also gain from the depth and detail afforded by a case study approach which complements our panel studies. We find that the dramatic increase in the average years of education in France during the 1950’s and 1960’s was on account of the marked increase in the post-war birth rate and the resulting policy action of educational reforms that opened up access to secondary and higher education. Similarly the decline in democracy between 1958 and 1969 was a result of changing from a parliamentary to a presidential system, with a much stronger executive. Our SVAR analysis enables us to investigate if the education shock had a significant role to play in progressing democracy in France during this time frame. The use of VAR and SVAR models are also increasingly popular in the political science literature, owing to the presence of endogeneity and persistence within political variables (Freeman, Williams and Lin, 1989, Brandt and Freeman, 2009).

Therefore, we contribute to the existing education-democracy literature in the following three ways: firstly, we use an individual country's time series of annual data spanning almost 100 years to harness the benefits of a case-study approach, namely the richness of detail that comes from the study of one country, which stands in contrast to the recent econometric 5-year and 10-year panel data literature; secondly, we pioneer the use of structural impulse response functions to investigate the pathway of the response of democracy to a shock in education taking into account issues of stationarity and the structural breaks in our time series. By using a structural vector autoregression model, we by extension, explore the contemporaneous and recursive relationship between these two variables, which previous studies using GMM estimators cannot uncover. Thirdly, by investigating the response delay and the duration of the significant effect that education shocks have on democracy, our analysis confirms the results of previous empirical studies of a significant education-democracy relationship and extends beyond them to provide a richer level of detail of the period-by-period effect of education on democracy.

We proceed as follows: Section 2 provides a survey of related econometric literature and describes our econometric approach; Section 3 details our data and presents our theoretical and empirical specifications; Section 4 discusses the results in the context of our initial motivations; and Section 5 concludes.

2. Econometric Literature review

As aforementioned, the Arellano-Bond (1991) and Blundell-Bond (1998) linear generalized method of moments (GMM) estimators (termed difference-GMM and system-GMM, respectively) have become the most popular methods for the study of the education-democracy relationship on cross-sectional time series data. Studies using the latter have produced quite uniform results, establishing a positive and significant effect of education on democracy. Bobba and Coviello (2007) found that an additional year of education increased the steady-state value of democracy by 18%. Murin and Wacziarg (2014), having rescaled the combined polity score from the Polity IV dataset to between 0 (full autocracy) and 1 (full democracy) found that an additional year of primary school yielded a steady-state effect on democracy equal to 0.144 points on their democracy scale. Castello and Climent (2008) found that an increase in one standard deviation in the years of education (about 2.9 years) increased the long run value of democracy by 0.26. Our first chapter found that an increase of one standard deviation in education increased democracy by 0.41, whereas the reverse specification only yielded an increase in education of 0.13, both at the 1% significance level.

Given that our present study focuses principally on one country, namely France, time series techniques such as vector autoregression (VAR) are preferred; though the System GMM and VAR models are not terribly dissimilar in their approach and are largely complimentary. The Panel VAR technique, for example, can combine the traditional VAR approach, treating all variables in the system as endogenous, with the system GMM estimation for panel data. Jaunky (2013) uses such a model on 28 sub-Saharan African countries between 1980 and 2005 to find that economic growth increases democracy (as measured by the Freedom House indices) in the short run, whilst in the long run democracy and economic growth are mutually reinforcing. Indeed, VAR and Panel VAR models have been used increasingly in recent years to investigate the causal relationship between democracy and economic development. Tang (2008) uses a bivariate fixed-effects Panel VAR model on the years 1972-1990

to find that economic development (real GDP per capita in logs) promotes democracy (measured by Polity IV and Freedom House datasets); furthermore, using impulse response functions, she finds that the response of democracy is not significant until year 5 or 6, whilst the response of real GDP to political change is not significant at any time. In this regard, Tang (2008) finds that the political effect of economic development is realized gradually at a steady rate over a long period of time.

To our knowledge however there are no papers which investigate the causal link between education and democracy using VAR, Panel VAR or structural VAR models. We therefore seek to compliment the analysis undertaken by SYS-GMM methods, which model the linear relationship between democracy and education over time, to investigate how democracy responds to an unexpected structural shock in education. In doing so we also extend the analysis undertaken by existing economic development-democracy VAR studies by providing a structuralised interpretation of the recursive relationship between education and democracy on a single, annual time series spanning almost 100 years.

We proceed to explain the SVAR specification, beginning with the VAR model from whence the SVAR is derived.

2.1. VAR model

As explained in detail in Amisano and Giannini (1997), Luetkepohl (2011) and (in the context of political processes) Freeman, Williams and Lin (1989), a vector-autoregression (VAR) is a multivariate model where each series is regressed on a finite number of lags of all the series considered.

We can express the VAR in the following form:

$$A(L)y_t = \varepsilon_t$$

$$A(L) = I - A_1L - \dots - A_pL^p$$

$$E(\varepsilon_t) = 0$$

$$E(\varepsilon_t, \varepsilon_t') = \Sigma \quad \det(\Sigma) \neq 0$$

$$E(\varepsilon_t, \varepsilon_s') = [0] \quad s \neq t$$

where y_t is a $mx1$ vector of predetermined economic variables; A_i is a mxm matrix of coefficients, $i = 1, 2, \dots, p$; ε_t is a normally distributed $mx1$ vector of white noise; Σ is the mxm variance-covariance matrix for ε_t ; ' denotes transpose; L is the lag operator; and E is the expectation operator. The VAR is stable if all roots of the determinantal polynomial lie outside the complex unit circle ($\det[A(L)] = 0$). As Luetkepohl (2011) explains, a stable process, y_t , has time invariant means, variances and covariance structure, and hence, is stationary. The Wold decomposition theorem states that any stationary process, y_t , may be written as a stochastic vector moving average (VMA) process; the VMA expresses y_t in terms of accumulated past shocks or errors in the system

(Freeman, Williams and Lin, 1989), e.g. the effects on y_i of a change occurring in y_j , h periods before. This form of dynamic analysis is termed 'innovation accounting' where an innovation is defined as the regression error, and the dynamic response of the system to a one standard deviation shock in one variable's residual can uncover the relationship between the variables.

Amissano and Giannini (1997) use the following notation to detail the VMA representation of the VAR as:

$$y_t = C(L)\varepsilon_t$$

$$C(L) = A(L)^{-1} \text{ or } C(L)^{-1} = A(L) \text{ or } A(L)C(L) = I_n$$

$$C(L) = I + C_1L + C_2L^2 + \dots$$

or

$$y_t = \sum_{i=1}^T C_i \varepsilon_{t-i}$$

where $C(L)$ is a matrix polynomial which can be of infinite order and where $\det[C(L)] = 0$.

If y_{jt} is subjected to a shock ε_{jt} equal to one standard deviation, the effect of this shock on y_{it+h} is measured by the VMA coefficient C_{ih} (Amissano and Giannini 1997), which is termed the impulse response function (IRF).

However, the covariance matrix of residuals, Σ , will not be diagonal, so the residuals, ε_t , are contemporaneously correlated. This implies that no causal interpretation of the IRF is possible: there is no way to determine whether the shock to the first variable caused the shock in the second variable or vice versa, without providing an interpretation of the instantaneous correlations among the elements of ε_t . This interpretation is called the Structuralisation of the VAR (Amissano and Giannini 1997).

2.2. SVAR model

In order to move from this reduced form model, where no explanation of the contemporaneous relationships among variables can be interpreted, we can decompose the error covariance matrix into a 'causal chain' or triangular array of contemporaneous effects, which amounts to an orthogonalisation of the remaining errors, e.g. the assumption that in a two-variable VAR, shocks to the first variable in the causal ordering have an immediate impact on itself and the second variable in the system, whilst shocks to the second variable only have an impact on itself (Freeman, Williams and Lin, 1989).

Amissano and Giannini (1997) explain that Sims' (1980) original proposal consisted in moving from a non-orthogonal VMA to an orthogonalised VMA representation via a Choleski factorisation of the Σ matrix. Eponymously named after its inventor, Andre Louis Cholesky, the Choleski factorisation can orthogonalize the vector of shocks by decomposing a positive-definite matrix, A into the product of a lower triangular matrix, L ,

and its conjugate transpose, L^{-1} , to solve systems of linear equations. This amounts to starting from the reduced form VAR representation:

$$A(L)y_t = \varepsilon_t, \varepsilon_t \sim VWN(0, \Sigma)$$

And pre-multiplying the system by the inverse of the Choleski factor of Σ

$$A^*(L)y_t = e_t, e_t \sim VWN(0, I_n)$$

$$A^*(L) = \sum_{i=0}^p A_i^*, A_0^* = P^{-1}, A_i^* = P^{-1}A_i,$$

$$PP' = \Sigma$$

Where P is the Choleski factor of Σ and A_0^* is lower triangular with unit diagonal elements. This amounts to modelling contemporaneous relationships among the endogenous variables in a triangular recursive form. The resulting orthogonal VMA representation is

$$y_t = \sum_{i=0}^{\infty} C_i P e_{t-i} = y_t = \sum_{i=0}^{\infty} \Phi_i e_{t-i}$$

$$\Phi_i = C_i, \Phi_0 = P$$

Since $\Phi_0 = P$ the orthogonal VMA representation shocks e_t have instantaneous effects on the elements of y_t according to the triangular scheme given by the Choleski factor P .

Given the matrix Σ , the Choleski factor P is uniquely determined depending on the ordering of the variables contained in y_t . In this regard, the triangular representation is a particular one which is not suitable to every context. This is why we perform a case-study on the relationship between education and democracy in France to provide the economic motivation for the SVAR and our findings motivate the use of a recursive structure.

Amissano and Giannini (1997) detail three different models which structuralise the VAR that are popular in the recent literature, which they term the 'K' model, the 'C' model and the AB model, respectively, though they are termed the 'A', 'B' and 'AB' model in Luetkepohl (2011).

The K model is an $n \times n$ invertible matrix which premultiplies the autoregressive representation to induce a transformation on the ε_t disturbances by generating a vector e_t of orthonormalised disturbances. Contemporaneous correlations among the elements of y_t are therefore modelled through the specification of the invertible matrix K . The K matrix usually has ones on its main diagonal and applies zero restrictions such that

some variables are not allowed to have a contemporaneous impact on other variables. The A matrix maybe lower triangular if there is a recursive relationship among the variables (Luetkepohl, 2011). Its covariance matrix is not only diagonal but also equal to the unit matrix I_n . The equation implicitly imposes $n(n+1)/2$ non-linear restrictions on the K matrix, leaving $n(n-1)/2$ free parameters in K. The order condition for identification requires that at least that many restrictions are placed on those parameters.

$$KA(L)y_t = K\varepsilon_t$$

$$K\varepsilon_t = Ke_t, K\varepsilon_t\varepsilon_t'K' = e_t e_t'$$

$$E(e_t) = 0 \quad E(e_t e_t') = I_n$$

$$K\Sigma K' = I_n$$

Amissano and Giannini (1997) explain that the triangular representation deriving from the Choleski decomposition of Σ can be interpreted as a K model where $K = P^{-1}$.

The C model is an $n \times n$ invertible matrix where no contemporaneous relationships among the variables are explicitly modelled. Each variable is affected by a set of orthonormal disturbances whose impact effect is modelled through the C matrix. The ε_t vector is regarded as being generated by a linear combination of independent (orthonormal) disturbances e_t . In this way, we can specify that a certain structural shock does not have a contemporaneous impact on one of the variables. This may have a different meaning than that of the K-model, where one is concerned with the explicit modelling of the instantaneous relationships among endogenous variables.

$$A(L)y_t = \varepsilon_t$$

$$\varepsilon_t = Ce_t, \varepsilon_t\varepsilon_t' = Ce_t e_t' C'$$

$$E(e_t) = 0 \quad E(e_t e_t') = I_n$$

$$\Sigma = CC'$$

This equation implicitly imposes the same set of restrictions on the C Matrix as in the A model above. The C model is often viewed as a long run SVAR model, where restrictions are placed on the long run accumulated effect of shocks, e.g. specifying that a shock has no long run effect on the level of a variable by enforcing that the accumulated changes in the variable induced by the shock sum to zero. Blanchard and Quah (1989) use a C model SVAR to specify that demand shocks have no long run effects on output (Luetkepohl, 2011). In the long run SVAR model the constraints are placed on the elements of C as exclusion restrictions and the free parameters are estimated.

The AB Model is viewed as a combination of the K and C models, where A and B are $n \times n$ invertible matrices. The A matrix induces a transformation on the ε_t disturbance vector, generating a new vector $A\varepsilon_t$ that can be conceived as being generated by linear combinations (through the B matrix) of n independent (orthonormal) disturbances, e_t . Therefore in this kind of structural model, it is possible to model explicitly the instantaneous links among the endogenous variables, and the impact effect of the orthonormal random shocks hitting the system. This is our preferred SVAR model for our study.

$$AA(L)y_t = A\varepsilon_t$$

$$A\varepsilon_t = Be_t, \quad A\varepsilon_t\varepsilon_t'A' = BB'$$

$$E(e_t) = 0 \quad E(e_te_t') = I_n$$

$$\Sigma = A^{-1}BB'A^{-1}$$

This equation again imposes a set of $n(n+1)/2$ nonlinear restrictions on the parameters of each of the A and B matrices, leaving overall $2n^2 - n(n+1)/2$ free elements. The SVAR is exactly identified if this number of restrictions is placed on those parameters. All the SVAR models detailed above are generally estimated via OLS.

Having detailed the econometric specification that our analysis will follow we shall now proceed with the description of our data. In doing so, we will justify our econometric approach.

3. Data

The data for our principal analysis refers to France. We base our study on France for two reasons; firstly on account of the quality of data available. The Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) (the main independent French institute for international economics research) provides average years of education data for France in annual format, unlike the popular education datasets available, such as Barro and Lee (2012), Cohen and Soto (2007), or Morisson and Murtin (2009) who provide 5-year or 10-year panels. Furthermore the annual dataset provides a time series of almost 100 years so that meaningful analysis can be undertaken with sufficient data².

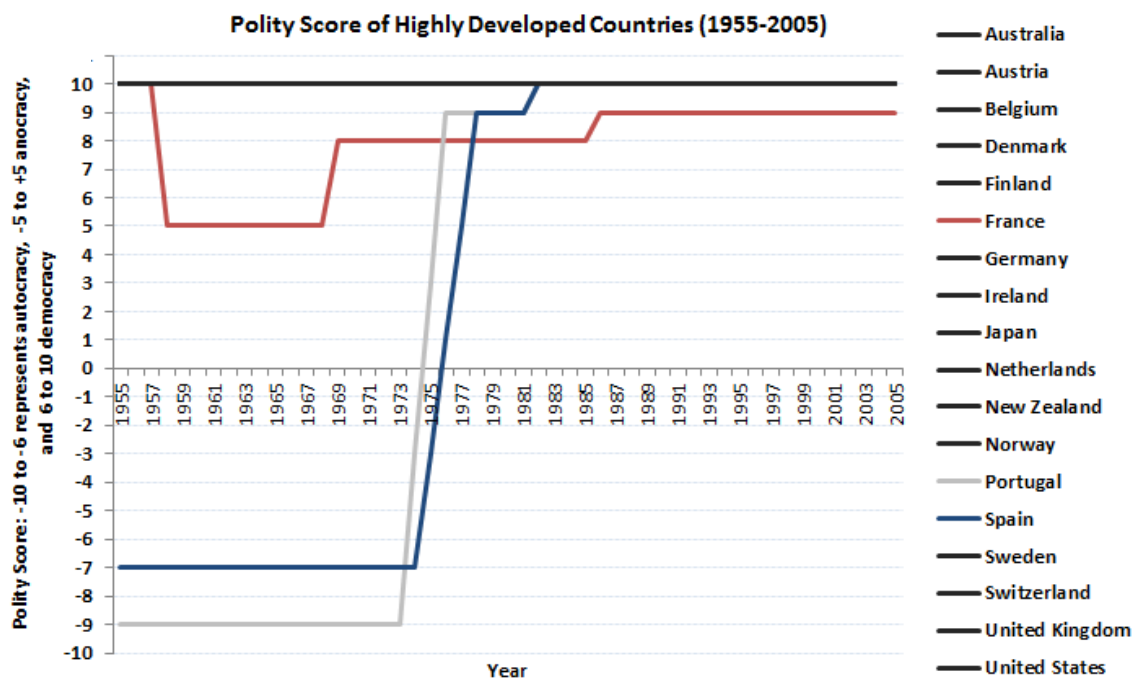
For our democracy data we use Polity IV's 'Polity2' measure and the Vanhanen Democracy Index. The Polity2 measure is a single regime score that ranges from +10 (full democracy) to -10 (full autocracy); it is derived by subtracting the 'autocracy' score from the 'democracy' score in Polity IV's dataset. Both of these underlying indicators are additive eleven-point scales (0-10) derived from the weighted codings of the competitiveness and regulation of political participation, the openness and competitiveness of executive recruitment and constraints on the chief executive sub-indices.

² Box Jenkins requires that times series analysis be undertaken with more than 40 data points, our study provides more than double.

We also use the Vanhanen Democracy Index (Vanhanen 2000) which is similarly comprised of two quantitative measures based on electoral data: the smaller parties' share of the votes cast in parliamentary or presidential elections, or both, which highlights the degree of political 'competition'; and the degree of electoral participation as a percentage of the total population, to measure the degree of voter 'participation'. The two variables are then combined by multiplying them together and dividing the result by 100, to create the index of democratization. Both the Polity IV and the Vanhanen measures of democracy highlight that public contestation and the right to participate encapsulate the most important characteristics of democracy. The Vanhanen Democracy Index has been used in a large number of studies, published in high quality economics and political science journals (Davenport and Armstrong 2004, Stepan and Skach 1993, Poe and Tate 1994, Bezemer and Jong-A-Pin 2013, for example) and critically evaluated by Munck and Verkuilen (2002), Campbell (2008) and Seawright and Collier (2014), among others, which we detail further on.

Our second reason for the choice of France is because it is the only country to have begun the 20th century as a strong democracy (with a Polity score of +8) and ended it similarly (with a Polity score of +9) having experienced a single shock to democracy during the intervening years³, namely between 1958 and 1968 (wherein the Polity score declined to +5). In the post-war period with the exception of Spain and Portugal, who were under military dictatorships for almost and over 40 years respectively, France is the only country not to maintain a perfect (and stationary) Polity score of +10⁴. This is best depicted graphically in Figure 1 below. Of the 15 countries, 13 maintained a perfect +10 score from 1955 onwards, all depicted by the black line. Spain and Portugal, having obtained their +10 score after transitioning to democracy have also maintained their score. Only France, depicted by the red line, fared a sharp decline in its Polity score from +10 to +5 in the 1960s.

Figure 1



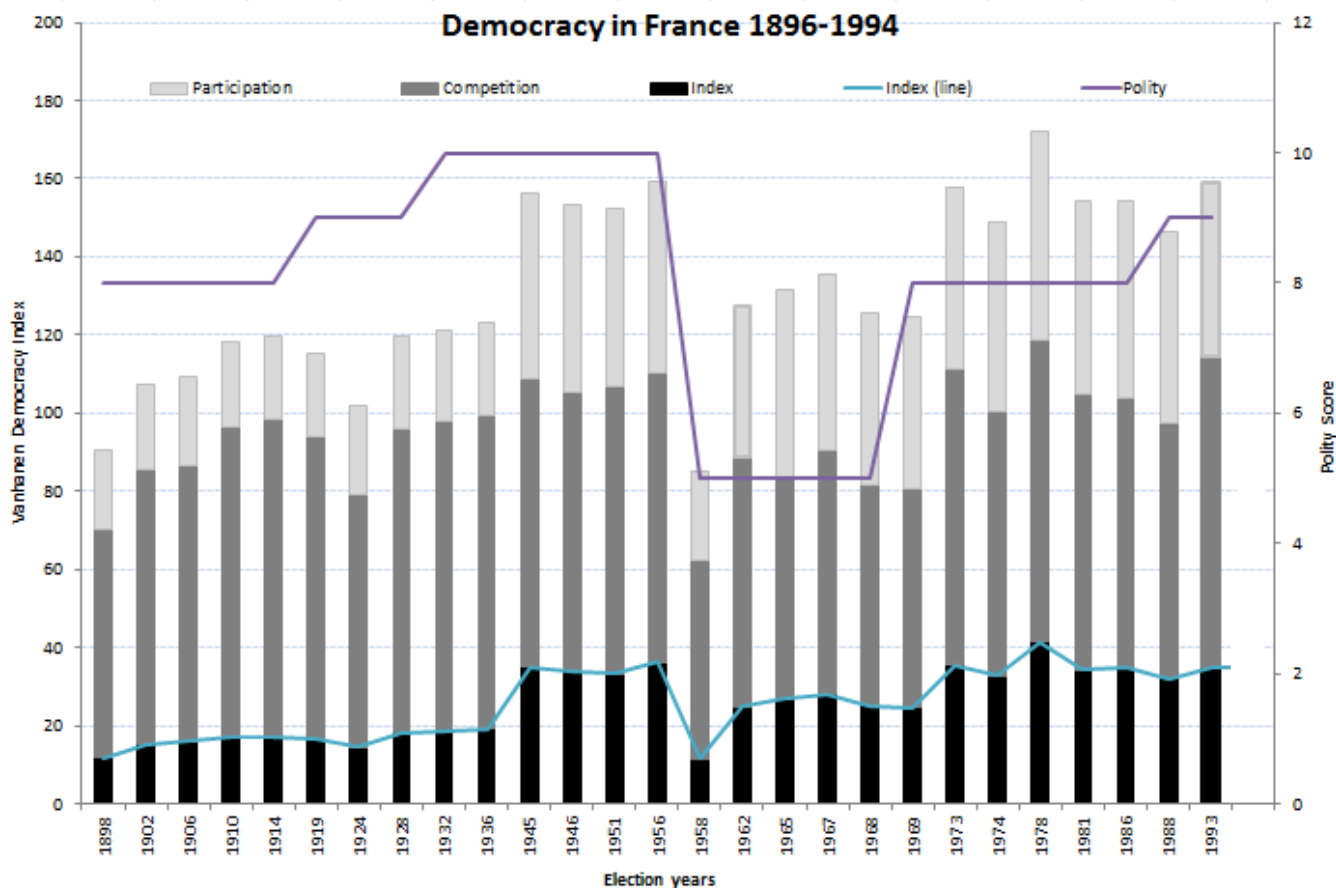
³ Excluding the period of occupation during World War II

⁴ In 2008 Belgium's Polity score dropped from +10 to +8 where it has remained

Because the Polity score in France has not remained +10, like in other highly developed countries, it provides us with a fertile testing ground to investigate if an education shock had a significant role to play in progressing democracy from its low polity score of +5 in 1958 upward to +8 in 1969 and beyond.

We graphically depict the evolution of democracy in France between 1896 and 1994 in Figure 2 below using both the Polity score from the Polity IV dataset and the Vanhanen Democracy Index.

Figure 2



Years 1958, 1981 and 1988 held both parliamentary and presidential elections. We highlight the combined Index score only. Years 1965, 1969, 1974 and 1993 held presidential elections only

The Polity score increases from +8 to +9 in 1919 owing to an increase in the regulation and competition of political participation scores. The 1919 legislative election was the first to be held after World War I, and the first under a new electoral law (12th July 1919) which replaced the two-round system by ‘arrondissements’ (election by small districts) in use since 1889 with proportional representation on a general departmental ticket. The reform enabled the electoral area to be broadened so that the interests of the nation could predominate over those of the district, and furthermore, prevented the suppression of minorities (Stuart 1920).

The score also increases from +9 to +10 in 1930 on account of a 1-point increase in the ‘competitiveness of participation’ sub-index, referred to by Polity IV as the extent to which alternative preferences for policy and

leadership can be pursued in the political arena. This increase was on account of the Law of 5th April 1928 and its successor on 30th April 1930 which laid the legal foundation for a large-scale insurance scheme covering illness, maternity, disability, old age and death. Low income workers in industry and commerce were the prime beneficiaries of this national insurance program, and payments into the system were shared equally between employer and employee, amounting to 4% of the salary of each worker (Gill and Stanley 1994). The significance of this particular law to France's 'competitiveness of participation' sub-index and subsequent democracy score was on account of the parliamentary access that was granted to a broad range of competing interest groups in bringing the law into force.

We find that the Vanhanen Democracy Index (hereafter, the Index) unlike the Polity measure is relatively stable during these years. In 1945, however, the Index increased drastically following the granting of universal suffrage in 1944. The right of women to vote increased the percentage of the total population who were able to (and did) vote, pushing the participation rate up into the high 40 percents from the low 20 percents and subsequently the democracy index to 35 from 19. The polity measure makes no reference to women's newly granted right to vote and its score remained unchanged.

Both measures of democracy display sharp falls in 1958 with the indirect election of France's first president, Charles de Gaulle, which occurred at the same time as a parliamentary election. The result of the two elections has been multiplied in the Index. As the election of De Gaulle was via the electoral colleges and not the voting population the 'participation' value is practically zero which brings the overall Index score down from 36.3 to 11.6. The polity score drops from +10 to +5 as a result of the weakening constraints on the chief executive from +7 to +3 as de Gaulle operated within moderate political constraints. The constitution of the Fifth Republic, written in part by De Gaulle himself in 1958, subordinated the prime minister's position, and effectively removed parliament's right to control the executive.

The polity score remains at +5 until 1969 following the resignation of De Gaulle (27th April 1969) and the appointment of Georges Pompidou (who has been credited with being less autocratic than his predecessor) and a jump in the score to +8. The final move in the polity measure occurs in 1986 with the onset of "cohabitation" in France during the second phase of the first Mitterrand presidency. The presidential and parliamentary elections of March 1986 resulted in the first period where the President was from a different political party than the majority of the members of parliament. Thus, cohabitation occurs because of the duality of the executive: an independently elected President and a prime minister who must be acceptable both to the president and to the legislature. This resulted in a shift higher on the executive constraints scale (from +3 to +5) and a concomitant increase in France's Democracy score from +8 to +9 where it has remained until today.

The Index recovers from its low in 1958 with the legislative and presidential elections of the 1960s, which included the presidential referendum election reform enabling De Gaulle to become the first president to be directly elected by the French people. The 1973 and 1978 parliamentary elections see upward spikes in the index; for 1973 on account of an increased 'competition' score owing to the new parties that were formed and the smaller parties having a larger share of the overall votes. In 1978 the competition score also increased as the French electorate appeared evenly shared between four equivalent political parties. Contrary to what the polls indicated, the Presidential majority won but it obtained only 2,284 votes more than the "Union of Left". Overall, both measures of

democracy, Polity and the Vanhanen Index, appear stationary over the period 1896-1994 aside from the De Gaulle presidency years where a level shift downward occurred.

There are a number of criticisms levied at both (if not all) measures of democracy. Polity IV's Polity2 index, whilst being the most widely used measure of democracy in econometric studies, is deemed to rely on a definition of democracy that is too minimalist. Furthermore, whilst the user manual provides a detailed description of the coding rules, there is no theoretical justification for the aggregation of the component variables into a single regime index. Munck and Verkuilen (2002) provide a comprehensive evaluation of the relative strengths and weaknesses of different measures of democracy, as we highlighted in our first chapter.

The Vanhanen Democracy Index is also criticised for its use of only two underlying variables, which commentators consider to be weak approximations of the underlying concepts of political competition and participation. Munck and Verkuilen (2002) also criticise The Index's multiplicative aggregation rule used for converting the two underlying variables into the overall measure, and argue that the author provides no theoretical argument for it and why the variables have the same weight. Campbell (2008) highlights that other authors have found voter turnout to be weakly or negatively correlated with other indicators of democracy, which calls into question its appropriateness as part of the overall measure.

Norris (2008) makes two further arguments, which really only apply in the cross-country context and not on a single country case study for France but they are worthy of note. She highlights that voter turnout may be a product of intimidation and manipulation by government forces seeking to legitimise their authoritarian rule, even in one-party states, or could be as a result of "rigged voting, ballot stuffing, and vote buying, pressures on opposition politicians, and state control of the media". Given that our study is on France, a country where multiparty competition and civil liberties are upheld and democracy has been established for over a hundred years, this does not apply in our context. Norris (2008) also explains that voter turnout in countries which apply strict use of compulsory voting laws (e.g. Australia) should not be regarded as more democratic than the UK or France for example. Furthermore, countries which hold more frequent elections or have younger voting ages may have lower levels of participation but may not be less democratic. This argument is not really applicable to the study of one country over time. Norris (2008) concedes however that despite the differences in the construction of oft-used democratic indices (Polity IV, Freedom House, Vanhanen and the ACLP Alvarez-Cheibub-Limongi-Przeworski measure) they strongly correlate with one another and exhibit considerable consensus about the overall classification of regime types.

Amidst the criticism, the Vanhanen Democracy Index is praised for its (quasi) objectivity, clear coding rules, comprehensive empirical scope (187 countries over the years 1810-1998) and for providing data on the disaggregated attributes so other researchers can independently test how different aggregation rules would affect the aggregate scores (Munck and Verkuilen 2002).

We do acknowledge that the Vanhanen Democracy Index offers a thinner conceptualisation of democracy than Polity IV's aggregate and comprehensive perspective of political institutions, but this does not invalidate its use for our purpose which is principally to investigate how democracy responds to an unexpected structural shock in education. As we have highlighted, people with a higher educational attainment participate more fully in political

activities, from voting to engaging in demonstrations (Campante and Chor, 2011) and Putnam (2001) claims that "education is by far the strongest correlate that I have discovered of civic engagement in all its forms". Studies also show that democracy only leads to positive economic benefits in countries with high education levels (Duch and Whitten 2003), as well-educated citizens are much more likely to have median voter preferences that favour growth-compatible public goods. In this regard, a positive relationship between education and the Vanhanen Democracy Index, which captures voter turnout and voter preferences for smaller parties when frustrated with the incumbent, should exist as educated people endorse democratic procedures and reject non-democratic alternatives through the electoral system. The reverse relationship however from the Vanhanen Democracy Index to education may be tenuous compared with other broader measures of democracy. Seawright and Collier (2014) reference Casper and Tufis (2003) who find that the Vanhanen Democracy Index has a more pronounced negative relationship with secondary education enrolment rates than other measures (Polity IV and Freedom House), though their study concludes that empirical findings on Democracy are not uniform or robust across all three political measures for a wide range of economic variables. We can logically argue that data representing voter turnout and preferences may not exert a positive impact on education if for example the political party which comes to power does not follow through on electoral promises to deliver more education opportunities. A notable example would be that of the UK, where the Liberal Democrats upon joining a coalition with the Conservative party to form a government in 2010 backtracked on their election pledge not to raise university tuition fees from £3,000 to £9,000 per year. As a result of their backtracking, a poll in the Sunday Telegraph newspaper at the time suggested that just 54% of those who voted for the Liberal Democrats in the 2010 election planned to back the party at the next general election in 2015. Furthermore, we can argue that the number of students attending and completing university education for example (a key driver of the overall educational attainment measure) is a function of a whole stream of funding, socioeconomic and cultural decisions and outcomes that take place over a period of time. As a result they are related to broader measures of the political institutional environment rather than the narrower scope of electoral data, though it is logical to assume that voter turnout and preferences help to shape the institutional environment in which higher educational attainment is more likely to be achieved.

Ultimately, we believe that the Vanhanen Index offers one key advantage over the Polity2 index for our purposes: primarily, on account of its easily accessible and historically factual data. By using electoral data, albeit aggregated into one index, the Vanhanen Index provides an account of the state of democracy in real time. The Polity2 Index comparatively is an artificially smoothed index which is coded retrospectively. Smoothing induces a number of problems: it reduces the variance of the original data; it can falsely indicate the onset of increases or decreases before they occur; and it can seriously and persistently shift the peak and trough locations. The greater the length of the smoothing interval, the more these problems occur. Though smoothing techniques are popular in certain econometric studies, (such as with financial market data where moving-averages are used or when Box-Jenkins ARIMA models are appropriate) with time series data, smoothing induces such spurious signals that a smoothed series should not be used as an input for other analyses. Given that our SVAR model uses annual times series, we believe that the Polity2 index may not be an accurate reflection of the period-to-period changes in democracy. Particularly as we aim to measure the response of democracy to a shock in education, timing is of the essence. Referring to Figure 2 above, we can see a very different pattern emerging in the evolution of the democracy score after 1958 between the two indices. Polity2 considers the date that Pompidou was elected

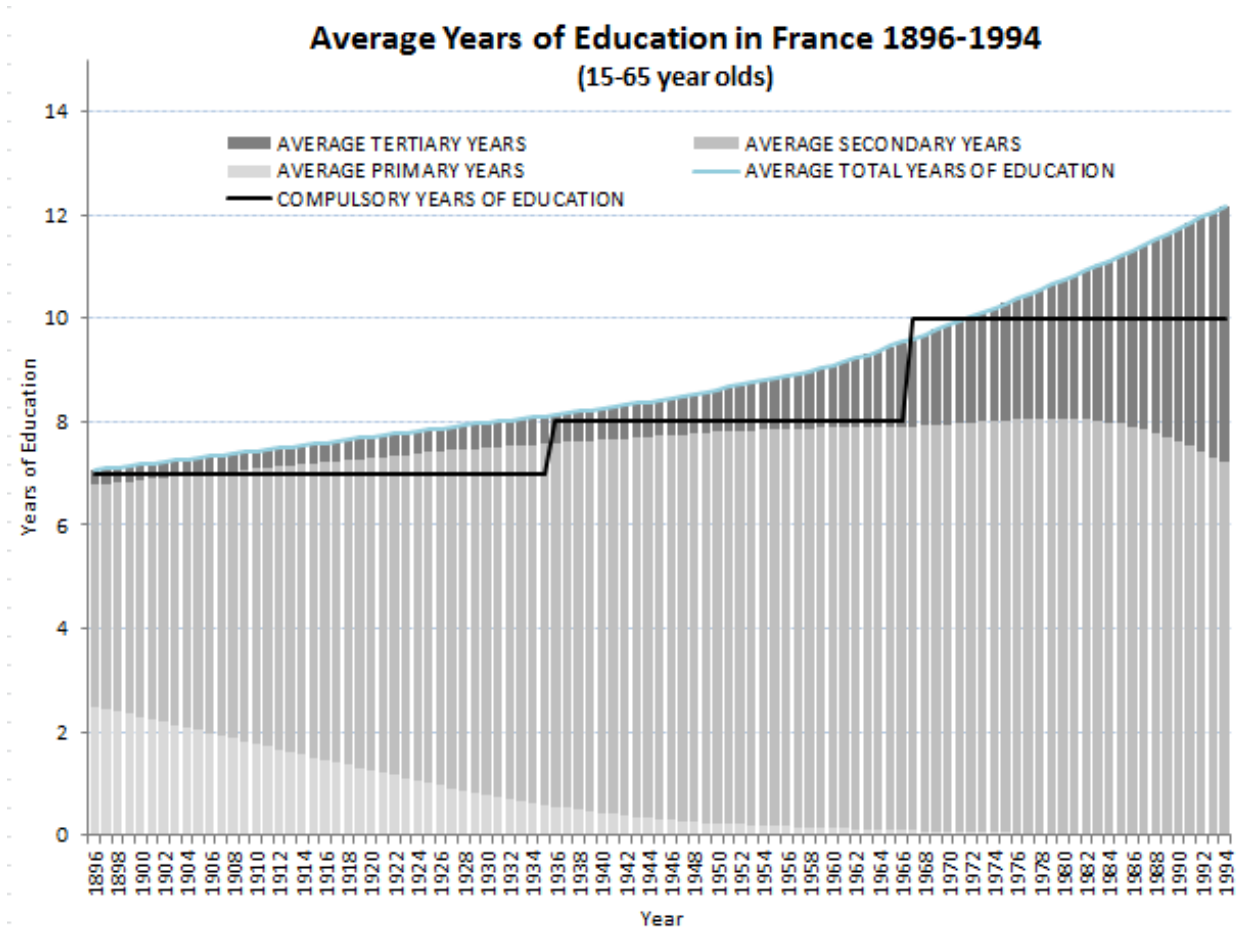
president in 1969 to be the date that a new political structure emerged, and democracy increased from +5 to +8. The Vanhanen Democracy Index, however, does not see the resumption in the democracy score to the pre-1958 level until the 1973 legislative elections.

Whilst the Polity2 measure provides a clear overall picture of the state of democracy over our time period, the Index of democratization offers a deeper (and temporally accurate) insight into political party competition and voting behaviour. The Polity2 measure also displays insufficient variation for France (only 5 changes in almost 100 years of data) to be included in our time series study. As a result we will use the Vanhanen Democracy Index as our principal measure of democracy but will continue to use the Polity2 Index in our analysis for robustness purposes, and will report any differences.

3.1. Education in France

The evolution of education in France is portrayed below using CEPII data. We use the average years of education, where the numerator is the total education years and the denominator is the total population, for 15-65 year olds. This is the key education measure used in the education-democracy literature.

Figure 3:

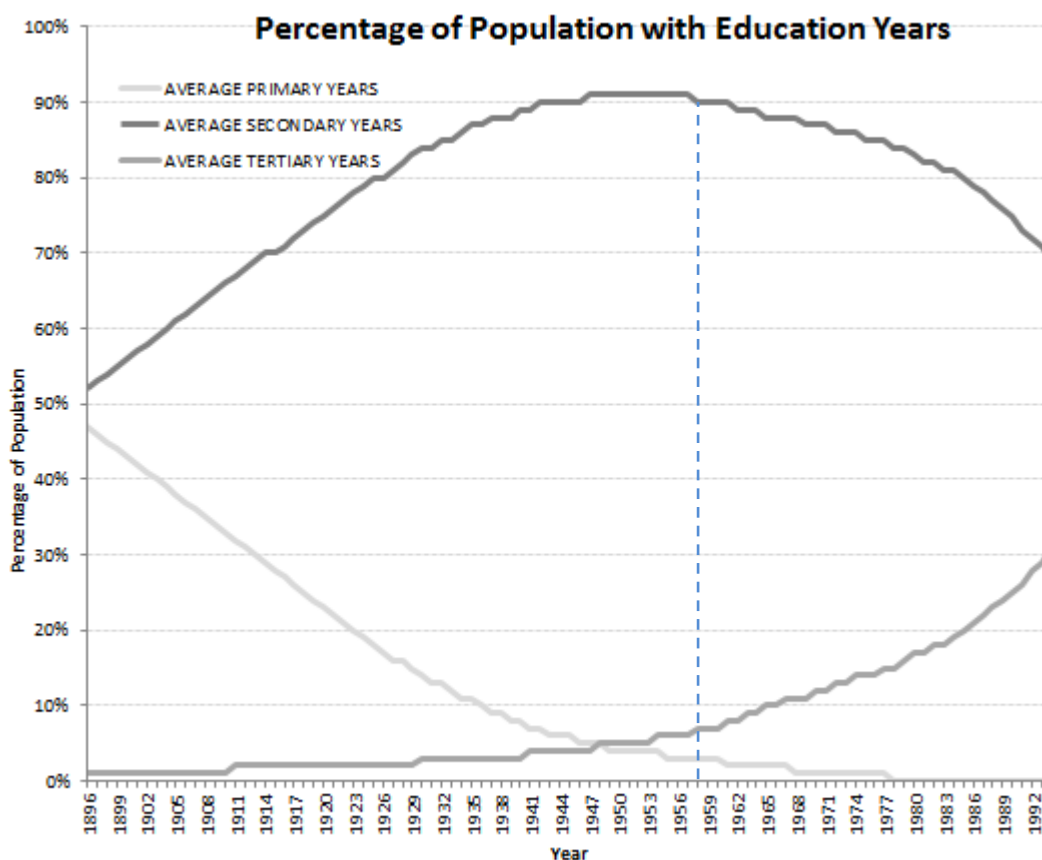


The CEPII dataset considers ‘primary’ education to correspond with 6 or less years of education, ‘secondary’ with 7-13 years and ‘tertiary’ with 14 years or greater.

The graph above highlights that the average years of education in France grew from 7 years to 12 years during our time period, largely on account of the growth in tertiary education. Secondary years of education grew quite rapidly from 4.29 in 1896 to 7.04 years in 1936, but slowed thereafter to reach their peak of 8.03 years in 1979. Tertiary years of education however grew from 0.28 in 1896 to 1.02 years in 1956, to 2.05 years in 1972, 3.00 years in 1982, 4.10 years in 1990 and 4.96 years in 1994.

Figure 4 below illustrates the proportion of the population aged between 15 and 65 who have acquired the corresponding years for each stage of education in clearer detail.

Figure 4:



We see that in 1896, 52% of the population had between 7 and 13 years of schooling, whilst 47% had less than 6 years, and only 1% had more than 14 years. The proportion with years of schooling corresponding to secondary education increased rapidly to 91% by 1947 as those with only primary education subsequently declined to 5%. Those with greater than 14 years of education also steadily increased to 4%. It was not until 1958 that the proportion with secondary education started to decline as students increasingly proceeded on to tertiary education. By 1994, the French population had 31% with tertiary education and 69% with secondary education.

There are a number of important milestones and key dates in the growth of education in France. In the 1880's, the Camille Sée law of 1880 instituted secondary public education for girls, primary education became free in 1881 and in 1882 education became compulsory for all children aged 6 to 13. In the early 20th century, from 1933 attendance at the Lycees (selective secondary schools for the most able) for every new class of eleven year olds

became free, and in 1936, the Jean Zay reform extended free education to the entire secondary level. Compulsory education was also extended to the age of 14.

In the 1950s considerable steps towards the ‘democratisation’ of education were taken. University scholarship numbers totalled 4,220 in 1948 but 26,000 by 1952. The Barangé Act of 1951 established an educational grant of 1000 francs per pupil, per term for both public and private primary schools. In 1955, steps were increasingly taken to enable families of modest means to keep their children longer at school, including the award of about 100,000 scholarships for secondary education, thus bringing the percentage of scholarship holders to 25%, as compared with 10% in 1940. The actual value of the scholarships was also increased by 20% for secondary school pupils.

As we highlighted above, the increased growth of education after 1958 was largely on account of increased access to higher education, particularly for the ‘baby boomers’ generation.

Figure 5

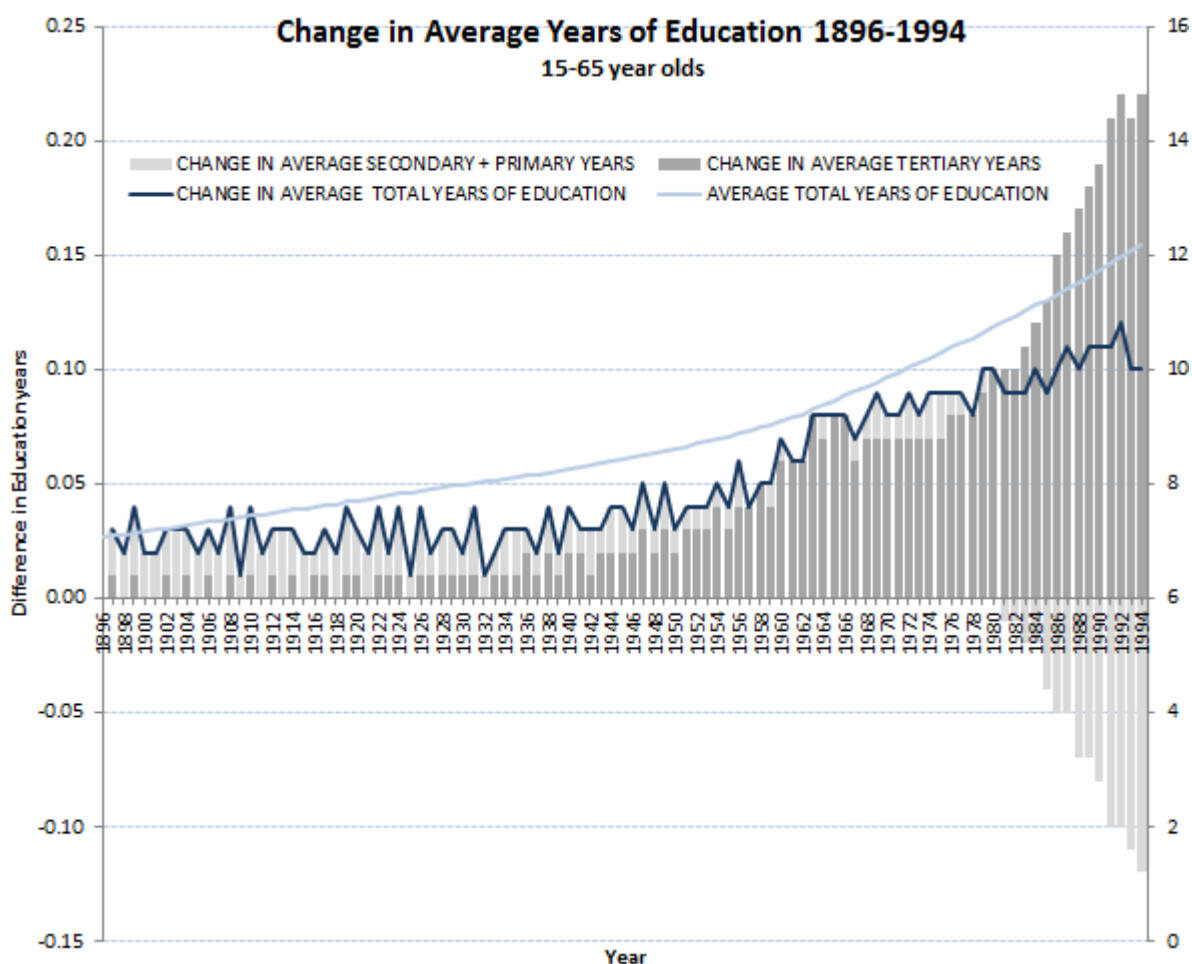


Figure 5 above illustrates that the difference in the average total years of education prior to 1936 was driven by increases in primary and secondary education; between 1936 and 1947 the contribution of higher education notably increased, and from 1958 (save for a few years between 1967 and 1977 where secondary education also expanded once more) the increase in education was driven solely by increases in higher education years.

France's post-World War II 'baby boom' occurred between the years 1946 and 1974, though the fertility rate increased markedly from its low of 1.82 in 1941 to 2.19 in 1943 initially and then on to 2.96 in 1946. 32.5% more children were born in 1946 compared to the previous year (800,747 children compared to 604,349 in 1945). Figures 6 and 7 below show the fertility rate in France during our time period and with a lead of 15 years to show the cohorts once they show up in our dataset.

Figure 6

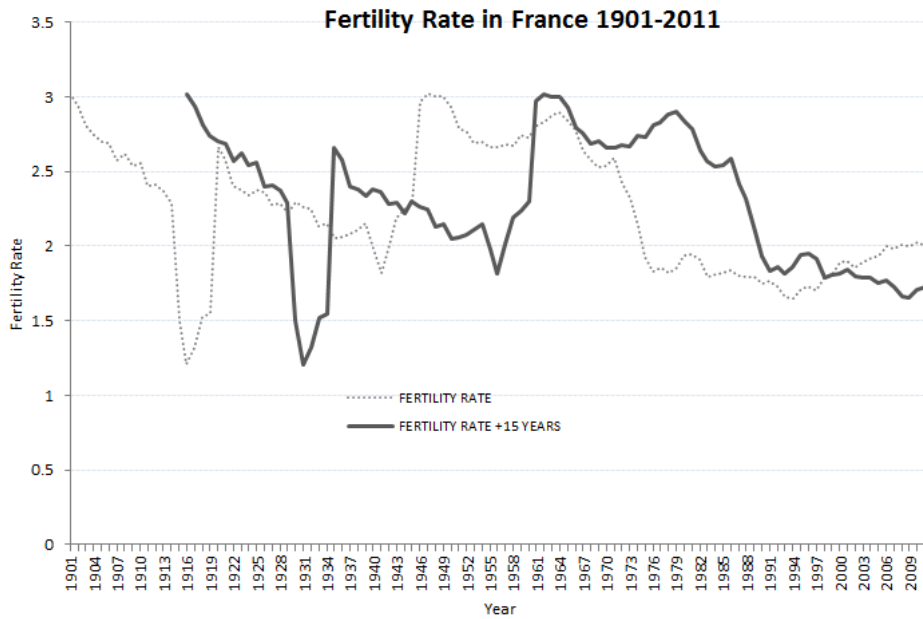
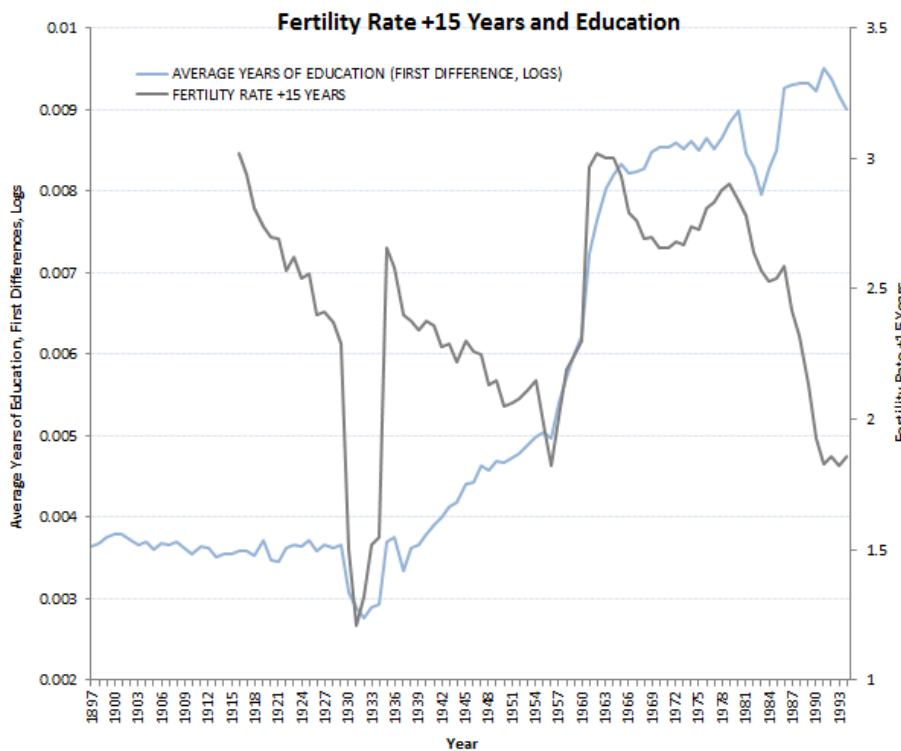


Figure 7



Access to higher education was also greatly expanded during this period. In 1957 the entrance exam into secondary school was abolished for state schools and the baccalaureate was no longer needed for entrance to certain universities on certain degrees if candidates held other diplomas, particularly technical qualifications. In 1959 the Berthoin reform extended compulsory education to the age of 16 for cohorts born after 1953, such that it was put into application in 1967. In 1959, scholarships for higher education were increased from 25% of students to 33%. Over the period 1962/1963, 152,000 students were repatriated from Algeria, adding to the increasing school population.

A child born in 1946 would be 15 years old in 1961 with 8 years of compulsory education. However a child born in 1953 would have 10 years of compulsory education by 1969 on account of the Berthoin reform in 1959. The increase in secondary education years that we see from 1967 to 1977 is, we believe, largely a result of the 'baby boomers' completing the new compulsory education years to age 16. It is also on account of increasing numbers of students completing higher secondary education, such as the baccalaureate, and the expansion of technical education. Ultimately however, as we have highlighted, from 1958 (save for the years between 1967 and 1977 where secondary education expanded once more) the increase in education was driven solely by increases in higher education years, from students completing university studies.

As a result it is important here that we explain how university education in particular, as the main driver of higher educational attainment levels, influences political behaviour. Hillygus (2005) outlines three explanations in the literature linking higher education specifically to political participation. The first is the Civic Education hypothesis: implicit in this explanation is the notion that education (beyond the three "Rs") is influential in shaping political engagement by teaching citizens the behaviours and knowledge necessary for identifying political preferences, understanding politics, and pursuing political interests. The second hypothesis is the Social Network hypothesis: that education is a determinant of political engagement because it predicts an individual's social network position. Education places citizens either closer to or further from the centre of critical social and political networks that, in turn, affect levels of political engagement and voter turnout. The third hypothesis is the Political Meritocracy hypothesis which suggests that intelligence begets educational attainment, not the other way around. That is, more intelligent students tend to go further in education and also participate in politics at higher rates. In other words, intelligence, rather than education, is the more important determinant of political sophistication. Hillygus' (2005) study found the verbal skills students bring to university and the curriculum studied while there have a significant impact on future levels of political engagement. Likewise, social science credit hours positively correlate with political participation and voter turnout some four years after university graduation.

However, university students are also more likely to engage in political activism, and thereby demonstrate their political views in a broader scope than just at the ballot box. Van Dyke (1998) explains that university students are arguably the population most likely to protest because they are biographically available and free from many of the constraints imposed by full time careers and family commitments. University students are also at a stage in their life when they are developing their belief systems, and are most open to consciousness raising and ideological appeals. Lipset (1972) stressed the "inherent potential of students as the most available social base for innovative forms of cultural behaviour and aggressive political action dedicated to the attainment of 'absolute ends.'" He concludes that "the student population is the most volatile and most easily mobilizable of all social strata" (p195).

Student protest and political activism is not a recent phenomenon, but occurred in universities in 13th century Paris and Bologna (Boren 2001), at Harvard University in the U.S. in 1766 (Lipset 1972) and indeed university student demonstrations in Vienna in March 1848⁵ were instrumental to the abdication of Emperor Ferdinand I (Altbach 1998). Indeed student protests have spearheaded a great number of revolutionary movements across the globe (a factor we focus upon in Chapter 3), although much of the research and analysis on the subject dates from the 1960s when student activism was particularly turbulent. Van Dyke (1998) and Altbach (1998) explain that student political activism is a highly complex, multi-faceted phenomenon that is difficult to predict, let alone explain its emergence in particular locations, or explain why university campuses are hotbeds for contentious political activism at all.

Research findings have indicated that student activism tends to occur at more selective or elite schools, where the faculty may be more active in government policy and the students, being from wealthy (or even politically active and powerful) families, may have a high sense of self-belief that inspires them to political action. This might help create a more politicized campus culture and foster student protest activity (Van Dyke 1998). Students at these schools may have also more financial resources with which to mobilize, both institutional resources, and also resources from their parents, which concurs with arguments put forth that groups will not mobilize for protest until they have sufficient resources to do so. Lipset (1976) also suggests that students at large universities may become lost and isolated due to their large numbers and frustrated with the lack of interaction with the faculty. The students may therefore become interested in protest activity. Though Van Dyke (1998) explains that Critical mass theory argues that most people will not participate in protest activity until the number of participants reaches a critical size. Schools with large student populations may be more likely to host larger student protests, which may then trigger even more protest as a critical mass is reached, and participation becomes widespread. Lastly Van Dyke (1998) finds quantitative evidence that a history of activism at a university does influence the emergence of future student protest activity as a result of long-standing activist subcultures that may endure on university campuses over many generations through the participation of organizations, as well as interactions among faculty, community members, and a continuing influx of students.

The motivations for student activism are even more complex. Altbach (1998) explains that 'generational revolt' plays a key role as students' propensity to 'anti-regime' attitudes because of the nature of the campus culture, youthful idealism and the like. However, political events or key political issues appear to be the main factor which galvanises large-scale student movements into action e.g. protests against war or lack of civil rights and liberties. Economic realities and social concerns can also play a large part as students worry about future employment opportunities and about their role in society after graduation. Altbach (1998) also explains that the impact of student activism can be dramatic and immediate, though more often, activism has had a less direct influence with ideas posited by student activists often gaining acceptance by society years later. As student generations mature they frequently bring their university values and orientations to the broader society through voting intentions for example. As a result any student movement should not be judged on its direct impact but its subsequent aftereffects.

⁵ As part of a revolutionary movement that swept across many European countries; the 1848 revolution in France led to the overthrow of King Louis Phillippe in February and to the elected government of the Second Republic under Napoleon

Returning to France therefore, we can see that the expansion of education, on account of the 'baby boom' and educational reforms in the 1950s, did not lose momentum with the election of different political parties over the time period. The Communist Party was in power from 1945 to 1956, the Independents and Moderates won the 1958 parliamentary election, then the Gaullists/Fifth Republic was in power from 1962 to 1973. In this regard, the downward shift in the democracy score during the De Gaulle presidency years does not appear to have impacted the expansion of education.

In contrast, we do believe that the rise in education over our time period impacted democracy. For example, the democratisation of higher education led to increased educational attainment primarily through an increase in university students, which subsequently led to greater democracy following the university student protests of 1968. Education policy stayed within the remit of the government, not the president. The momentum for education reform had been building for years before and thus was largely unaffected by the weakening constraints on the executive.

3.2. *The Rise and Fall of De Gaulle*

Bernstein (1993) provides a comprehensive account of the Republic of De Gaulle between 1958 and 1969, and from that great text we glean the following details. On 1st June 1958, the National Assembly by 329 votes to 224 welcomed De Gaulle as the new prime minister of the ailing Fourth Republic. De Gaulle was given full powers in order to devise a wholly new constitution and a new institutional structure for the Republic, over the next six months. Submitted to a referendum on 28th September 1958, 79.2% of the electorate voted in favour of De Gaulle's new parliamentary system that separated the functions of the prime minister and president (the former subordinated beneath the latter) but guaranteed a Chamber elected by universal suffrage. The President, selected by an Electoral College, and not parliament, would nominate the prime minister and the other members of the government. He would also have the power to dissolve the National Assembly, decree laws and submit to referendum bills regarding the organisation of public powers. Under the new Fifth Republic, the role of the National Assembly was reduced to legislative and budgetary functions, that neither controlled the dates of its sessions nor its timetable, which was determined by the government. The Senate too was given a limited role in the legislative process as the National Assembly ultimately held the power of decision if a disagreement arose over the passing of bills between the two Chambers (Bernstein, 1993:p8-10). The legislative elections of 23rd and 30th November resulted in a Gaullist victory with the UNR party winning, combined with the Moderates, 66% of the seats (Bernstein, 1993: p23).

The new institutional structure of the Fifth Republic resulted in a fall from +10 to +5 in the Polity score; the power structure of the new regime can be summed up by De Gaulle's own words in his memoirs: "Of course there exists a government which 'determines the policy of the nation'. But everyone knows – and expects – that it exists by my choice and can only act with my support." (Bernstein 1993: p60). De Gaulle's 'direct democracy', through numerous public referenda and radio and television appearances established a direct link with the French people and effectively reduced the power and influence of parliament and the political parties, who grew increasingly resentful towards De Gaulle as the years progressed (Bernstein 1993: p63).

On 12th September 1962 De Gaulle announced a national referendum on the direct election of the President, which provoked outrage among politicians and jurists. A president elected by universal suffrage would enjoy the supreme authority, and would forever entrench the subordinate position of parliament (Bernstein 1993: p71-72). On 28th October 1962, 61.75% of the electorate voted in favour. The legislative elections of 18th and 25th November resulted in another majority for the Gaullist UNR party, winning 233 of the 470 seats; though the number of abstentions had risen (from 15% in 1958, to 22.6%) and the victory was not viewed so definitively as in 1958 (Bernstein 1993: p77).

De Gaulle's handling of the Miner's strike of 1963 weakened his public support however. Bernstein (1993: p188) explains that until 1962, more than 60% of those polled were satisfied with De Gaulle, whilst 20-30% were not. In March 1963 the number of dissatisfied overtook the contented by 42% to 40%.

According to a newspaper article at the time⁶, the miners' strike on 1st March 1963 resulted from a legitimate wage claim: private industry wages had risen 9% the year prior, whilst wages for nationalised industries, except for the Renault car company, were kept down on inflationary concerns. The Coal unions, supported by all the major unions and largely the French public and the Church, effectively demanded an 11% pay increase to narrow the pay differential between their industry, other nationalised industries and the private sector. President de Gaulle only ceded the offer of a 5.7% pay increase and signed a 'requisition order', effectively ordering the miners back to work or risk a fine, imprisonment or loss of employment. The miners defied the order.

The Miami News reported that the French resented "le Grand Charles" for his drastic, overreaching and authoritarian stance on the situation. The government, under Pompidou, ultimately conceded the 11% pay increase, a fourth week of paid holidays and the opening of negotiations on the industry's future, particularly the setting up of a committee to review the problem of wages in nationalised industries given the inflationary situation (Bernstein 1993: p139). This was a victory for the miners and the early symptoms of waning power for De Gaulle.

By 5th December 1965, the presidential elections revealed a decline in De Gaulle's public appeal. De Gaulle obtained 43% of the vote in the first round, forcing him into a second round run-off with Francois Mitterrand, a viable candidate from the Left. The latter was 26 years De Gaulle's junior and his poster campaign centred on the 'youth theme': "a young president for a modern France". On 19th December De Gaulle won the second round with 54.5% of the votes (Bernstein, 1993:p196-200) and a second seven-year term as President. However, at least 45% of the voting public had shown their dissatisfaction with De Gaulle's policies. The 1967 legislative elections of 5th and 12th March saw the Gaullist UDV party almost lose its overall majority, with 247 seats against the opposition's 240. This narrow victory demonstrated a weakening of public support for Gaullist political power (Bernstein 1993: p206-207).

De Gaulle's handling of the Student protests was further criticised. The student protests began at the University of Nanterre which was founded in 1963 to relieve pressure on the overcrowded Sorbonne. According to UNESCO education reports⁷, the number of university and higher education students in 1957-1958 totalled 170,000, a

⁶ The Miami News, 20th March 1963

⁷ UNESCO International Yearbook of Education 1958, Vol. XX publication 202 and UNESCO International Yearbook of Education 1968, Vol. XXX publication 312

decade later the figure stood at 500,000. This spectacular growth, within a free-admission university system, resulted in severely overcrowded student accommodation and lecture theatres, and also a large number of drop-outs. Bourdon (1971) explains that at the Sorbonne, over 40% of the students who began their degree in 1962 had withdrawn by 1966, and only 30% had graduated. The remainder stayed on at the university having fulfilled only part of the requirements in four years of what should have been completed after three.

Part of the problem, both Bourdon (1971) and Bernstein (1993) hypothesise, was the pedagogical approach of the teaching, based upon a formal lecture course, with limited contact between teacher and student. This approach had suited previous generations of small-scale student populations but had become outmoded by the new mass of undergraduates from lower-middle class backgrounds. These students relied more on their school performance than the economic status of their families for their future employment and social position. Indeed, as a result of this huge growth in the student body, its social composition changed dramatically: from a mostly upper and upper-middle class representation, whose fathers were mostly professionals and businessmen, to an increasing proportion of lower-middle class students whose fathers were farmers, shopkeepers and craftsmen (Bourdon 1971). This argument conforms to Lipset's (1976) view that large universities are likely to experience more protest activity as a result of students feeling isolated and disengaged with the faculty.

The first protest started on 22nd March 1968 with the occupation of Nanterre's Senate-Chamber by a small minority of far-left students. Their campaign of verbal terror and physical threats toward the university disrupted the education programme through April, and on 2nd May 1968 the Dean closed down the University. The next day, the same students occupied the courtyard of the Sorbonne University in Paris, where 500 of them were arrested by police under some brutality. 2,000 demonstrators thereafter entered the Latin Quarter, erected barricades and threw stones and Molotov cocktails at the police. Student clashes with the police lasted until 11th May, the famous night of major street-fighting, termed the 'night of the barricades'.

Bernstein (1993: p215) describes the aspirations of the protesting students as the abolition of hierarchical and authority structures throughout society. However, Bourdon (1971) couches it in different, more economically-grounded terms: the students publicly decried the lack of communication between teachers and students, the exams, the capitalist bourgeoisie and bureaucratic totalitarianism, and so forth; but it was anxiety over unemployment that enabled a student revolt in Nanterre to be taken up by a large majority of students in academic institutions across the country (as Altbach 1998 explained as a factor for student activism). Bourdon (1971) refers to Vermot-Gauchy's 1965 paper⁸ wherein he predicted that in 1975 universities would deliver 65,000 degree holders but there would only be 45,000 jobs requiring that level of intellectual competence; furthermore, 20,000 of these jobs would be given to a minority of students at the highly selective Grande Ecoles, leaving 25,000 jobs for the 65,000 university graduates. Bourdon (1971) also cites the results of a survey undertaken in September 1968, asking students what they thought the cause of the student revolts were: 56% cited anxiety over the probability of finding employment related to their studies as the primary cause, with 33% believing it was the second most important. Similarly, 35% cited the unresponsiveness of the university to the needs of a modern society as the key contributor, with 54% giving this reason secondary importance.

⁸ Michael Vermot-Gauchy 'L'education nationale dans la France de demain' (Paris: SEDEIS, 1965)

Before 11th May the student protests were isolated, thereafter they entered the public sphere. On 13th May the trade unions called a general strike and organised a march of 200,000 people in Paris to protest against the police brutalities of 10-11th May against the students. From 14th May further strikes, wholly spontaneous, occurred across the public and private sector alike throughout the country and continued until 22nd May. Involving ten million people, the strikes effectively brought the country to a standstill. Bernstein (1993:p217) explains that the strikers demanded higher wages and better working conditions, but also a change in the hierarchical authority structure at work. Somewhat in unison with the student movement, they desired participation in the decision making process and rejected authoritarianism.

On 18th May, De Gaulle, having returned from an official trip to Romania, announced a referendum to permit him authority to change whatever outdated structures were necessary, however it had no effect on the strike movement. Pompidou instead, on 25th May, agreed a number of proposals with the major trade unions, termed the Grenelle Agreement, which included a 35% increase in the minimum wage, a reduction in social security charges and half pay during strikes. Once again, the strikes continued (Bernstein, 1993:218-219).

On 28th May, as the government appeared to have no control over the movement, Francois Mitterrand, as president of the FGDS non-communist left party, proposed to fill the power vacuum and advocated a presidential election in July (for which he would be a candidate) and a legislative election in October. On the 30th May De Gaulle agreed to new elections in June and appealed to the French to come to the defence of the existing political order. Pro-government demonstrators numbering 300-400,000 immediately marched in support of De Gaulle. Whilst the French largely agreed in principle with the May movements they now wished the strikes, and, the difficulties they imposed, to end. As a result, the students and trade unionist who tried to prolong the strikes into June, and denounced the elections as a betrayal, found themselves alone and regarded as troublemakers (Bernstein, 1993:p222).

The elections on 23rd and 30th June resulted in a landslide victory for the Gaullist UDR party; they obtained 46% of the vote, 8% more than in the 1967 election, in the first round. After the second round, the party acquired an overall majority (the first occurrence of the Fifth Republic) in the national assembly winning 283 of the 487 parliamentary seats. There was a notable rise in the number of abstentions, from 19.1% to 19.9%, however but on the surface it appeared that the electorate had rejected the May movements. Bernstein (1993:p224) explains that the elections of June 1968 were about fear; fear of disorder, fear of a threat to the economic growth that France had witnessed over the past decade. The French public, who supported the movements in May, voted for order in June, not necessarily for De Gaulle.

In July 1968, De Gaulle belatedly accepted the resignation of Pompidou, which he had offered twice during the May movements but had clearly rescinded it by organising the Gaullist UDR party and leading the government to a successful victory in the June elections. Whilst it was argued that Pompidou's departure was necessary to reinvigorate the party (he had been Prime minister for 6 years), Bernstein (1993:p228) argues it was most likely the result of the threat of political diarchy. Following the May crisis, Pompidou had enjoyed a greater degree of public support which worked against De Gaulle's view of presidential supremacy.

De Gaulle appointed the minister of national education, Edgar Faure, with the task of reorganising the university system in response to the student demands. On 12th November the 'orientation law' was adopted, which resulted in two new principles: firstly, it created elected councils to oversee the management of the university and represent the interests of all staff and students. Secondly, it enabled the universities to adopt new teaching methods and programmes and introduce new courses (Bernstein, 1993:p229).

De Gaulle also wished to bring the French closer to the decision-making process by reorganising the administrative system into a regional structure. Unlike university reform, regional reform was not a pressing issue; as a result, it was largely viewed as pretence for De Gaulle to call a referendum and assure his public support through universal suffrage. There were two elements to the project which formed the referendum of 27th April 1969. The first proposed the formation of regional councils, wherein three-fifths of the councillors would be nominated by locally elected officials and two-fifths by local professional organisations of farmers, business and industry, and trade unions and cultural and community organisations (Bernstein, 1993:231-232). The second principle of the reform concerned the Senate, and provoked outrage. It was proposed that the second Chamber, the Senate, and the third Chamber, the consultative Economic and Social council should be combined and replaced by a consultative Senate which would lose both its legislative function and control over the government. It would only provide advice on all government and private member's bills (Bernstein, 1993:233).

The two principles of the referendum faced opposition from all the political parties, except the loyal Gaullist UDR. However, Pompidou, now Deputy of Cantal, honorary president of the UDR parliamentary group with considerable influence, declared his candidacy at the next presidential election. Given his popular support, Bernstein (1993: p236) asserts that the French were offered a suitable replacement for the ailing, and aging (79 year old), De Gaulle. He states (1995:p5) that de Gaulle and his loyal supporters warned at every election that chaos would ensue if an election result hostile to the ruling majority were to occur. With Pompidou ready to assume the presidency this threat no longer seemed valid.

On 10th April, De Gaulle announced that he would resign if the referendum was defeated, making it his personal plebiscite. The official results of the 27th April 1969 referendum was that 53.18% voted 'no' and 46.82% voted 'yes'. De Gaulle subsequently resigned as President of the Republic on 28th April (Bernstein: 1993, p238).

Bernstein (1995:p1) explains that the parliamentary system envisioned in the 1958 constitution had gradually resembled a form of presidentialism; the 1962 reform and 'direct democracy' had endowed the President with most of the decision-making power, and as a result the public's support for such a system had gradually eroded. In order to win over the French, the next president of the Republic would have to embrace the 1958 constitution anew. Pompidou's presidential campaign subsequently centred on the slogan 'change within continuity' (*'le changement dans la continuité'*); 'continuity' to win the support of the Gaullist UDR party and 'change' for the independent republican and centrists votes who had withdrawn their support for De Gaulle in the 1969 referendum and advocated a 'no' vote to their supporters (Bernstein 1995: p11). Pompidou committed to broader cooperation within Europe, to the lifting of De Gaulle's veto on Great Britain's entry to the EEC and to maintaining the legislative power of the Senate. He promised, if elected, to instil a more open style of government, to form political alliances and essentially change the way power was exercised (Bernstein 1995: p7). "I am not General De Gaulle" he said on 15th May during a radio broadcast, "I shall necessarily be more persuasive, more

conciliatory” Bernstein (1995: p12). In the Presidential elections of 1st June 1969, Pompidou won 43.9% of the vote in the first round, and 57.5% in the second round. As the new President of the Fifth Republic, Pompidou continued to espouse the Gaullist view of politics but brought a more pragmatic and inclusive stance to his presidency (Bernstein 1995: p14-15). We see that the Polity score increased from +5 during De Gaulle’s regime to +8 for the Pompidou, Giscard d’Estaing, and first half of the Mitterrand years. After the 1986 legislative elections, President Mitterrand named Jacques Chirac, leader of the opposition RPR party, as Prime Minister, and the resulting cohabitation, of a president and prime minister from different political parties, increased the Polity score to +9 where it has remained.

3.3 Hypothesis

What we can take from the above account of the rise and fall of De Gaulle between 1958 and 1969, is at the last, De Gaulle was removed from power by mounting social and political discontent. Bernstein (1995, p.10) draws upon IFOP survey data⁹ to assert that 57% of French people polled wanted a President to act solely as an arbiter, whilst 32% wanted him to have control over the main policy areas, as De Gaulle did. The student and trade union movements of May 1968, and the public support they garnered, demonstrated that the French wanted existing authoritarian structures to be changed.

How then can we attribute the rising education in France to this political change in 1969? Penniman (1969) highlights that the students who protested in May 1968 were not numerous enough to truly determine the outcome of the 1969 referendum. Using INSEE population data, we find that only 19.8% of the population in 1969 were aged 21-30 years old; 20.2% were aged 31-40 and therefore 60% were aged 41 and over. And in 1965, the ratio of students entering university to their corresponding age group was 18.8% (Bourdon 1971). Of course there are factors of voting eligibility and participation to consider, but by sheer numbers alone, the largest voting population who decided the fate of the referendum were not the students, but were generally people of middle age; though this age group would plausibly contain the parents or older family members of university students. However, using IFOP voting intentions data, we see that 57% of 21-34 year olds intended to vote ‘no’ in the 1969 referendum. If indeed they did, it would have accounted for half of the ‘no’ votes as a result of the size of this cohort making up 27.5% of the population¹⁰.

However, we are not making such a narrow, and literal, assertion. The crux of the matter is that the student protests gave a voice and a visual demonstration to the French public, whose support for De Gaulle’s authoritarian regime was already waning. This wave of collective action, alongside dissention within the parties, and with reformist politicians ready to take advantage of the political opportunities offered by the protests, enabled regime change to occur. Indeed, student protests have precipitated all manner of democratic movements across countries. This is a factor we elaborate upon greatly in our third chapter.

Our hypothesis is therefore twofold: given that education reforms continued unabated after De Gaulle came to power and the Polity score declined, we hypothesise that democracy, and changes thereof, had no

⁹ From (1971) *Les Français et de Gaulle. Présentation et commentaire de sondages IFOP*, Paris, Pion.

¹⁰ The total number of ‘no’ votes in the 1969 referendum were 11,945,149. The population of 21-34 year olds were 8,933,654 (Bernstein 1993: p238).

contemporaneous effect on the average years of education in France. As documented by the annual reports of the UNESCO International Yearbook of Education between 1958 and 1969, the ministry of education budget continued to rise, as did funds earmarked for scholarships. New courses and diplomas, and administrative measures were introduced, new university buildings and campuses established, and syllabuses revised. And as we have mentioned in Section 3, the number of university students (that is, the average years of education attributable to higher education), which drove increases in the average years of education value after 1958, continued to grow. At the time of the student protests in 1968, the number of students attending university was a function of a whole stream of funding, socioeconomic and cultural decisions and outcomes that had taken place over a period of time. And as such, a sudden change or shock to democracy would be unlikely to impact education outcomes contemporaneously, though it is logical to assume that changes to democracy could influence those decision factors in the future.

However, our case study approach has shown that changes in education can have a contemporaneous effect on democracy through civil action and protests. The factors which drove the students, en mass, to revolt against existing authoritarian structures within the university and society at large, were in part a function of their sheer number and the inability of the current university system and the labour market to accommodate their needs and aspirations, exactly as Davis (1962) and Huntingdon (1968) theorise. Such factors would have been exacerbated by the increasing year-on-year enrolment of more students. Furthermore, with the number of students, inculcated with democratic and anti-authoritarian values (as the role that education performs) rising dramatically, the desire for a liberation society increased. The student protests in France were not entirely unique; student demonstrations had occurred in Amsterdam, Rome and Warsaw against established patterns of authority, in Madrid against Dictator Francisco Franco's regime, in Berlin against the USSR's occupation of East Germany, and in London and across US cities in anti-Vietnam war movements. The changing demographic pattern of most Western countries following the post-war baby-boom and the increased access to education in a period of strong economic growth had a profound and a pro-democratic impact on societies. In France, the student protests were taken up by a large majority of students across the country, and their movement lasted much longer.

Our reasoning on the contemporaneous relationship between education and democracy in France forms the logical basis and economic theory for the recursive structure necessitated by a SVAR model: we believe that democracy has no contemporaneous effect on education, but that education affects democracy contemporaneously. We therefore, perform a bivariate SVAR AB model as detailed in section 2.2 with a triangular representation, placing zero restrictions on the A and B matrices. To clarify, this is why we cannot perform the SVAR in the opposite direction, that is, to question if shocks to democracy impact education contemporaneously without undermining the specification we have found through our case-study.

4. Econometric Approach and Empirical Results

Before we can begin our SVAR analysis, there are two important steps to be undertaken. The first is to select the appropriate number of autoregressive lags that each variable requires to remove any correlation between error terms over different periods. Serial correlation can be inherent in time series data given the temporal proximity

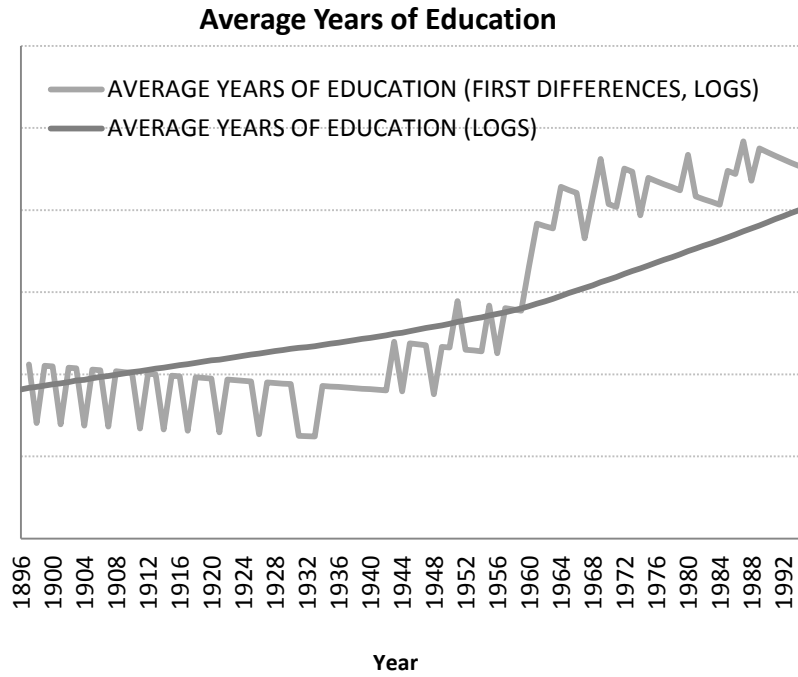
between observations, and moreover, the likelihood of errors in one period carrying over into future periods (Baum 2006: p155).

Serial correlation will not bias the OLS estimators or render them inconsistent, but it will produce incorrect standard errors so the estimates will be inefficient. The solution is to include lagged values of the dependent variable until the serial correlation is removed. In order to determine the appropriate lag length, we use the Akaike Information Criterion (AIC) and the Schwartz Bayesian Criteria (SBC), and the Breusch-Godfrey Lagrange Multiplier test (LM). We find that all three model selection methods deem the appropriate lag length for each variable where the residuals are not autocorrelated to be 4 lags for education and 1 lag for both measures of democracy.

The second step is to ascertain the stationary property of our variables. In the presence of non-stationary variables the regression of two trending variables may be spurious. Whilst all of our variables are bounded-indices¹¹ and therefore cannot be unit-root processes, they can still exhibit a trend within the bounds. Therefore we follow Giuliano, Mishra and Spilimbergo (2013), Sobel and Coybe (2011), Ostrom and Smith (1992) and Freeman et al (1998) (from notable economic and political science journals) in reporting standard unit root tests for our democracy and education variables. We perform unit root tests, where the null hypothesis of a difference-stationary property of the variables is competed against the alternative hypothesis of trend stationary. We use the Adjusted Dickey Fuller (ADF) and the DF-GLS (Dickey-Fuller generalised least squares) tests for this purpose. We also use a stationary test, the Kwiatkowski, Phillips, Schmidt and Shin (1992) test, where the null hypothesis is trend stationary. Briefly revisiting our data, a visual check suggests the education series appears to be nonstationary in levels as it trends upwards over time. In first differences as shown in Figure 8, education still appears nonstationary as it trends downward and upward, that is to say that the growth in the average years of education decreases and increases over time, as explained above in section 3.

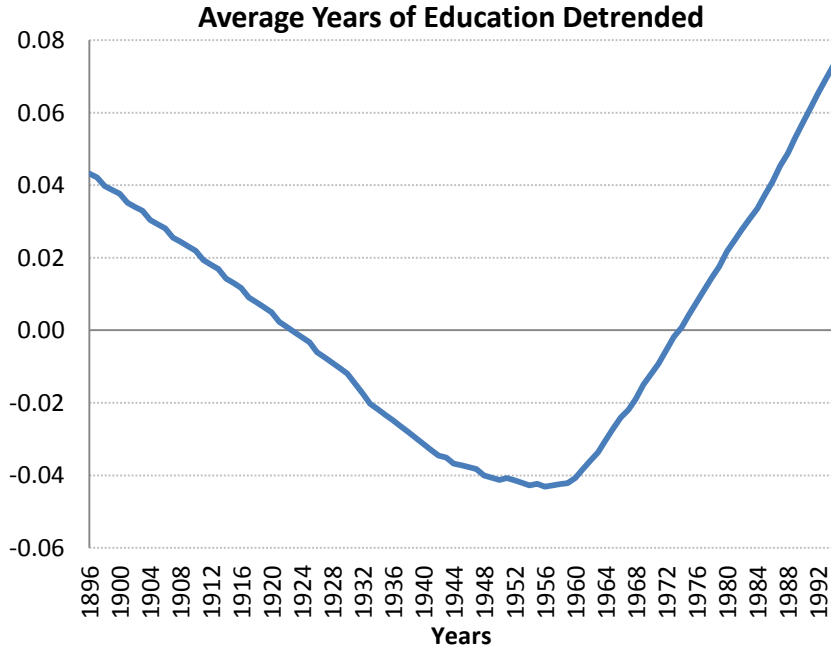
¹¹ Average years of education cannot be a negative number, Polity2 is bounded between -10 and +10 and the Vanhanen Index is bounded between 0 and 100.

Figure 8



Detrending the education series, in figure 9 below, we can see that the sequence is still non-stationary; there is a sharp about turn or structural break in the trend.

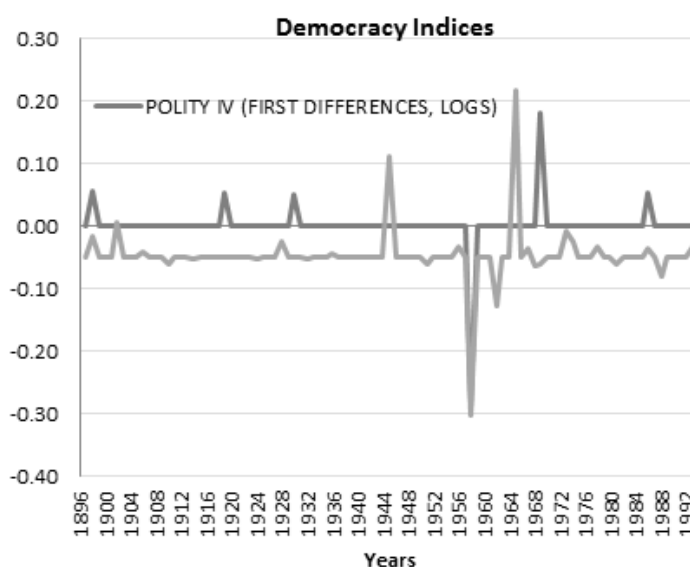
Figure 9



Turning to democracy, as we saw in figure 2, both democracy series in levels appear stationary aside from level shifts. In figure 10 below, in first differences, changes in democracy appear generally infrequent and the structural breaks in the intercept are very apparent. For the Vanhanen Democracy Index we find surges in the democracy score in 1945 and 1965, and a sharp downward fall in 1958. As explained in section 3 these dates coincide with

the introduction of universal suffrage in France in 1944, the 1958 constitution/Fifth Republic which created a stronger executive and granted the president 'extraordinary powers' in a state of emergency, and the first presidential election (1965) by direct universal suffrage since 1848. For the Polity IV index, the democracy score shows the greatest level shifts in 1958 and 1969 as aforementioned. To formalise these graphical findings of structural breaks we perform the Chow test (Chow 1960) to test if the coefficients before and after the break dates in our series are different, which essentially is just an F-test. The Chow test confirms that our education series has a break at 1957 with a p-value of 0.0001. The test also finds breaks in the Vanhanen Democracy index at 1945 (p-value 0.0438), 1958 (p-value 0.0262) and 1965 (p-value 0.0002). However the Chow test cannot perform a unit root test to inform us of the stationary properties of the series.

Figure 10



Given that we are aware of structural breaks in both democracy series', (similarly the change in slope of the education series highlights a break in the trend) the aforementioned conventional unit root tests will be incorrect. The ADF test has very low power to reject the null hypothesis of the existence of a unit root. This is particularly true if there is a structural break in the mean of the series. Perron (1988) has shown that a stationary process with a structural break in the mean will be difficult to distinguish from a random walk. Table 1 confirms this, showing that, as expected, the ADF results reveal erroneously that all three series' in levels have unit roots. The test statistics are not more negative than the appropriate critical values for significance.

The DFGLS test is an augmented Dickey–Fuller test, except that the time series is transformed via a generalized least squares (GLS) regression. It is deemed to have significantly greater power than the augmented Dickey–Fuller test, and it finds our education series to be trend stationary at the 5% level as we logically believe it to be. However, the null of a random walk cannot be rejected for both democracy series' in levels, lending to the view that this test is still inefficient in the presence of structural breaks. The Kwiatkowski, Phillips, Schmidt, Shin (KPSS, 1992) test for the stationarity of a time series is complementary to the tests above. However, Perron (1989) again finds that the KPSS test will reject the null hypothesis of level and trend stationarity in the presence of structural breaks. The KPSS test wrongly finds that all three of our series are random walks.

Table 1

	Democracy Index	Polity IV	Education
ADF	-2.337	-2.57	1.531
ADF First Differences	-9.726	-9.757	0.046
	5% -2.892, 1% -3.51		
	<i>H0: Random Walk, HA: Stationary</i>		
DFGLS	-1.105	-1.693	-2.893
DFGLS First Differences	-6.527	-6.483	-0.975
	Level 5% -2.129, 1% -2.60; Trend 5% -2.776, 1% -3.584		
	<i>H0: Random walk HA: Level or Trend Stationary</i>		
KPSS	2.69	0.505	0.505
KPSS First Differences	0.029	0.072	0.387
	Level 5% 0.463, 1% 0.739; Trend 5% 0.146, 1% 0.216		
	<i>H0: Level or Trend Stationary; HA: Random walk</i>		

We proceed therefore to the Perron (1998) structural breaks test for our education series, to test if it is trend stationary or difference stationary with one structural break at 1957. There are three alternative hypotheses we can test. The first test assumes a structural change at $t = T_B$ and compares the null hypothesis of a unit root with a one-time jump in the level $H_1 : y_t = \mu + dD(TB)_t + y_{t-1} + e_t$ against the alternative hypothesis of trend stationarity with a one-time change in the intercept $A_1 : y_t = \mu_1 + \beta t + (\mu_2 - \mu_1)DU_t + e_t$ where $D(TB)_t = 1$ if $t = T_B + 1$, and 0 otherwise and where $DU_t = 1$ if $t > T_B$ and 0 otherwise. $D(TB)_t$ therefore represents a pulse dummy variable and DU_t a level dummy. We calculate the t-statistic for the null hypothesis $a_1 = 1$. This statistic can be compared to the critical values by Perron (1989), where the asymptotic distribution of the t-statistic depends on the location of the structural break $\lambda = T_B / N$ within the sample. T t-statistic is 1.843 which exceeds the critical value -2.92, so we reject the null of a unit root process in favour of trend stationarity with a level break. The second test compares the null hypothesis of unit root with a one-time change in the slope against the equivalent for trend stationarity including the level dummy and also a trend dummy, defined as $D_T = t - \tau$ for $t > \tau$ and 0 otherwise. Here we find the t-statistic is 1.973 which against exceeds the critical value of -5.15, so we reject the null of a unit root process. Given that the result of the first two tests indicate that our education series is trend stationary with a one-time level and trend break, we test the third hypothesis that allows for a combination of both a level and trend change, including pulse, level and trend dummies in the regression. The t-statistic is 1.760 exceeding the critical value of -1.63, so our assumption is correct. We also perform the Zivot-Andrews unit root test which allows for a single break in the intercept or trend. For education, the Zivot Andrews test finds a break in the trend and intercept at 1957 and rejects the null hypothesis of a unit root for the series.

Given that we suspect three structural breaks in the Vanhanen Democracy Index neither the Perron (1998) nor Zivot Andrews tests are adequate. We therefore perform the Bai-Perron (1998, 2003) test which allows for multiple break dates in Eviews 8¹².

¹² A Stata program for the Bai-Perron test does not exist

Bai and Perron (2003) consider a multiple linear regression model with m breaks ($m+1$ regimes): $y_t = x_t'\beta + z_t'\delta_j + u_t$, $t = T_{j-1} + 1, \dots, T_j$, for $j = 1, \dots, m+1$. In this model y_t is the dependent variable observed at time t ; x_t ($p \times 1$) and z_t ($q \times 1$) are vectors of covariates and β and δ_j ($j = 1, \dots, m+1$) are the corresponding vectors of coefficients; u_t is the disturbance term at time t . The indices (T_1, \dots, T_m) , or the break points, are explicitly treated as unknown (they use the convention that $T_0 = 0$ and $T_{m+1} = T$). The purpose is to estimate the unknown regression coefficients together with the break points. The method of estimation is based on the least-squares principle. For each m -partition (T_1, \dots, T_m) , the associated least-squares estimates of the coefficients are obtained by minimising the sum of the squared residuals. Bai and Perron (2003) impose some restrictions on the possible values of the break dates as each break date must be asymptotically distinct and bounded from the boundaries of the sample. To that end they include a trimming parameter ϵ which imposes a minimal length h for a segment such that $\epsilon = h/T$. The minimisation of the square residuals is taken over all partitions such that $T_i - T_{i-1} \geq h = T\epsilon$. The regression parameter estimates are obtained using the least-squares estimates at the estimated m -partition $\{\hat{T}_j\}$. Using the user-written program in Eviews 8 to perform the Bai-Perron (2003) multiple structural breaks test on the Vanhanen Democracy Index, we find that 1945, 1958 and 1965 are the three significant break dates with F-statistics which exceed Bai-Perron's (2003) critical values¹³. The Bai-Perron (2003) test also confirms the two break dates for the Polity Index (1958 and 1969). Both democracy indices are therefore level stationary with breaks, exactly as we hypothesize.

Once we have performed our SVAR regression, there are two important post-estimation tests to be carried out regarding the stability and the normality of the model. Testing the stability of the SVAR model is very important, as the impulse response standard errors will be invalid if the SVAR is unstable. Luetkepohl (2005) and Hamilton (1994) both show that the VAR is stable if the modulus of each eigenvalue of the matrix A is strictly less than one. Comparatively, normality of the residuals is not a necessary condition for the validity of many of the statistical procedures related to VAR (and therefore SVAR) models, although Luetkepohl (2005) explains that model improvements may be possible if the normality assumption does not hold. We will report the results of the Jarque-Berra test for normality, which tests the skewness and kurtosis properties of the residuals against those of a multivariate normal distribution.

We must also take into consideration the structural breaks in our series when performing our regression analysis. A common assumption is that structural breaks do not affect the structural parameters, only the unconditional covariance matrix of the system disturbances. However, in agreement with Bacchiocchi and Fanelliz (2012) we believe this assumption to be untenable. Failing to use the appropriate methodology in the unit root tests above yielded erroneous results, and so to ensure the stationarity of our variables we include pulse and level dummy variables in the SVAR regression to take account of the structural breaks, as outlined by the Perron (1989), Bai

¹³ 0 vs 1 break F-statistic 85.717 exceeds critical value 8.58, 1 vs 2 breaks F-statistic 63.617 exceeds critical value 10.13, 2 vs 3 breaks F-statistic 27.787 exceeds critical value 11.14 and 3 vs 4 breaks F-statistic 5.079 does not exceed critical value 12.25 so there are a maximum of 3 breaks 1945, 1958 and 1968 using 0.15 trimming

and Perron (1989) and Perron and Vogelsang (1992). A pulse dummy variable takes the value of 1 at the year of the break + 1, and 0 elsewhere. The level dummy variable takes the value 1 the years after the break date, and 0 before or at the break.

A point here must be made about economic growth. Income is ordinarily included as a control variable in panel studies investigating the relationship between education and democracy in order that the relationship is robust to different income levels across countries. As we have highlighted previously in chapter 1, a tri-partite relationship exists between education, democracy and growth as the three variables are endogenous. Murin and Wacziarg (2014), using a historical times series between 1870 and 2000 in 10-year intervals on panel data, examines the relationship between education (or income) and democracy; therefore highlighting that over long time periods the inclusion of income as a control variable is not necessarily required. For our purposes, our analysis is conducted on a single country's time series so that GDP need not be controlled for. Our argument proceeds thus: education is a function of income, democracy in part is a function of education, which is a function of income and so over almost a 100 years of annual data, GDP is inherent within the system. Furthermore, for identification purposes of the SVAR we cannot include three regressions with exactly the same regressors unless a recursive structure is applied throughout, as Wooldridge (2002) finds that if one equation is a linear combination of other equations is it a special structure that causes the rank condition to fail when the model passes the order condition. Therefore we do not control for GDP in our SVAR model.

Lastly, whilst the SVAR model is capable of placing short run and long run constraints on the contemporaneous relationship between our variables, we choose to only investigate the short run effect of a shock in education on democracy. There are two reasons for this: firstly, as Dupor and Keifer (2008) point out, long run restrictions on the cumulative response of a variable require long lead and lag covariances, however the underlying VAR typically has short lags, which give poor estimates of the long run properties. Faust and Leeper (1997) agree that the long-run effect of shocks is imprecisely estimated, causing serious bias to IRFs even with large samples. As a result we feel that a long run structural VAR model is likely to produce efficient results. Secondly, as both our variables, democracy and education are stationary and trend stationary respectively, albeit with breaks, a shock to education would dissipate over time and so the most important timeframe under analysis is the short run.

4.1 Results

We proceed to our SVAR regression analysis with the Vanhanen Democracy Index as our response variable, the average years of education as our impulse variable, and certain contemporaneity restrictions placed on the A and B matrices of our AB model as aforementioned. The restrictions manifest themselves that education and democracy shocks affect democracy contemporaneously, but only education shocks affect education contemporaneously. In Table 2 below we see the first stage of the SVAR results, the reduced form vector autoregression with four lags of each variable, and pulse, level and year dummies.

Table 2:

Table 2: Vector Autoregression			
<u>Average Years of Education</u>		<u>Democracy</u>	
	(I)		(II)
Dependent Variable is D.Log Education		Dependent Variable is D.Log Democracy	
L.D.Log Education	-0.003	L.D.Log Education	25.92
	0.975		0.284
L2.D.Log Education	0.058	L2.D.Log Education	53.01**
	0.546		0.02
L3.D.Log Education	0.217**	L3.D.Log Education	40.8*
	0.024		0.073
L4.D.Log Education	0.199**	L4.D.Log Education	38.19*
	0.042		0.099
L.D.Log Democracy	0.000	L.D.Log Democracy	0.441*
	0.705		0.091
L2.D.Log Democracy	0.000	L2.D.Log Democracy	0.104
	0.427		0.191
L3.D.Log Democracy	0.000	L3.D.Log Democracy	-0.034
	0.118		0.67
L4.D.Log Democracy	0.000	L4.D.Log Democracy	0.232****
	0.722		0.004
Year	8.75E-06	Year	0.001
	0.129		0.273
Democracy Pulse Dummy 1965	0.000	Democracy Pulse Dummy 1965	-0.305
	0.879		0.338
Democracy Level Dummy 1965	0.000	Democracy Level Dummy 1965	-0.582****
	0.785		0
Democracy Pulse Dummy 1958	0.000	Democracy Pulse Dummy 1958	0.464
	0.438		0.13
Democracy Pulse Dummy 1945	0.000	Democracy Pulse Dummy 1945	-0.187
	0.883		0.4
Democracy Level Dummy 1945	0.000	Democracy Level Dummy 1945	-0.247****
	0.082		0
Education Pulse Dummy 1957	-0.001	Education Pulse Dummy 1957	-1.057****
	0.031		0
Education Level Dummy 1957	0.002	Education Level Dummy 1957	-0.084
	0***		0.439
Constant	-0.015	Constant	-3.429
	0.176		0.189
Observations	94	Observations	94
R-squared	0.95	R-squared	0.55

Exactly Identified Model Significance levels: **** p<0.001, *** p<0.01, ** p<0.05, * p<0.1

From the regression output in Table 2 above we see that previous growth levels of education¹⁴ exerted positive and significant effects on the growth in democracy in France. The second lag of education is significant at the 5% level, whilst subsequent lags are significant at the 10% level. The first and fourth lag of the growth in democracy also exerts positive effects on democracy at the 10% and 5% level respectively. This result likely highlights that elections in France were mostly held every four years and so the Vanhanen Democracy Index reflects these

¹⁴ Owing to stationarity restrictions necessitated by the VAR model, our variables are in first-differenced log formation, implying that the interpretation is that a 1% increase in education results in a percentage increase in democracy.

changes. Though there were notable exceptions for the 4-yearly elections during the 1950s and 1960s when Presidential and Parliamentary elections were held in different but often sequential years. We are surprised by the negative but significant coefficients for the democracy level dummies in 1945 and 1968, given that the Index experienced upward surges in those years. The Democracy level dummy for 1958 was dropped in the regression owing to its collinearity with the Education level dummy for 1957. However since the inclusion of these dummy variables is for the purpose of stationarity for our variables so that the regression that take account of the structural breaks, we are less concerned with their individual coefficients.

We also see that the growth rate in education in France, albeit from the third lag, exerts positive and significant effects on education at the 5% level, as we would expect. Logically, current levels of education, just like current levels of democracy, are likely to be a function of past levels of education and the political structure. In both cases, these are institutions that evolve slowly over time. That is, institutions build upon their own foundations and are not contemporaneously (or newly) determined year by year. It is somewhat surprising to see that the growth in democracy in France, whilst positive, exerts no significant effect on education given our findings in Chapter 1 that education and democracy exert positive and significant effects on each other. However, as we previously explained, the Vanhanen Democracy Index provides a thinner conceptualisation of democracy than the Polity IV measure, and as a result there are a myriad of reasons as to why data representing voter turnout and preferences may not exert a positive impact on education (such as the victorious political party not following through on electoral promises to deliver more education opportunities). In France we saw that the expansion of education, on account of the 'baby boom' and educational reforms in the 1950s, did not lose momentum with the election of different political parties over the time period. The Communist Party was in power from 1945 to 1956, the Independents and Moderates won the 1958 parliamentary election, then the Gaullists/Fifth Republic was in power from 1962 to 1973. In this regard, the downward shift in the democracy score during the De Gaulle presidency years does not appear to have impacted the expansion of education. However people with a higher educational attainment are found to participate more fully in political activities, from voting to engaging in demonstrations, which our case-study and results confirm by the positive effect of education on democracy in France in the regression output above.

As the cross-equation error variance covariance matrix of the vector autoregression contains all the information about the contemporaneous relationships between education and democracy, without placing diagonal restrictions on this matrix there is no way to determine whether a shock in education caused a shock in democracy in the impulse response function (the moving-average representation of the system). The errors are contemporaneously correlated. Therefore we proceed to use a structural vector autoregression, which rationalised through our case-study, imposes restrictions (in our case, recursive) to decompose the contemporaneous correlations into orthogonal components.

The recursive structure we impose, motivated by our case study, is that shocks to education impact both education and democracy contemporaneously, whilst shocks to democracy only impact itself contemporaneously and education with a lag. As a result we set the A matrix to lower triangular and the B matrix to a diagonal, which corresponds to the Cholesky decomposition: $A = \begin{bmatrix} 1 & 0 \\ \cdot & 1 \end{bmatrix}$ and $B = \begin{bmatrix} \cdot & 0 \\ 0 & \cdot \end{bmatrix}$. Recall that $A\varepsilon_t = Be_t$, where ε_t are the

VAR residuals and e_t are the structural shocks, so rewriting to $\varepsilon_t = A^{-1}Be_t$, where $A^{-1}B$ is lower triangular so the education equation does not contain contemporaneous democracy and therefore $\begin{bmatrix} \varepsilon^{EDU} \\ \varepsilon^{DEM} \end{bmatrix} = \begin{bmatrix} a & 0 \\ b & c \end{bmatrix} \begin{bmatrix} e^{EDU} \\ e^{DEM} \end{bmatrix}$ education does not respond to a structural shock in democracy. As we highlighted, at the time of the student protests in 1968, the number of students attending university was a function of a whole stream of funding, socioeconomic and cultural decisions and outcomes that had taken place over a period of time. And as such, a sudden change or shock to democracy would be unlikely to impact education outcomes contemporaneously, though it is logical to assume that changes to democracy could influence those decision factors in the future. However, our case study approach has shown that changes in education in France had a contemporaneous effect on democracy through civil action, protests and voter turnout.

Once we apply these contemporaneity restrictions we derive the structural VAR output, notably the table displaying the estimates of the parameters from the A and B matrices in Table 3 below. We see that the A_2_1 estimate (that is, the effect of a shock in education on democracy) is negative because the off-diagonal elements of the A matrix contain the negative of the actual contemporaneous effects. The estimated effect of a shock in education on democracy is therefore positive. Once we compute the Cholesky decomposition we derive the structural impulse response function output in Table 4.

Table 3 & 4

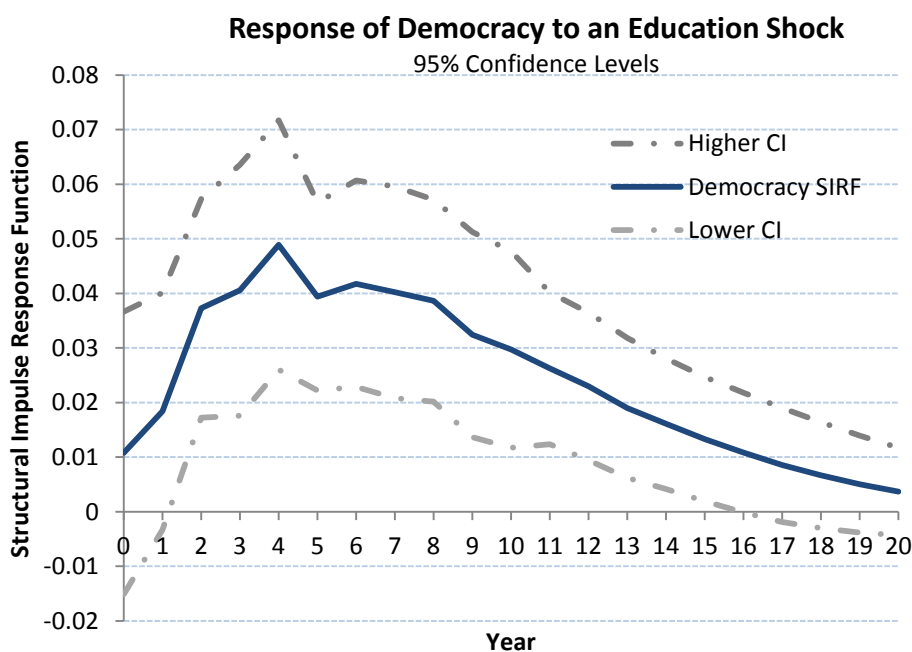
<u>Table 3: Structural Vector Autoregression</u>	
A_1_1 (Education on Education)	1.00
A_2_1 (Education on Democracy)	-20.46
A_1_2 (Democracy on Education)	24.37
A_2_2 (Democracy on Democracy)	(omitted)
B_1_1 (Education on Education)	1.00
B_2_1 (Education on Democracy)	0.00****
B_1_2 (Democracy on Education)	0.00
B_2_2 (Democracy on Democracy)	(omitted)
	0.01

<u>Table 4: SVAR SIRF</u>		
	D.Log Education	D.Log Democracy
D.Log Education	0.0005	0.00
D.Log Democracy	0.0108	0.1245

The SVAR structural impulse response function (SIRF) in Table 4 finds that a 1% shock (increase) in education produced a 1.08% increase in democracy in France in the short run. Whilst the magnitude of this result appears small we can make the following two points: firstly, the result is additive in so far as a 1% increase in education in France produced an even larger effect on Democracy; secondly, the growth in education in France was not stationary. That is, as Figure 8 shows, the yearly growth in education varied markedly between 0.2% and 0.4% from 1894 until the mid-1930s, then education grew more steadily between 0.37% and 0.47% until 1957 wherein education increased by 0.57% and the growth rate subsequently increased steadily each year to 0.93% in 1969. Therefore there were many sequential years where education grew by almost 1%.

We graph the SIRF in Figure 11, which traces the response of democracy in France to a shock in education on a period-by-period basis. We see that a shock to education had a positive effect on democracy that peaked after 4 years and slowly declined. The effect is significant after the 1st year when the 95% level confidence interval no longer crosses the zero bound, and remains significant until the 16th year.

Figure 11



In this regard, a 1% shock increase in education impacted democracy in France after the following year. We can explain the peak effect occurring after 4 years by the fact that increases in education, (that is, increases in the number of university graduates as the primary driver of the average years of education in France after 1957) would only be able to affect our democracy index either by people voting at an upcoming election (mostly held every 4 years) or through political activism and protest to bring forward the date of an election. Recall our democracy variable is only a measure of voter turnout and preferences, not a broad measure of the political institutional environment, though it is logical to assume that voter turnout and preferences help to shape the institutional environment over time. Furthermore as our education series is trend stationary, albeit with breaks, a shock to education, and its resulting impact on democracy, would dissipate over time.

In the 1965 presidential election, the surge in the Vanhanen Democracy Index score on account of both an increase in voter participation and political competition, followed the highest growth rate in education in 1964 since the series began in 1896 (0.86%, which was also 0.1% higher than the previous 3 years). As we explained, De Gaulle won the presidential election but only after being forced into a second round run-off with Francois Mitterrand, a viable candidate from the Left who was 26 years younger than De Gaulle and whose poster campaign centred on the theme of “a young president for a modern France”. De Gaulle only won with 54.5% of the votes, considerably less than his previous victories. Furthermore, the 1967 legislative elections saw the Gaullist UDR party almost lose its overall majority, with 247 seats against the opposition’s 240, demonstrating weakening public support for Gaullist political power.

Whilst the Gaullist UDR party won the 1968 elections following the student protests, the defeat of De Gaulle’s personal plebiscite referendum in 1969 saw him resign as President of the Republic. The 1973 legislative elections saw the Gaullist UDR party suffer heavy losses to the Socialists and the French Communist Party (PCF), winning only 183 seats. The surge in the Democracy Index at this time also came a year after a large increase in the growth of education (from 0.81% to 0.91%). The 1986 legislative elections ushered in France’s first period of cohabitation with Socialist President Mitterrand coming from a different political party to the centre-right coalition of RPR and UDF, who combined secured a 2 seat majority in parliament. The Vanhanen Democracy Index increased from 34.15 to 36.42 at that time, which also came one year after another surge in the growth of education in 1985 (from 0.82% to 0.9%). As we do not have data for the voter breakdowns (and their educational attainment) at these elections, we cannot make any assertion about which age group determined their outcomes. We cannot argue definitively that the large increases in education the year before each of these elections was the cause of the higher voter turnout and voter preferences which saw increases in the Vanhanen Index, but we also cannot say for definite that it did not play a part. As we have highlighted, many theoretical arguments are put forth within the literature for the relationship between university education specifically and voter turnout and student activism, and the student protests in France in 1968 attest to them. We can however see why our SVAR SIF output finds that shocks to education impact democracy in France after 1 year, given these examples.

In Table 5 below we show the results of SVAR post-estimation tests. We find that the SVAR is stable as all the eigenvalues lie inside the unit circle. The Jarque-Bera test, however, shows that whilst our education variable has a normal distribution, our democracy variable does not. We highlighted previously that the presence of non-normality was not an impeding factor in the SVAR model.

Table 5

Eigenvalue stability condition

Eigenvalue	Modulus
.84995 + .1043641 <i>i</i>	.856333
.84995 - .1043641 <i>i</i>	.856333
-.6778808	.677881
.05820455 + .6464459 <i>i</i>	.649061
.05820455 - .6464459 <i>i</i>	.649061
-.1028207 + .6237917 <i>i</i>	.632209
-.1028207 - .6237917 <i>i</i>	.632209
-.4945309	.494531

All the eigenvalues lie inside the unit circle. VAR satisfies stability condition.

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_logeduc	3.076	2	0.21481
D_logdemoc	921.541	2	0.00000
ALL	924.616	4	0.00000

Skewness test

Equation	Skewness	chi2	df	Prob > chi2
D_logeduc	-.43436	2.956	1	0.08557
D_logdemoc	2.7689	120.114	1	0.00000
ALL		123.070	2	0.00000

Kurtosis test

Equation	Kurtosis	chi2	df	Prob > chi2
D_logeduc	2.8248	0.120	1	0.72885
D_logdemoc	17.305	801.427	1	0.00000
ALL		801.547	2	0.00000

For robustness purposes we also performed our SVAR analysis using the Polity IV measure of democracy, polity2. We find that the cumulative effect of a 1% shock in education on democracy is 0.5% but the effect is not significant at all. We attribute this result to the temporally inaccurate, smoothed properties of this index and its insufficient variation to be used in our time series study, as we explained in Section 3.

Conclusion

Our case study approach investigating the education-democracy relationship in a single country, namely France, provided the theoretical justification for the contemporaneity restrictions in the SVAR model, and indeed, the use of SVAR analysis altogether. By delving into the details of the political transformation in France during the key time period under our analysis, we were able to logically deduce the likely causal relationship between our variables. Departing from, and extending beyond, dynamic panel regression analysis using the system-GMM estimator, our study compliments the existing empirical literature by finding that shocks to education exert a positive and significant effect on democracy in France. The results of our structural VAR analysis show that the cumulative effect of a 1% shock in education results in a 1.08% increase in democracy in France in the short run. Furthermore, the structural impulse response function highlights that the effect is significant after the 1st year until the 16th year following the shock. By pioneering the use of structural VAR models in the education-democracy literature, we hope that our analysis will be extended to investigate the relationship on other individual time-series, such as Spain and Portugal, or in a panel SVAR context.

Chapter 3: Education, Macroeconomic Crisis and Democratic Transition: A Logistic Regression Analysis

Abstract

This study uses logistic regression analysis to investigate the odds of democratic transition on a panel of 103 countries over the years 1970 to 2012. Our model shows that the odds of switching from a non-democratic to a democratic regime is positively and significantly linked to the level of education and inflation, whilst negatively and significantly related to economic growth. Macroeconomic crisis therefore serves as a catalyst for educated societies to bring about democratic change.

1. Introduction

As we have highlighted in previous chapters, the theoretical study of democratic transition largely originated with Lipset's (1959) seminal paper on socio-economic modernisation, which argued that industrialisation, urbanisation, an emerging middle class and rising incomes and education levels set forth the likely requisite conditions for democracy to emerge. In keeping with this, Moore (1966) argued that the relationship between socioeconomic development and democracy was not necessarily linear and inevitable but dependent on the social and power structures within society. Subsequent authors (Apter 1965, Davis 1962, Huntington, 1968) highlighted the destabilising societal effect of socio-economic progress, particularly political mobilisation, in the presence of comparatively underdeveloped institutions; however the view that mass popular action alone could not lead to permanent democratic transition (Tullock 1974, Huntington 1984) has been contended by those who insist on the fundamental contributions of labour market movements which served to bring about democratic change (Therborn 1977, Stephens 1987). History has shown that democratic transitions in a large number of countries have been preceded by student-led and worker protests. Up until the 1990s however, modernisation theory's assertion that rising income levels were the key contributing factor to achieving democracy appeared broadly accepted and was the predominant focus of study.

The unprecedented wave of democratic transitions which occurred in Latin America in the 1980s and across large swathes of Eastern Europe after the collapse of the Soviet Union in the early 1990s however, engendered a revival and extension of the theoretical literature on democracy; enhanced by the increasing sophistication of econometric studies and the completion and sharing of political datasets. Przeworski and Limongi (1997) noted that this new literature began to contest the 'old' insofar as viewing democratic transition as a result of actions and not just of economic conditions. We might add that just as the insights of the New Institutional Economics paradigm (highlighted in Chapter 1, originating with North 1971 and Williamson 1975) returned to the fore in academic circles in the 1990s, so too have explanations for democratic transition returned focus to the institutional attributes of political regimes and societal structures. In this regard, democratic transition has begun to be attributed not just to rising income levels (though this factor has become increasingly debated), but also to the dynamics of political regimes, the role of external actors, neighbourhood effects, economic decline and idiosyncratic factors specific to each country. This literature has in some respects extended beyond those highlighted in Chapters 1 and 2 which concentrated on the long run determinants of democracy, and instead placed focus on the factors prevailing at the time of democratic transition.

While this has been an important development in the literature, to date, the role of education – the principal focus of this thesis – remains largely overlooked. This observation provides the motivation for the work of this chapter. Huntington's (1991) oft-cited 'Democracy's Third Wave' asserted that the democratic transitions over the prior 30 years had been brought about by: external actors (such as the European Community, the changed stance of US foreign policy, the Catholic Church and the economic structural adjustment programmes of the IMF), "snowballing" or neighbourhood effects of democratisation which stimulated and provided models for democratic efforts elsewhere; rising income levels; and also a deepening of legitimacy problems for authoritarian regimes when faced with economic decline. He too noted that economic decline, or "reverse snowballing" via the

overthrow of democratic regimes elsewhere, and conquests by non-democratic regimes served to see new democratic regimes return to authoritarianism.

The subsequent econometric literature which has emerged has principally used binary outcome models to investigate the factors which Huntington (1991) highlights; notably the impact of macroeconomic crisis (Przeworski and Limongi 1997, Kennedy 2010, Burke and Leigh 2010), including inflation (Gasoworski 1995, Havard, Knutsen and Rod 2012, Arezki and Brückner 2011), neighbourhood effects (Strand, Hegre, Gates and Dahl 2013, Gleditsch and Choung 2004, Sanborn and Thyne 2013) and the role of the IMF (Aidt, Albornoz and Gassebner 2012) on the probability of democratic transition, whilst using regime type (Gasiowski 1995, Burke and Leigh 2010, Havard, Knutsen and Rod 2012) as a control variable. The results have not been uniform across studies and there has been a significant lack of focus on the role played by education in facilitating democratic transition.

Sanbourn and Thyne (2013) do investigate the impact of education (measured by the percentage of the population with some education, as well as completed primary, secondary and tertiary education), GDP per capita and neighbourhood effects on democratic transition, but fail to control for inflation or economic recession. Havard, Knutsen and Rod (2012) include economic growth, inflation and education. However their measures of education are primary, secondary and university enrolment rates, percentage of the population who are literate, and the percentage of the population who have completed secondary education. Conversely, the studies which have principally focused on economic crisis, through output contractions or high levels of inflation, either do not include education (Gasiowski 1995, Epstein et al 2006), or use secondary enrolment rates (Burke and Leigh 2010) or find that the average years of education on democratic transitions is significant, but the effect of income survives (Przeworski and Limongi 1997). In this regard there appears to be a shortage of key studies investigating the effect that economic crisis has on an educated society to bring about democratic change.

Our purpose is not to repeat the analysis of previous probability models, but the results of our analyses in Chapters 1 and 2 have brought us to an interesting juncture. Our first study found that education exerted a positive and significant effect on democracy; our second study found that shocks to education have a positive and significant effect on democracy. We are left wondering therefore why some educated countries are not democratic. What is the missing link or catalyst required for democratic transition to occur? As a result we seek to synthesise these two bodies of research; those investigating the impact of macroeconomic crisis on democratic transition and those which evaluate the role of education.

Therefore, we contribute to the existing education-democracy literature in the following three ways: firstly we investigate the concomitant impact of education and macroeconomic crisis (economic recession and inflation) on the probability of democratic transition, which other studies have either failed to investigate fully or have used an inferior measure of education; secondly, in doing so we provide a rich contextual analysis of the democratic transitions which have occurred over the last 40 years; and lastly by using a panel of 103 countries for the period 1970-2012 our dataset is one of the most balanced and up-to-date relative to other studies. As a result we answer a key question in the education-democracy literature, namely if education exerts a positive and significant effect

on democracy why are educated societies not democratic? Our analysis finds that the odds of switching from a non-democratic to a democratic regime is positively and significantly linked to the level of education and inflation, whilst negatively and significantly related to economic growth. Macroeconomic crisis therefore serves as a catalyst for educated societies to bring about democratic change. In this regard, the answer to the question we pose may very well be that some educated countries are not *yet* democratic, but they will be in time provided that educational attainment continues to increase and a catalytic event occurs. Our study focuses on macroeconomic crisis which engenders popular protests and collective action, which alongside internal regime factionalization and reformist elites ready to take advantage of the political opportunities offered by the protests, can enable regime change to occur. An alternative catalyst may be the death of a long-standing dictator or dominant leader, such as the cases of Spain (1975), Pakistan (1998), Nigeria (1998) and Zambia (2008) with the resulting power vacuum permitting a chance for democratic elections to be held, for example. Alternatively there may be no one specific catalyst, but countries may slowly transition to democracy through a series of incremental political improvements and electoral reforms such as in Mexico (1997) and Kenya (2001). Democratic transitions have followed disparate paths but our study of the 73 democratic transitions which have occurred over the past 40 years show that rising inflation and deteriorating economic performance are certainly the most frequent source of grievance that motivates student movements and popular protest to bring about democratic change.

We proceed as follows: Section 2 provides a survey of related econometric literature and describes our econometric approach; Section 3 details our data; Section 4 presents our theoretical and empirical specifications; Section 5 provides our descriptive statistics; Section 6 discusses the results in the context of our initial motivations; and Section 9 concludes. A detailed description of the democratic transitions which have occurred between 1970 and 2012 are found in Appendix 1.

2. Econometric literature review

Econometric studies investigating the probability of democratic transition have primarily used binary outcome regressions and we survey those studies below in terms of their findings for the key variables of interest, namely GDP per capita, economic growth, inflation, neighbourhood effects, regime type and, most relevant for this thesis, education.

2.1 Macroeconomic Variables

We begin with GDP per capita and economic growth which studies have often investigated jointly as well as inflation. Przeworski and Limongi (1997) used a dynamic probit model on a panel (and their own political regime classification) of 135 countries between 1950 and 1990 to find that GDP per capita did not determine democratic transitions. Whilst they found that the probability of a democracy failing with an income level above \$4000 per capita (1985 \$US PPP) was practically zero, the probability of dictatorship failing increased until \$5000-6000 per capita and then declined thereafter, making transitions to democracy less likely at higher income levels. Thus they find little evidence for modernisation theory's assertion that strictly economic development alone results in a fall of authoritarian regimes; rather, once democracy is established it is more likely to survive in wealthier countries, and

indeed fail in poorer countries. With regard to economic crises however, they found that in poor democracies (with income levels below \$2000 per capita) economic decline resulted in a large number of democratic reversals, most notably one year later, whilst for incomes above \$6055 there were none, showing that economic crisis destabilises political regimes. In this regard, they find that democratic transition is not a by-product of economic development, rather it is or is not established by political actors pursuing their goals and it can be initiated at any level of development. Only once it is established, economic constraints play a role. With development democracies can flourish in poor countries. They find that democracies are more likely to survive in a growing country with less than \$1000 per capita, than in a country with \$1000-\$2000 per capita that declines economically. They find their results are no different when using the Freedom House measures of political rights and civil liberties.

Boix and Stokes (2003) however criticise Przeworski and Limongi's (1997) study, arguing that their sample is subject to selection problems and omitted variable bias. By replicating Przeworski and Limongi's (1997) dynamic probit study but extending the panel to cover the years 1850 to 1990 they find that in the period 1950–1990 per capita income slightly increases the probability of democratisation and substantially reduces the chances of a democratic breakdown. However for the period 1850-1949 the reverse is true. In this period GDP per capita has a strong positive and statistically significant effect on transitions to democracy; it also does not reduce the probability of a democratic breakdown. In this regard they argue that democratisation is endogenous to the level of economic development, a fact that is less observable when only looking at a post-1950 sample. Countries that were economically developed by 1950 were already democratic by that time. And most countries that were not developed by 1950 either did not develop enough to make their way into democracy in the following decades or were prevented from democratizing by some exogenous variable (such as Soviet domination). They find that for low (below \$3000) and medium (\$3000-\$6000) levels of development the probability of a transition to democracy grows by 2% for each \$1,000 increase in per capita income. For high levels of development (above \$6000), the probability of a democratic transition still goes up with income, but only by about 0.5% percent for each additional \$1,000. Second, the same effect of diminishing returns actually takes place for the impact with which development stabilises democracies. Whereas the probability of democratic breakdowns declines rapidly as income goes up at low and middle levels of development, the marginal impact of additional wealth at high levels of development is very light. When they exclude countries under Soviet control and oil-rich countries and control for the exogenous factors of international politics and factor endowments, they find that economic development makes democratisation more likely. In the post-war period, for all countries in the sample, the probability of a transition more than doubles when one moves from the poorest to the wealthiest income level (from \$1,000 to \$12,000). For countries outside of the immediate zone of Soviet domination, the same rise in income is associated with a 300% increase in the probability of a transition to democracy, from 0.07 to 0.21. If they remove from the sample both Soviet dominated and oil-producing countries, the corresponding increase in probabilities of a transition is from 0.06 to 0.33, which means a non-oil-producing, non-Soviet country that had somehow remained a dictatorship up to the highest income level would be expected to democratise in three years after reaching a per capita income of \$12,000. They find that far from being non-existent, for many countries the endogenous effect of development on democracy is profound.

Kennedy (2010) too, using a probit model on a panel of 178 countries between 1816 and 2004, and using a dichotomous democratisation measure of the Polity IV Index (coding a democracy if the score is +7 or greater) found that GDP per capita decreased the probability of major institutional change, but increased the probability that such a change will be towards democracy. He found that a 1 standard deviation increase in GDP per capita resulted in a 21% increase in the probability of change being in the direction of democracy.

Havard, Knutsen and Rod (2012) using a dynamic logit model to explore the sensitivity of 85 explanatory variables from the literature on 'most' countries between 1960 and 2008 and also a dichotomous measure of democracy constructed from the Polity IV index (coding a democracy as 1 if the Polity score was +6 or greater), found that GDP per capita exhibited a non-robust effect on democratisation whilst the interaction between lagged democracy and GDP per capita was positive and significant, therefore, in concert with the findings of Przeworski and Limongi (1997), GDP per capita increases the probability of sustaining democracy, but not of democratisation itself.

Sanborn and Thyne (2013) using logistic regression on a panel of 85 countries between 1970 and 2008 and also using the same democracy measure and coding as Havard, Knutsen and Rod (2012) found that the likelihood of democratisation increased 186% on average as GDP per capita increased from \$6,200 to \$8,300 (2010 \$US PPP), with GDP per capita significant at the 5% level.

Epstein et al (2006) using a tobit model (with three-way categorisation of regimes: autocracies, partial democracies, and full democracies using the Polity IV index) on a panel of 170 countries for 1955-2000 find that GDP per capita is significant in helping countries move from autocracy to partial democracy (as measured by Polity IV) and preventing partial democracies from sliding back to autocracy. However they do not find any significance of GDP per capita (or any measure for that matter) in terms of movement from partial to full democracies. They code full autocracies as having a polity value -10 to 0, partial democracies +1 to +7, and full democracies +8 to +10; where other studies consider a Polity score of +6 or greater to be democratic.

Gasiorowski (1995) using a logit model and his own trichotomous regime classifications on 97 less developed countries (with population of more than 1 million in 1980) from 1950 to 1992 (with varying time lengths for countries) divides the data into two datasets with dichotomous dependent variables. In the first data set the dependent variable's value is 1 for democratic breakdowns and 0 otherwise; in the second, the dependent variable takes the value 1 for democratic transitions and 0 otherwise. He found that a one unit increase in per capita income at any given level reduced the log odds of democratic breakdown (by 0.497) and increased the likelihood of democratic transition (by 0.76). He also found that whilst slow or negative economic growth significantly increased the likelihood of democratic breakdown (though less likely when many countries in the surrounding region are democratic), it did not have a significant effect on democratic transition. Lastly, he found that high inflation had a negative effect on the likelihood of democratic transition in the 1950s, a marginally negative effect throughout the early and mid-1960s, and a marginally positive effect on the likelihood of transition in the late 1980s. At the same time, high inflation increased the likelihood of democratic breakdown in the early part of the period covered by the sample (1950-89) but not in the latter part of this period.

Arezki and Brückner (2011) also using logistic regression on a panel of 120 countries over the years 1970-2007 found that in low income countries rising food prices increased the incidence of anti-government demonstrations and riots and led to deterioration in democratic institutions. They found that a 1 standard deviation increase in the international food prices index significantly reduced a country's Polity IV score by 0.03 standard deviations. Furthermore that a one standard deviation increase in the food price index increased the number of anti-government demonstrations and riots by about 0.01 standard deviations. The authors argue that rises in food prices induced in net food exporting countries a significant increase in real per capita GDP and real per capita investment (the "terms of trade effect"), whilst inducing a significant decrease in real per capita consumption and a significant increase in income inequality. As a result rising food prices put the socio-economic and political stability of the world's poorest countries at stake.

Whilst not directly related to our study on democratic transition, Hendrix, Haggard and Magaloni (2009) using a negative binomial regression, similar to logistic regression, on a sample of 49 Asian and African countries for the period 1961-2006, found that international food prices are a significant determinant of the incidence of protest and riots, even when controlling for economic performance. Though they find that price declines are associated with a greater incidence of protest than equivalent price increases and that the relationship is contingent on regime type. They find that partial democracies are more prone to protest than both democracies, which have other means of holding political elites accountable, and highly repressive autocratic regimes that are willing and able to squelch contentious politics.

Burke and Leigh (2010) used fixed effects linear probability and fixed effect logit models on a panel of 154 countries between 1963 and 2007, also using the Polity IV index; they consider a democratic change event as a 3 or more point increase in the Polity score over 3 years or less that commences in year t and the reverse for an autocratic event. They find that countries were less likely to undergo democratic change after experiencing significant advances in their development level (the variable they use equals 0 when a country's $t-2$ per capita GDP is within 30 log points of its sample average $t-2$ per capita GDP, +1 (-1) when 30-60 log points above (below) its sample average, and +2 (-2) when 60 or more log points above (below) its sample average). However, they found that a 1% increase in GDP per capita growth reduced the likelihood of democratic change in the following year by 2-3% at the 5% significance level, and reduced the likelihood of an autocratic change event by 5-6%, showing that both democratic change and autocratic change are more likely to occur after output contractions.

2.2 Non-macroeconomic Variables

Using multinomial logit analyses of a large number of countries between 1820 and 2008, Strand, Hegre, Gates and Dahl (2013) found strong support for Huntington's (1991) theory that democratic transitions (and subsequent reversals) occur in waves; furthermore that the neighbourhood of a country and the global context within which it finds itself exerts a powerful force on the setup of its political system, resulting in a clustering of changes in similar directions. The effect of such diffusion, however, is largely dependent on the 'stickiness' of institutional consistency. Institutions that are internally consistent (i.e., fully-fledged democracies or concentrated autocracies)

initially prevent change, but open up for a series of changes as soon as this consistency is broken. Lastly, systemic shocks such as the two World Wars, decolonialization in the 1960s, and the fall of the Soviet Union, can open up the possibility of rapid or complex change, and in each of those examples, led to the emergence of new countries. Such clustered formation of states gives rise to clustered increases in global democracy. Strand et al (2013) also find that the institutional setups of new democracies tend to some extent to be non-sustainable. The global surges in democratization following systemic shocks then tend to be followed by subsequent reverse waves. Strand et al (2013) use the Scalar Index of Politics (SIP) measure of democracy developed by Gates et al (2006) which is a weighted measure of political participation from the Vanhanen Polyarchy dataset (that we used in Chapter 2) with the executive constraints measure from Polity IV.

Gleditsch and Choung (2004) also use a Multinomial logit model and the Polity IV index (+6 or greater is considered a democracy) to find that that transitions to democracy become more likely than transitions to autocracy when more than 60% of the neighbouring states are democratic; moreover, that democratic transitions appear to cluster regionally, and the estimated odds of a transition increase notably when neighbouring states undergo a transition to democracy. They also find that transitions to democracy became relatively more common when autocratic regimes broke down in Catholic societies after changes in the Vatican Church's doctrine. After the II Vatican Council (1962-65) the Church emphasised the value of democracy and human rights and began to play an active role in supporting organisations that promoted democracy, and indeed denouncing non-democratic regimes. Lastly, in concert with a number of studies previously mentioned, they found that low incomes and poor economic performance increased the probability of autocratic failure, but do not increase the prospects for transitions to democracy.

Aidt, Albornoz and Gassebner (2012) also use logistic regression on a panel of 108 countries over the years 1970 to 2002 and the dichotomous political regime indicator developed by Przeworski et al. (2000) to find that the anticipation of new loans from international financial institutions such as the IMF and World Bank immediately after a political regime transition increases the probability of transition from autocracy to democracy and reduces the probability of democratic survival. They argue that this is because the anticipation of a 'golden hello' or 'welcome gift' upon regime change causes regime instability. On the one hand it increases the value of transition to democracy which makes the governing elite more willing to extend voting rights for fear of revolution. On the other hand, once democracy is established the anticipation of funds enhances the incentive of the governing elite to engage in a coup and regain autocratic control. Their results show that a perfectly anticipated IMF 'golden hello' two years hence, increases the likelihood of a democratic transition by 6%. The equivalent from the World Bank is 0.8%. Whilst an anticipated 'golden hello' from the World Bank two years hence decreases the survival probability of a new democracy by 0.5% (there is no significant effect for the IMF loan). Lastly they also find that GDP per capita does not facilitate democratic transitions.

A number of studies have investigated the impact of regime type on the likelihood of democratic transition. Geddes' (2009) survey of the literature notes that military regimes are more easily destabilised by poor economic performance and can result in more orderly negotiated transitions to democracy as the military elite, fearing factionalization amongst themselves, make the first moves toward political liberalisation. She argues that

transitions from military rule are more likely to lead to democracy with successors nearly always elected in competitive elections. However the new democratic regime may not last. Acemoglu, Ticchi and Vindigni (2010) explain that in former military regimes that transition to democracy, the threat of a subsequent military coup continues to exist, particularly in countries which have high income inequality and natural resource endowment.

Geddes (2009) highlights that dominant party or single party regimes are comparatively more robust and can last substantially longer than other non-monarchic forms of authoritarianism. When they face extreme challenges they are more likely to try to retain power by changing institutions slightly to allow participation by moderate opponents. At the last they will negotiate new electoral institutions that will benefit them when they become ex-authoritarians, though the new ruling party may too turn hegemonic by using institutions originally devised to help the previous regime.

Lastly, Geddes (2009) explains that personalistic dictators are more likely to be replaced by a new dictatorship or a multiparty regime than democracy as these types of dictators are less willing to negotiate their departures for fear of assassination or prosecution. Transitions from this type of regime therefore are rarely initiated by regime insiders; instead, personalistic dictators are often overthrown in popular uprisings, invasions or pressured by international financial institutions or intergovernmental military alliances. Their departure may leave a power vacuum and an undeveloped political institutional structure where another dictatorship can emerge. A case in point may be that of Libya; after the overthrow of personalistic dictator Mu'ammar al-Qadhafi in the 2011 revolution, de facto power remained largely in the hands of armed groups and subsequent disputes over the legitimacy of the February 2014 elections have brought the country to civil war.

In the econometric democratic transition literature, Gasiorowski (1995) found that least developed countries were more likely to transition to democracy under military rather than civilian rule, with the coefficient on the military regime type positive and significant at the 1% level. Burke and Leigh (2010) and Havard, Knutsen and Rod (2012) also use military regime latent variables in their regressions, though the former does not report the results and the latter finds that when interacted with the lagged democracy variable, the log-odds of democratic transition is "barely negatively robust" which they argue indicates the destabilizing effect of military intervention in politics.

2.3 Education

Having reviewed the macroeconomic controls in the studies above which are most often used to investigate the validity of Modernisation Theory, as well as the role that neighbourhood effects and external actors play in democratic transition as highlighted by Huntington (1991), we now turn to the studies investigating the impact of education which is the particular interest of this paper. However, as we noted previously, in all of the studies save one, the inclusion of education in their econometric analysis is as a control variable to test the robustness of the effect of income and is not in of itself the specific focus.

Przeworski and Limongi (1997) found (though they do not report the results) that while the accumulated years of education of an average member of the labour force increased the probability of survival of democracies

independently of level, the effect of income survives when education is controlled for, and indeed is much stronger. As a result they assert that income is not just a proxy for education; further, that the exogenous version of Lipset's hypothesis, namely that democracies may be established irrespective of their economic development level but once attained democracy is more likely to survive in developed countries, is confirmed by the effect education has on democratic transition.

Boix and Stokes (2003) too found that the statistical significance of GDP per capita income was strongly eroded by the introduction of their index of education. They used Vanhanen's index of knowledge distribution, which consists of the arithmetic mean of the percentage of literates in the adult population and the 'level of students'. The latter refers to the number of students per 100,000 inhabitants normalized so that 1,000 students per 100,000 inhabitants correspond to a level of 100%. Boix and Stokes (2003) use education as a proxy for capital mobility, and find that the impact of GDP per capita on democratic stability is reduced by half when education is included, and so they argue that income in post-war samples behaves mostly as a proxy for other more fundamental factors.

Havard, Knutsen and Rod (2012) in their broad study of 15 'concepts' (including urbanisation, ethnicity and colonial heritage for example, using 85 variables in total) identified by the literature as having an impact on democratic transition, contrarily found that education (measured both by enrolment rates and the percentage of the population with secondary school education) has a positive effect on the probability of democratisation over and beyond that of GDP per capita. Furthermore, they argue that the combination of a non-robust effect of GDP per capita and relatively robust effects of the education variables provide further indications that the type of economic transformation processes, rather than whether income increases in aggregate or not, is what matters for democratisation. They also found that in terms of autocratic stability, only two of their education variables were significant (percentage literate and secondary school enrolment) however they had negative coefficients indicating that education reduces the stability of democracy. Given that they find education to increase democratisation but also reduce democratic stability they argue this is the reason for the lacking effect of education on level of democracy found in other studies, namely Acemoglu et al (2005) as we detailed in Chapter 1. However education is not the primary focus of their paper and indeed we would argue that the measures they use are inadequate. Firstly, as we detailed in Chapter 1, using literacy rates by definition does not capture educational ability beyond basic literacy implying that investments in education beyond that level do not add directly or increasingly to the productive capacity of the labour force or indeed to the ability of the population to make informed political choices, circumvent obstacles to civic participation, or shape individual preferences for civic activity. Furthermore, enrolment rates are a flow variable and therefore only capture the education of current students who may or may not continue their studies at any moment in time. In this regard, measures of education which quantify the accumulated educational investment of the population as a stock variable, such as the average years of education, are preferred. Secondly, the use of the fraction of the population who have attained secondary education from the Barro and Lee (2000) dataset also poses problems. This measure provides a false impression of the level of education in a country if one does not also include tertiary education. For example, the countries with a high percentage of their population having completed tertiary education will naturally have a lower percentage with just secondary education than a country with low tertiary education. In 2010, 41% of South

Korea's population had undertaken tertiary education (of which 30% completed), 45% had only undertaken primary and secondary education (35% completed), 10% had only undertaken primary education (9% completed) and 4% had no education at all. Barro and Lee (2010) find that South Korea had an average of 12.05 years of education in the population. However, by using just the percentage of the population who have attained secondary education, South Africa and Tajikistan (with 54% and 62% completed secondary education) rank higher than South Korea (with 30% completed) though their average years of education are less with 9.69 years and 10.3 years respectively. Therefore this measure of education produces erroneous results when used in isolation.

Contrary to the studies above, Sanborn and Thyne (2013) do investigate the role of education on democratic transition as the principal focus of their paper. Their education variables, namely the percentage of the population with some, completed primary and completed tertiary education, are taken from the Institute for Applied System Analysis (IIASA) dataset (1970-2000) which Sanborn and Thyne extrapolate to 2008. They find using separate regressions that each measure of education is robustly associated with democratisation at the 10% level, whilst GDP per capita maintains its 5% level significance. However, as they use the same measure as the one used by Havard, Knutsen and Rod (2012), albeit from a different dataset, we levy the same criticism. In 1985 for example, using the IIASA dataset we find that Namibia had the highest percentage of its population with only completed primary education (86%) which was higher than for Nicaragua (62%), both nondemocratic regimes at the time, though the latter country had 3 times the percentage of completed secondary education and completed tertiary education than the former. In the same year the Philippines only had 43% of its population with only completed primary education, because its completed secondary and tertiary education percentages were even higher. As previously mentioned, using education attainment percentages orders countries incorrectly by level of education, especially if primary, secondary and tertiary education measures are used in separate regressions. As a result only Sanborn and Thyne's (2013) tertiary education measure correctly orders countries by their true education level and indeed their results are compelling. They find a 121.8% (0.012 to 0.027) increase in the likelihood of democratisation as the percent of the population completing tertiary education varies from 0.0% to 9.5%. Their paper however does not investigate the effect of macroeconomic crisis, recession or inflation levels; nor do they use regime specific variables or duration under said regime, or evaluate the effect of world events such as the collapse of the Soviet Union or political interference.

Having reviewed the studies above we can summarise their findings are follows: with regard to the effect of GDP per capita the studies above find that it is (Gasiorowski 1995, Boix and Stokes 2003, Kennedy 2010, Sanborn and Thyne 2013) and isn't (Przeworski and Limongi 1997, Havard, Knutsen and Rod 2012, Aidt, Albornoz and Gassebner 2012) a significant determinant of democratic transition, whilst Epstein et al (2006) found that it was significant in moving from autocracy to partial democracy, but not from partial democracy to full democracy. On economic decline there is also a lack of agreement as Przeworski and Limongi (1997) and Gasiorowski (1995) found that slow or negative economic growth significantly increased the likelihood of democratic breakdown, and for Gleditsch and Choung (2004) increased the likelihood of autocratic failure, all three found that it did not have a significant effect on democratic transition. Burke and Leigh (2010) however found that both democratic, and autocratic, change is more likely to occur after output contractions. On inflation, Gasiorowski (1995) finds a

marginally positive effect on the likelihood of transition in the late 1980s, but a negative effect in the years prior, and the reverse effect on democratic breakdown, whilst Hendrix, Haggard and Magaloni (2009) and Arezki and Brückner (2011) found that rising food prices significantly increased the incidence of anti-government protests and riots and political instability. Neighbourhood effects or 'democratic contagion' are also significant (Gleditsch and Choung 2004, Strand, Hegre, Gates and Dahl 2013). Lastly on education, the studies find a positive and significant relationship with democratic transition even when only used as a control variable or when using an inferior measure of education.

As a result we are able to formulate a number of hypotheses for the outcome of our own econometric analysis. We strongly believe that education will increase the likelihood of democratic transition, given the results of our previous two chapters which have shown a positive and significant effect of education on democracy. Furthermore as we have articulated, education serves to inculcate populations with democratic and pluralistic values, as well as provide them with greater ability to understand policy choices and most importantly recognise the failures of their governments. As Sanborn and Thyne (2013) explain, under authoritarian rule underinvestment in education may occur as resources are misappropriated elsewhere, which may serve as a source of popular grievance and result in protest, coup d'états and civil conflict. In Chapter 2 we also highlighted that higher education in modernising countries may lead to unemployment as labour markets are unable to accommodate this large group of skilled workers. The resulting unmet aspirations may lead to political instability and violence, as Davis (1962) and Huntingdon (1968) explain. We also explained in Chapter 2 the hypotheses put forth for the specific relationship between university education and democratic outcomes and the likely transmission mechanisms, notably through voter turnout and student activism. In 2014 alone we have seen a number of student-led pro-democracy movements, in Venezuela, Hong Kong, Burkina Faso and Djibouti. We also believe inflation, output contractions and democratic contagion will increase the likelihood of democratic transition, whilst the effect of income may prove insignificant as we found in Chapter 1. In order to inform our study further we provide a rich set of democratic transition examples which have occurred over the last 40 years in Appendix 1 and draw upon specific examples in section 5. First however we detail our data and econometric approach.

3. Data

To explore our hypotheses above, our study uses a panel of 103 countries over the time period 1970-2012 in a logistic regression model, as explained in section 4. Unlike with many of the studies referred to in the previous section, our dependent variable is taken from Magaloni, Beatriz, Jonathan Chu, and Eric Min's (2013) Autocracy's of the World dataset, which we prefer for our purpose over the oft-used Polity IV or Freedom House democracy variable for several reasons.

Firstly, as our analysis concentrates more fully upon the exact year of democratic transition than our SYS GMM panel regression analysis in Chapter 1, we must examine the democracy measure more critically. We prefer Magaloni et al's qualitative, case-by-case evaluation of the presence of democracy rather than using a threshold approach as Polity IV does (score +6 and higher represent democracy) and by extension Geddes et al (2014) who combine Polity IV and Freedom House scores into a threshold measure. The Vanhanen Democracy Index,

which we used in Chapter 2, is also not suitable for our purpose for the same reason as Vanhanen (2000) also uses minimum threshold values for the two underlying sub-indices (30% for Competition, 10% for Participation) and a threshold value for the overall Index score (5.0) for the presence of democracy. As we highlighted in Chapter 1, Polity IV's (and Freedom House's) aggregation method has been criticised by Munck and Verkuilen (2002), Munck (2009) and Treier and Jackman (2008) for producing scores that do not fully meet the criteria for ordinal measurement. Polity IV's scoring choices for Central American countries (Bowman, Lehouq, and Mahoney, 2005) and African countries (Berg-Schlosser, 2004) have also been specifically criticised. In the former case for coding Costa Rica a perfect "10" between 1900 and 1999 despite 16 coup attempts between 1900 and 1955; for the latter, the Polity scores for 2000 miss seven probable democracies due to inattention to the actual functioning of institutions, as opposed to formal rules. In Chapter 2, we also highlighted the criticisms by Norris (2008) of the Vanhanen Democracy Index when used in cross country studies, notably that voter turnout may be a product of intimidation and manipulation by government forces or that differences in election frequency or voting ages may bias the results.

Secondly, unlike the Cheibub, Gandhi and Vreeland (2010) measure of political regime types, (also known as the ACLP (Alvarez-Cheibub-Limongi-Przeworski) measure (Alvarez et al. 1996; Przeworski et al. 2000)), Magaloni et al (2013) do not use the 'alternation rule' for new democracies. ACLP draws on the Schumpeterian notion that contested elections are the crux of democracy and therefore only score regimes as democratic if there has been at least one observed alternation in power. Countries remained coded as authoritarian until such time. Magaloni et al (2013) and Knutsen and Wig (2014) note that this requirement is problematic and may induce biases when empirically investigating relationships between democracy and outcome variables of interest, since government alternation is not only a function of regime type. Bogaards (2007) also criticizes this indicator by showing that electoral turnover in Africa has a relatively weak relationship with subjective measures of democracy that do not incorporate electoral results.

Thirdly, like Geddes et al (2011) and Cheibub et al. (2010), the authors provide a classification of the regime type, however they do not use 'missing', 'transitional' or 'hybrid' regime classifications which the authors believe hinder useful quantitative analysis, and instead make substantial effort to find the 'essential' regime type underlying transitional years and cut through what they term 'window-dressing institutional features' which other datasets use to justify hybrid regime type classifications.

Lastly, Magaloni et al (2013)'s dataset covers up to 2012, whilst most datasets end in the mid to late-2000s, so our analysis benefits from this extension into more recent years. In comparing the transition year provided by Magaloni et al (2013) against Geddes et al (2011) and Polity IV, we note 26 differences, both by whether a country transitioned, the year of transition and the duration of democracy before a reversal occurred. Magaloni et al (2013) provide justifications where their coding of democracy is discrepant with the commonly used Cheibub, Gandhi, and Vreeland (2010) and Geddes, Wright, and Frantz (2012) datasets, and it is this case-by-case consideration which aids our choice of democracy variable.

In implementing this empirically, countries are included and removed from the dataset when democratic transition occurs or reverses, respectively, as identified by the dependent binary variable (0 or 1). In addition to using Magaloni et al's (2013) classification of when democratic transition occurred, we also include their regime classifications as a control variable, which are military, multiparty, single party and democratic regimes and monarchies. As we highlighted in our literature review, there is a strong theoretical argument for military regimes being most likely to transition to democracy.

For our education variable, we once more draw upon the Barro and Lee (2010) educational attainment dataset. As we highlighted in Chapter 1, the total average years of schooling is constructed at 5 year intervals between 1960 and 2010 for 146 countries and provide a reasonable proxy for the stock of human capital. For our purposes we interpolate in between the 5-year intervals and extrapolate between 2010 and 2012 to create an annual time series.

In addition to the key democracy and education variables in our analysis, our annual inflation variable is taken from the United States Department of Agriculture Economic Research Service's (ERS) international macroeconomic dataset. The data covers 190 countries from 1969 to 2013 with projections to 2030, using consumer price indices from the IMF International Financial Statistics (IMF IFS) database (which the World Bank World Development Indicators (WDI) also source), as well as ERS PPP's derived from their real exchange rate database. 2010 is used as the base year. As a result the ERS produce the most balanced and complete inflation dataset available. As the individually sourced World Bank WDI and the IMF IFS inflation measures are notably scanty for our dataset, particularly in the early part of our time period (1970-2012) and in terms of the countries covered (mostly middle and low income), the ERS dataset is preferred. The ERS dataset contains inflation data for 12 more countries than the IMF (17 more than WDI) for example at the time of their democratic transition (most notably for high inflation Eastern European and Latin American countries). As Deaton and Heston (2010) explain, measurement error and biases are inherent in inflation data, particularly when the International Comparison Program (ICP) data, used to calculate price index numbers or purchasing power parities, is used in different ways by commonly used sources (such as the WDI and Penn World Tables) to give different estimates (and indeed when different baselines are used). As a result we will use several measures of inflation to test the robustness of our results. We will use the individually sourced WDI and IMF inflation data as well as the Penn World Table's GDP deflator. There is however one caveat of a yearly inflation measure for our purpose, notably that it does not capture spikes in inflation which occur intra-year and can be instrumental in stirring protest movements that instigate political change.

Our GDP per capita and GDP growth variables also come from the ERS dataset for the same reason; completeness and also for consistency. GDP data is available (in 2012 US dollars) for 1969-2013 with forecasts for 2014. Here the ERS sources the IMF IFS, the WDI, ISH Global Insight and Oxford Economic Forecasting. For the same purpose as the ERS inflation data, we will also use in the GDP per capita and GDP growth data from the WDI for robustness purposes.

As we noted in Chapter 1, we also include rents from Oil production from the World Bank's Adjusted Net Saving dataset (1970-2008), which we normalize by dividing the data by population (taken from the Penn World Tables) to create an oil rents per capita variable. This variable serves both to control for the level of GDP per capita that results from natural resource utilisation, and thus is unaccounted for productive economic development, and serves as a proxy for barriers against institutional and regime reform as mentioned in the studies of Beck and Laeven (2005) and Sonin (1999). Ross (2001) highlights three reasons why oil has anti-democratic properties: because oil revenues enable governments to use low tax rates and patronage to relieve pressures for greater accountability; they increase funding for internal security; and they fail to bring about the social and cultural changes that accompany economic growth from productive sources that tend to produce democratic government. Oil rich countries are also more able to pacify protests seeking democratic change with generous social packages. For example, following the 2011 Arab Spring protests in Saudi Arabia, the King announced an initial \$36bn package, and later on a further \$93bn package creating new homes and jobs, and investing in education and health. He also announced that women would be able to vote and be elected in the 2015 municipal elections. These concessions help to quell the protest movement.

We also include a 'democratic contagion' latent variable which is coded 1 or 0 if a neighbouring country underwent a democratic transition. In this regard the variable captures both a time and region element, as well as the waves of democracy which Huntington refers to according to world events. The fall of the Soviet Union for example presaged a number of democratic transitions in former communist countries, not just those in Eastern Europe but in socialist regimes in Latin America and Africa, where populations were moved by events occurring nearby and galvanised by those countries' success in overthrowing their dictators. There are opposite examples also, such as the communist stronghold in Cuba and the ongoing cold war between the US and the USSR, which lead to the United States aiding democratic transition in neighbouring Dominican Republic rather than risk another communist state emerging on its doorstep.

4. Econometric Specification

As the dependent variable Y in our econometric analysis is necessarily binary, as countries are either autocratic or democratic, ordinary linear regression is infeasible. This is because the values of Y, taking either 0 or 1, are not normally distributed; further the variance of Y is not constant across values of X with a binary variable which is the homogeneity of variances assumption of the linear regression model. Lastly, using linear regression will produce predicted values greater than 1 and less than 0 at extreme levels of X which would be theoretically implausible for probabilities. We therefore adopt a logistic regression approach, modelling the conditional probability of our binary output variable Y, $\Pr(Y = 1|X = x)$ as a function of x, where unknown parameters in the function are estimated by maximum likelihood. The logistic regression model is as follows:

$$p = P(y = 1) = \frac{1}{1 + e^{-b_0 - \sum_{j=1}^k b_j x_j}}$$

As explained by Shalizi (2013) and Zaiontz (2013) the logistic model provides the log odds of event E occurring, namely democratic transition, where the probability function, p , has a value between 0 and 1.

$$\ln Odds(E) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k + \varepsilon, \quad \text{where } Odds(E) = \frac{P(E)}{P(E')} = \frac{P(E)}{1 - P(E)}, \quad Odds(p) = \frac{p}{1 - p}$$

The odds function transforms the probability function into an equivalent function with values between 0 and ∞ , thereafter the natural log of the odds function provides a range of values from $-\infty$ to ∞ , to yield:

$$\ln Odds(p) = \ln \frac{p}{1 - p} = \ln p - \ln(1 - p)$$

And based on the logistic model above is:

$$\ln Odds(\pi) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k + \varepsilon, \quad \text{where } \pi = P(E) \text{ it now follows that:}$$

$$\frac{P(E)}{1 - P(E)} = Odds(E) = e^{\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k + \varepsilon}$$

Re-writing the specification for the observed sample so the π parameter is replaced by its sample estimate p , the β_j coefficients are replaced by the sample estimates b_j and the error term ε is dropped, we arrive at our original model:

$$p = P(E) = \frac{e^{b_0 + b_1 x_1 + b_2 x_2 + \dots + b_k x_k}}{1 + e^{b_0 + b_1 x_1 + b_2 x_2 + \dots + b_k x_k}} = \frac{1}{1 + e^{-(b_0 + b_1 x_1 + b_2 x_2 + \dots + b_k x_k)}} = \frac{1}{1 + e^{-b_0 - \sum_{j=1}^k b_j x_j}}$$

$$p = P(y = 1) = \frac{1}{1 + e^{-b_0 - \sum_{j=1}^k b_j x_j}}$$

$$\ln Odds(p) = \ln \frac{p}{1 - p} = \ln \frac{p(y = 1)}{1 - p(y = 1)} = b_0 + \sum_{j=1}^k b_j x_j$$

The logistic regression model therefore is simply a non-linear transformation of the linear regression, where the logistic distribution is an S-shaped distribution function. As a result the least squares approach to calculating the values of the coefficients cannot be used as least squares estimation is not capable of producing minimum variance unbiased estimators for the parameters of a logistic regression. Instead it uses maximum likelihood techniques defined below:

$$L = \prod_{i=1}^n p_i^{y_i} (1 - p_i)^{1-y_i}$$

Taking the natural log of both sides and simplifying, the log-likelihood statistic is defined as follows:

$$LL = \ln L = \sum_{i=1}^n [y_i \ln p_i + (1 - y_i) \ln(1 - p_i)]$$

Unlike linear regression where the slope coefficients are the rate of change in Y as X changes, in logistic regression, the logit coefficient is the odds ratio, interpreted as the rate of change in the log odds as X changes. For example, if the odds ratio is equal to 2 then a one unit change in X would make the event twice as likely; odds ratios equal to 1 mean that there is a 50/50 chance that the event will occur and an odds ratio less than 1 imply that the event is less likely to occur with every unit change in X. Where X is a dichotomous variable the coefficient represents the log odds relative to the omitted group. The odds ratio is formally defined as follows:

$$R_{x_i x_j} = \frac{Odds(x_{i1}, \dots, x_{ik})}{Odds(x_{jk}, \dots, x_{jk})} = \frac{e^{b_0 + \sum_{m=1}^k b_m x_{im}}}{e^{b_0 + \sum_{m=1}^k b_m x_{jm}}} = e^{\sum_{m=1}^k b_m (x_{im} - x_{jm})} \text{ where } \ln Odds(p_{x+1} / p_x) \text{ and therefore}$$

$$\ln Odds(p_{x+1} / p_x) = \ln \left(\frac{p_{x+1}}{1 - p_{x+1}} / \frac{p_x}{1 - p_x} \right) = \ln \frac{p_{x+1}}{1 - p_{x+1}} - \ln \frac{p_x}{1 - p_x} = b_0 + b_1(x + 1) - b_0 - b_1x = b_1$$

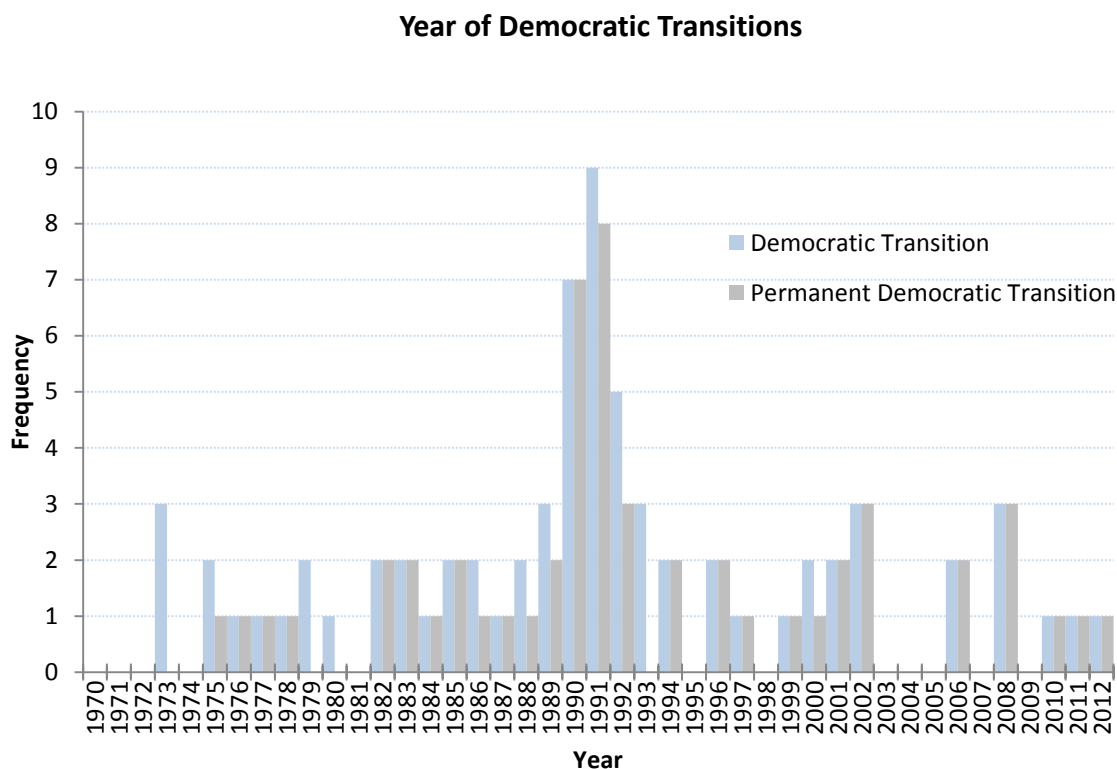
$$\text{Thus } \frac{Odds(x + 1)}{Odds(x)} = \frac{p_{x+1}}{1 - p_{x+1}} / \frac{p_x}{1 - p_x} = e^{b_1}, \text{ and when } x \text{ is a dichotomous variable } e^{b_1} = \frac{Odds(1)}{Odds(0)}$$

5. Descriptive Statistics

In our dataset, 73 democratic transitions occurred between 1970 and 2012 which include multiple reversals for several countries such as Turkey, Pakistan, Thailand, Mali and Niger. As Figure 1 below shows, the first few transitions during our timeframe of analysis occurred in the 1970s with (later reversed) transitions for Argentina, Pakistan and Turkey in 1973. Democratic transitions occurred frequently after, averaging 1-2 in almost yearly succession, until the years 1990-1992 saw a dramatic increase in the number of transitions. These include, but are not limited to, the Eastern European region after the fall of the Berlin Wall in 1989 and the collapse of the Soviet Union with 12 countries becoming democratic over those 3 years. The USSR-supported communist regime in Mongolia was also overthrown in 1992, and a wave of democratic campaigns occurred in Africa linked to these movements, with Mali, Benin, Central African Republic, Burundi, Niger and Malawi experiencing democratic transitions between 1991 and 1994. Chile, Nicaragua, Thailand, Nepal and Bangladesh also became democratic between 1990 and 1992. After this surge, democratic transitions continued to occur across the globe at its pre-1990 frequency until the end of our dataset in 2012. Using the information provided by the Global Non-Violent

Action Database, Freedom House, the US Federal Research Division of the Library of Congress country reports and country-specific studies, we can provide an overview of the events which lead to democratic transition in our countries which we detail in Appendix 1.

Figure 1



From the experience of the 73 democratic transitions in our dataset, we find that the role of the student body and universities was salient in the majority of cases. Student-led protests, if not outright student movements, are specifically implicated in 25 of the cases though they were likely instrumental to a great many more transitions. The Global Database of Events, Language and Tone (GDEL) monitors the world's news media in over 100 languages, every moment of every day from January 1, 1979 to now, to create a database of a quarter billion georeferenced records covering the entire world. As a result we can find protest activity, as reported by the media, by date, participant type, purpose (such as demonstrating specifically for leadership or institutional/regime change) and importance (by citing the number of sources and mentions within them of the event, or the 'tone' of the documents mentioning the event on a scale of -100 (extremely negative) to +100 (extremely positive). Common values range between -10 and +10, with 0 indicating neutral). We can see that student protests and demonstrations for leadership/regime change occurred in every country in our dataset, albeit with varying frequency¹, though there were notably more student protests in countries that later transitioned to democracy. What we cannot garner from the GDEL database is the sheer number of students who participated. However using European Protest and Coercion Data (Francisco 2000), which is also derived from media reports, we find

¹ When we tried to include the data from the GDEL database as a "number of incidences of student protest" variable in our regression, it predicted democratic transition too perfectly, absorbing the significance of every other variable so we did not include it.

the approximate number of student protest participants for 28 European countries daily from 1980 through to 1995. We can use this data to discuss two cases in point for Eastern Europe.

Whilst the transitions in Poland and Hungary were not a result of mass protests and revolution, the transitions in Czechoslovakia and Romania were certainly aided by them. In Prague for example, some 200,000 students peacefully demonstrated against the communist regime on International Students Day (November 17th 1989, what became known as the first day of the Velvet Revolution) but ended in police brutality and violence, spurring an avalanche of daily protests amassing half a million people by November 20th. Hundreds of thousands of students also occupied schools and colleges for 3-weeks calling for democracy in November 1989, and on December 5th some two thousand students built a wall of paper boxes around government offices in protest. In June 1990 Czechoslovakia held democratic elections. In Romania, students formed the large majority of thousands of protesters in Timisoara on 17th December 1989, considered the first protest of the Romanian revolution, who were fired upon by the Ceaușescu regime (official reports estimate 118 people were killed). This event is considered the beginning of the end of Ceaușescu's regime, as riots and protests ensued in several Romanian cities after (including thousands of Students protesting outside Bucharest's University in 21st December). Upon fleeing, being captured and tried by a military tribunal, Ceaușescu was executed on Christmas day 1989. Therefore to conclude that students were not influential in some of the democratic transitions of Eastern Europe would be misleading.

What is particularly instructive is that students were key instigators of democratic transition in countries where the average level of education is quite low, such as Mali (0.95 years) and Benin (2.2 years), which for the sake of Mali's reversal in 2012, both countries would have held democratic regimes for 20 years. Further research would therefore be greatly aided by the construction of an education dataset which has the average years of education for the capital city (where the universities in developing countries are found) and not the country as a whole, particularly where countries have large rural and likely uneducated populations which drag the measure down.

Aside from specific student-led demonstrations, the primary causes of democratic transitions occurring within our dataset appear to lie in economic decline and high levels of inflation which galvanised popular protest movements. This was particularly prominent in Latin American countries, whose deepening economic crises and rampant inflation, worsened by IMF imposed economic austerity measures, led to strikes and demonstrations that undermined the legitimacy of their military regimes. However the 1973 oil price shock and the Asia financial crisis in 1997/1998 also served to bring about protests movements in Thailand and Indonesia that preceded their democratic transitions. Furthermore, a number of transitions have been aided by the US through their military or diplomatic involvement, such as in the Dominican Republic, Nicaragua, Ecuador and Guyana. Other countries experienced democratic transitions as a result of small steps toward political liberalisation, or were brought about internally by the military regimes in power such as in Turkey and Ecuador (the first time Ecuador transitioned). Democratic transitions occurring in neighbouring countries also spurred protest movements elsewhere, such as the wave of collective action that swept across Eastern Europe and Africa after the fall of the Berlin Wall in 1989, and in Asia after the 'People's Power Revolution' in the Philippines in 1986 which spurred similar student-led movements in South Korea and Burma in 1988.

It is important to note however that a large number of student-led pro-democracy movements have not led to democratic transition, but to brutal massacre. The most notable example is that of the Tiananmen Square protests of 1989 which resulted in the regimes massacre of students and other demonstrators. The “8888” student-initiated protests in Burma in 1988, mentioned above, resulted in thousands of deaths at the hands of the regime. Even in 2014, Venezuelan students initiated widespread demonstrations against the government’s inability to tackle soaring crime rates, hyperinflation and the shortage of basic goods, though the movement ended in violence, barricades and bloodshed, leaving many dead, even more wounded and more than a thousand people detained by the police (Nagel 2014). These examples highlight that student protests against a regime which is both able, and more importantly, willing to confront them with military force is likely to result in bloodshed; but it does not necessarily mean that democratic transition will never occur.

Having established overwhelming anecdotal evidence from the 73 democratic transitions in our dataset that the role of the student body and universities were instrumental in many cases, we now turn to the more quantitative empirical evidence. Before we present the logistic regression analysis there are a number of important insights to be gleaned from a descriptive analysis of the data. In particular we highlight the skew of the data for countries that underwent i) a democratic transition and a ii) permanent democratic transition with no subsequent reversal during our time period.

Figure 2

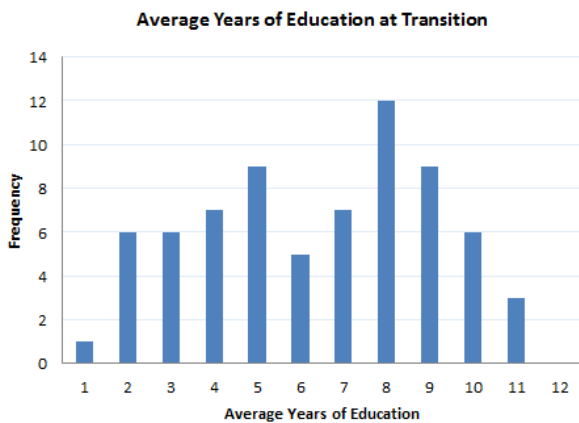
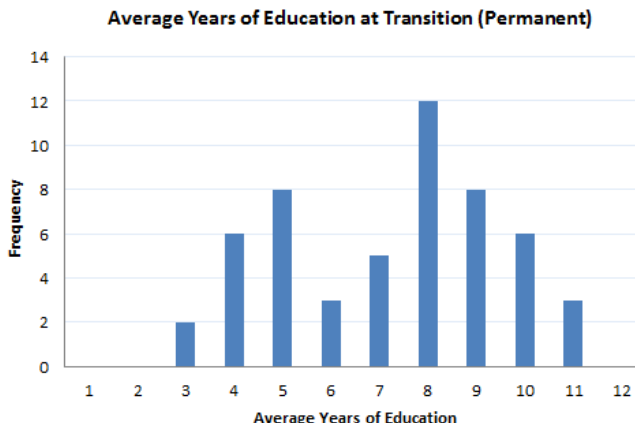


Figure 3



We can see that for countries which underwent a democratic transition in our dataset the average level of education has a negative skew; that is, a larger number of countries have democratised at higher levels of education. It is interesting to note that for permanent transition, the 8 transitions which occurred with education levels below 3 years were not sustained. This adds important descriptive weight to the argument that education is important for democracy.

Comparatively, GDP per capita at the time of transition is positively skewed, with more countries democratising at much lower levels of income; 37 transitions (out of 73) occurred with income levels of below \$2000 per capita. In terms of permanent transitions, we see that those which occurred at the lowest income levels were not sustained,

however there is a similar frequency of permanent transitions between wide ranging levels of income. In this regard, it may be that the importance of pure economic well-being for democratic transition has been overstated in the literature.

Figure 4

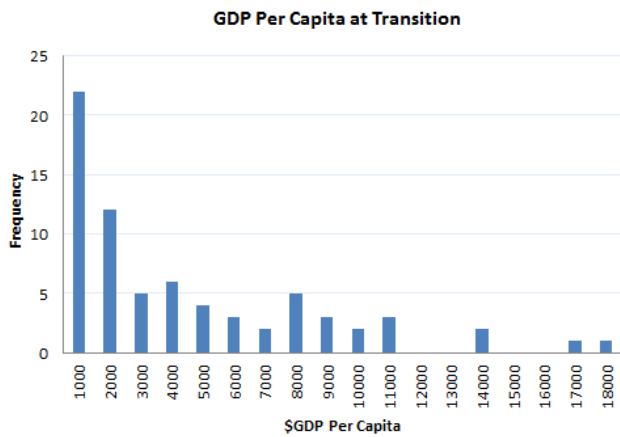
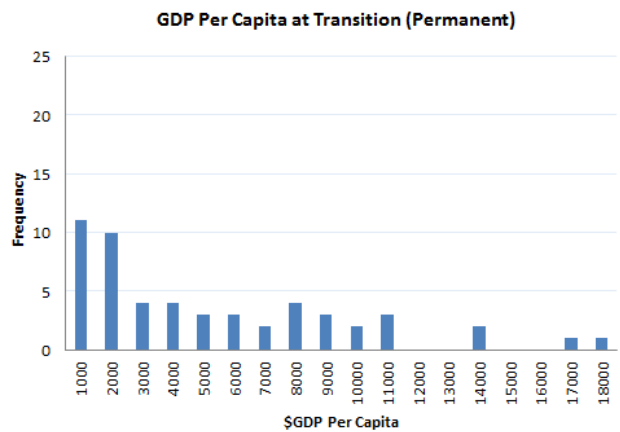


Figure 5



GDP growth however appears more instructive; the distribution is positively skewed, showing that democratic transitions occurred most often with growth rates below 0% (21 transitions) and a total of 26 transitions (22 permanent) at a growth rate of less than 1%.

Figure 6

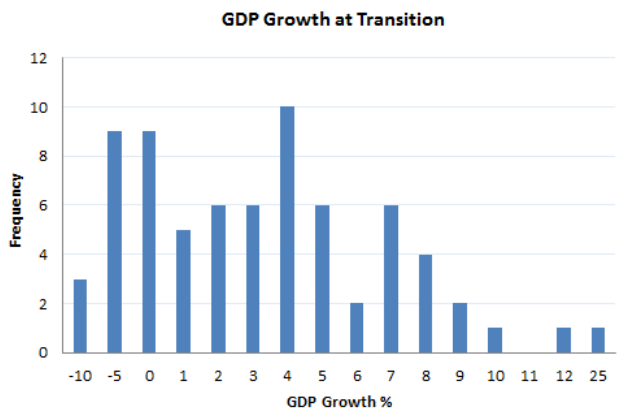
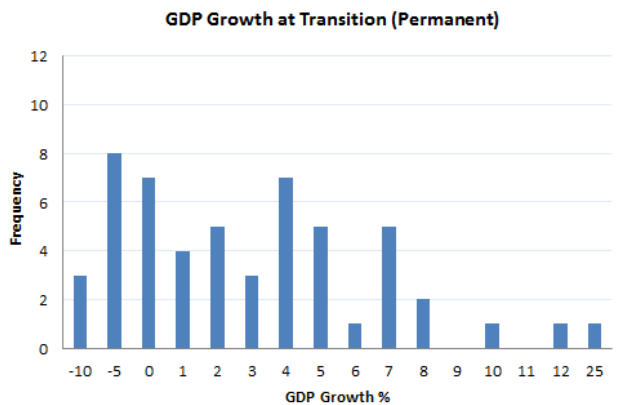


Figure 7



We include an oil rents per capita variable in our regression to control for income per capita accounted for by non-productive means and also to investigate how oil revenues act as a barrier to democratic reform. We note that across our entire dataset the range is between 533% of GDP per capita to 0, and not a single country has become democratic with a level above 2.67%. Only Ecuador (1979 – 2.67%) and Albania (1992 -2.15%) have levels above 0.79% which have transitioned. Countries with high levels of oil rents per capita include (from the highest) Qatar, Bahrain, Gabon, Saudi Arabia, Kuwait, Kazakhstan, Iraq, Yemen, Syria to name a few, all notably non-democratic. Russia is an interesting case, viewed as non-democratic by Magaloni et al (2013).

Inflation is also negatively skewed, with 38 transitions (30 permanent) occurring with an inflation level greater than 10%. The hyperinflation results capture the experience of Latin America and also Eastern European countries emerging from central planning in the late 1980s and early 1990s.

Figure 8

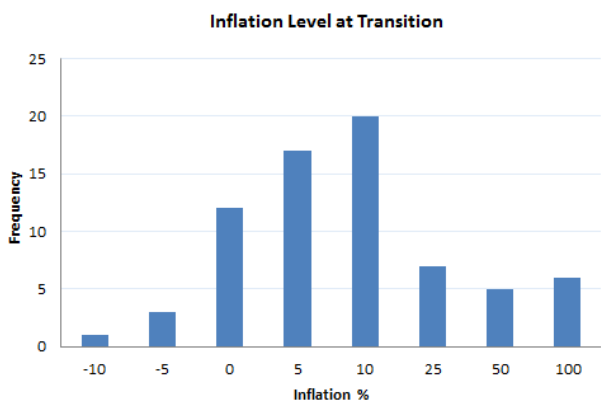
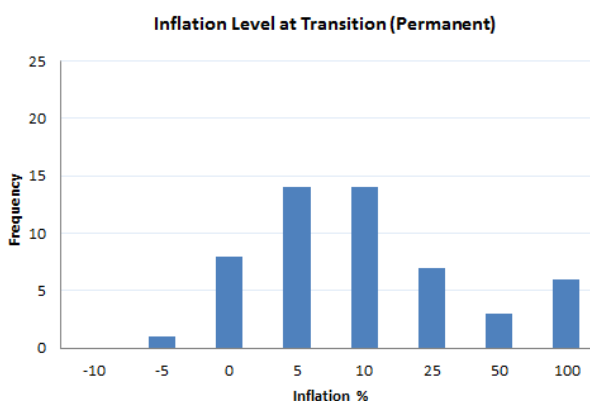


Figure 9

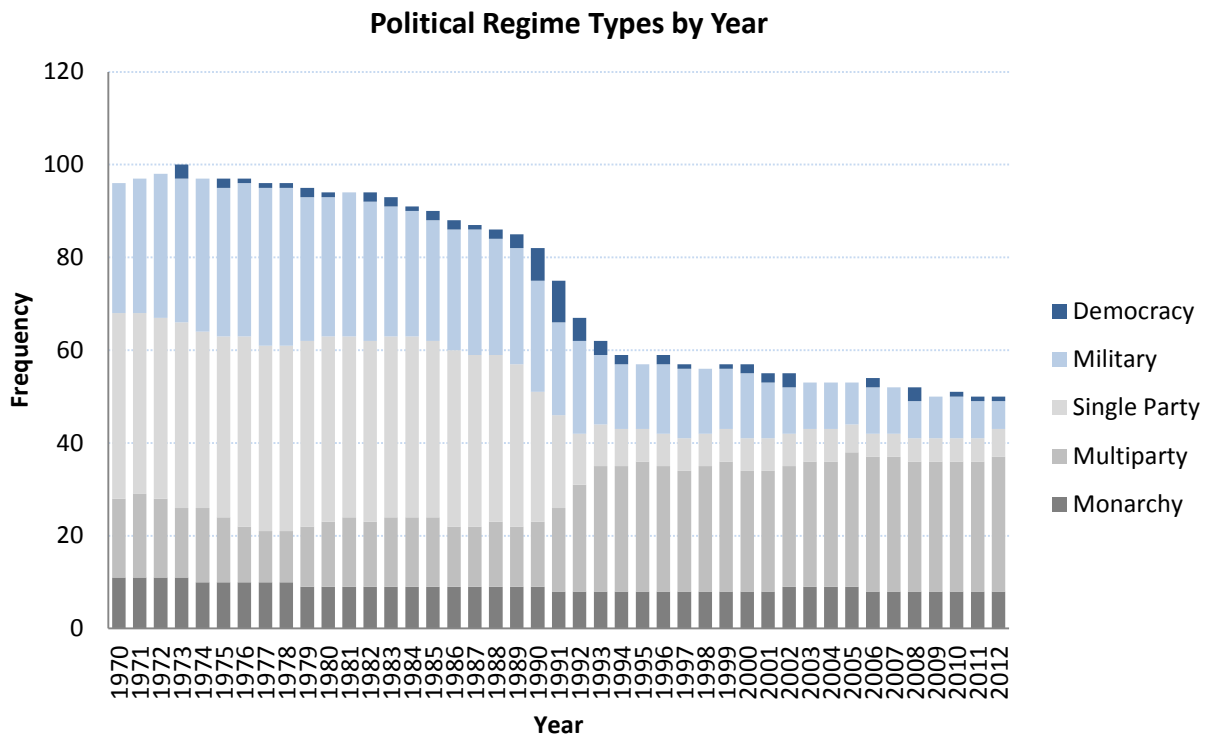


To capture both region and time controls as well as the effect of democratic contagion, we include a latent variable coded 1 if a neighbouring country became democratic. 33 democratic transitions (27 of which were permanent) had neighbouring countries which had become democratic in the preceding year.

Lastly, Figure 10 below highlights the political regime types prevailing in each year of our time period, recalling that democratic regimes are removed from the dataset the year after transition (and are returned if democracy fails). We see that the number of military regimes has reduced significantly; 32 military regimes transitioned to democracy, most notably 13 occurred in Latin America (of which 10 were permanent), 7 in Sub-Saharan Africa (though none lasted), 4 in Europe (Greece, Portugal and Turkey, with the latter reversing briefly), 4 in South Asia (with several reversals in Pakistan and Bangladesh) and lastly 4 in East Asia with South Korea and Indonesia, and reversals for Thailand. As a result, of the 32 transitions, only 15 were permanent.

The number of monarchy regimes, mostly prevalent in the MENA region, have remained broadly stable; from 11 in 1970 to 8 in 2012, with Afghanistan (1973) and Iran (1979) switching to military and single party regimes respectively. The former occurred as King Mohammed Zahir Shah was ousted by a military coup, the latter as a result of the Iranian Revolution, a series of strikes and demonstrations in response to a sharp economic contraction (1977 GDP growth -1.3%, 1978 GDP growth -7.7%) and conservative backlash against the Westernizing and secularizing efforts of the Shah. The pro-Western semi-absolute monarchy was subsequently replaced by an anti-Western authoritarian theocracy. The Monarchist regime in Nepal transitioned to a democracy from 1991 to 2001, before reverting back and then transitioned to democracy once again in 2006.

Figure 10



Single party regimes have reduced in number significantly, particularly after the collapse of the Soviet Union and the subsequent transition to democracy for former Soviet Bloc countries and certain Soviet Union donor recipient countries in Africa. This saw single party regimes decline greatly in number from 36 in 1988 to 8 in 1994. With Mozambique and Iraq becoming multiparty regimes in 1995 and 2005 respectively, only 6 single party regimes remained in 2012 in China, Cuba, Iran, Laos, Libya, and Vietnam. Multiparty regimes saw the greatest increase after 1991

Multiparty regimes increased from 14 in 1990 to 27 in 1993, representing a midpoint for former Soviet Union countries and military regimes on their pathway to democratic transition, ending our time period at 29 in number. Multiparty regimes are present for example in Malaysia, Singapore, Russia, Tunisia, Egypt, Algeria, Albania and Sri Lanka to name a few.

Given the skew of results for countries that have democratised, even if they reversed, as shown below, we expect a military regime type to prove a significant factor for democratic transition relative to other regime types as both theoretical and econometric studies have shown.

Figure 11

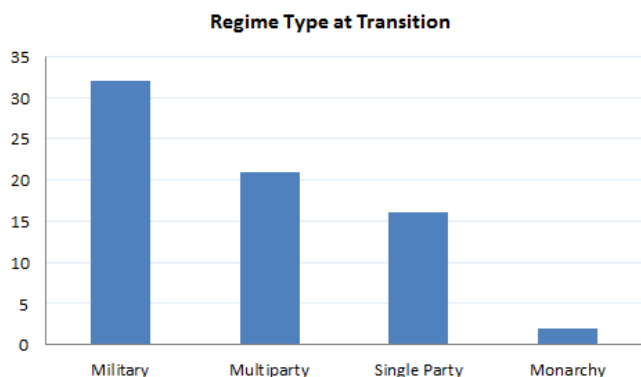
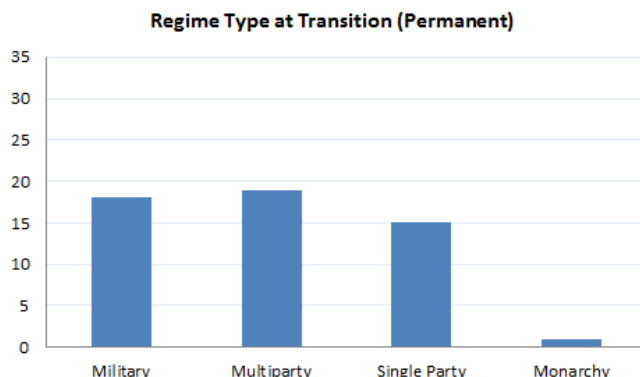


Figure 12



What the anecdotal and descriptive evidence suggest is that higher levels of education should result in the increased likelihood of democratic transition; furthermore than macroeconomic crisis through higher inflation and economic decline should also prove significant as countries have mostly democratised with higher levels of education and inflation and lower or negative growth rates. However, to establish this more firmly we wish to explore this in a multivariate framework.

6. Results

In this section we present the results of our econometric analysis using OLS, pooled, fixed and random effects logit frameworks. Table 1 below therefore presents 4 sets of estimates for democratic transition. As we highlighted previously there are several potential problems with OLS regression using a binary dependent variable. The assumption of homoscedasticity is violated as the variance of our dichotomous dependent variable is given by the probability of democratic transition both occurring and not occurring; as the probability will not be the same for all countries the variance will not be the same across cases. As a result the standard errors will be wrong and the hypothesis test incorrect. Furthermore, as the residuals can only take on two possible values, 0 or 1, the errors are not normally distributed. Lastly as OLS places no restriction on the estimated probabilities of event success i.e. democratic transition, such that the output can imply probabilities of success that are less than 0 or greater than 1, when probabilities can only range between 0 and 1. Ultimately the assumptions of linearity and additivity are unreasonable with a binary dependent variable calling into question the plausibility of the model and its coefficient estimates. This is why we employ a nonlinear specification through logistic regression which expresses $P(Y=1)$ as a nonlinear function of X with an S-shaped distribution such that $P(Y=1)$ approaches 0 and 1 at slower and slower rates as X gets smaller and larger. We nonetheless include the OLS regression output to highlight the notable difference that results from the pooled logit specification.

The use of fixed effects regression, as we explained in Chapter 1, is to control for unobserved country-specific heterogeneity which may be correlated with our regressors. In this context these fixed effects may include colonial heritage, previous incidences of student protest or military coups, inclusion in an IMF structural adjustment program (which may necessitate price rises), or internal regime factionalization which may influence the likelihood

of democratic transition, for example. Fixed effects regression therefore removes the problem of omitted variable bias at the cost that any characteristic which does not vary over each unit cannot be included in the model. We also perform random effects regression and will use the Hausman test to determine if the orthogonality conditions imposed by the random effects model are valid and that the unobserved country-specific heterogeneity should be parametrised as an additional random disturbance.

Firstly we must highlight the reason for the choice of our estimation equation and the variables therein. The inclusion of time and region controls made no material difference to the coefficients or significance of our independent variables across all specifications, except to render the lagged democratic contagion variable insignificant. In some respects this was to be expected as latter captures both a region and time element, as a dichotomous variable coded 1 if a neighbouring country underwent a democratic transition the preceding year. Aside from this, both region and time controls in any case were also insignificant. In this regard controlling for time and region did not alter the regression results. Furthermore, whilst including a regime type control was found to produce a significant and negative coefficient, this result was driven purely by the military regime type. By including all individual regime types (save the control, as democracy) none were significant. By including only one regime type at a time into the regression, only military produced a significant coefficient. We therefore proceed to only include the latter and not all regime types in the regression.

Table 1 OLS and Logit Models

		1	2	3	4	
Dependent	Independent	OLS	POOLED	FE	RE	
democracy	logeduc	0.01 (0.013)	1.40** (0.705)	0.86 (2.160)	1.42* (0.754)	
	loginflation	0.01* (0.006)	0.48** (0.206)	0.74 (0.455)	0.49** (0.225)	
	loggdppc	0.01* (0.006)	0 (0.287)	4.13 (2.591)	0.03 (0.320)	
	loggdpgrowth	-0.02** (0.007)	-0.69*** (0.228)	-0.96*** (0.338)	-0.70*** (0.235)	
	l.contagion	0.04* (0.017)	1.15** (0.516)	1.66** (0.748)	1.20** (0.543)	
	l.military	0.05*** (0.014)	2.10*** (0.604)	2.38 (1.513)	2.15*** (0.660)	
	logoilpop	-0.001*** (0.002)	-0.43*** (0.126)	-0.72* (0.397)	-0.43*** (0.132)	
	constant	-0.12* (0.05)	-8.72**** (2.383)		-9.14*** (2.830)	
	observations		764	764	185	764
	pseudo R-squared		0.07	0.26		
Standard errors in parentheses						
**** p<0.001, *** p<0.01, ** p<0.05, * p<0.1						

Taking a first look at the results across all four specifications in the table above we see that that OLS estimation produces similar coefficient signs and significances for some, but certainly not all our variables; the exception being those for education and income. The pooled logit results show a key difference here when the correct model specification based on a nonlinear distribution function is applied. Notably, for pooled logit in concert with the results from our first two chapters and our hypothesis, education exerts a positive and significant effect on the likelihood of democratic transition, whilst income is insignificant.

In order to confirm the robustness of this output we also present the results from fixed and random effect logit models. Here we find that the fixed effects estimation is inappropriate for our data as the cost of not being able to include time-variant characteristics in the model is too great. Fixed effects only uses information from changes within countries and disregards the information obtained from comparing across countries. As a result, the fixed effects model removes countries where our dependent variable does not change overtime, for example the 31 countries that did not experience a democratic transition during our timeframe, as well as removing all other independent variables which also might not change over time, such as regime type. 8 of our countries for example have been monarchies throughout our time period without undergoing a regime change. China, Cuba and Vietnam have also been single party regimes throughout the duration of our time period under analysis. We see that the sample size therefore for the fixed effects models is greatly reduced to 185 from 764. Furthermore we see that our key macroeconomic variables are insignificant, save for economic growth, and the military regime type which was strongly significant in the pooled logit specification is no longer an important determinant. As a result we proceed with random effects regression and perform the Hausman test to decide which of the two effects specification are accurate. The latter produces an insignificant result (0.583) so we cannot reject the null hypothesis that the unobserved individual level effects are uncorrelated with the other covariates and the time-invariant characteristics are an important inclusion in the model, implying that the random effects estimator is the most appropriate for our analysis.

We therefore present the log coefficient and log odd ratio results of the random effects logit model for the democratic transition and permanent democratic transition (no reversal in our time period) models in table 2 below.

Table 2 Random Effects Logit

		5	6			7	8
Dependent	Independent	RE	OR	Dependent	Independent	RE	OR
democracy	logeduc	1.42*	4.14*	permanent democracy	logeduc	2.15**	8.62**
		(0.754)	(3.12)			(0.9634)	(8.303)
	loginflation	0.49**	1.64**		loginflation	0.64***	1.90***
		(0.225)	(0.369)			(0.240)	(0.455)
	loggdpcc	0.03	1.03		loggdpcc	0.004	1.004
		(0.319)	(0.329)			(0.332)	(0.333)
	loggdpgrowth	-0.70***	0.50***		loggdpgrowth	-0.95****	0.39****
		(0.235)	(0.117)			(0.272)	(0.105)
	l.contagion	1.20**	3.31**		l.contagion	1.29**	3.63**
		(0.543)	(1.796)			(0.620)	(2.250)
	l.military	2.15***	8.61***		l.military	1.65**	5.18**
		(0.660)	(5.685)			(0.709)	(3.672)
	logoilpop	-0.43***	0.65***		logoilpop	-0.53***	0.59***
		(0.132)	(0.086)			(0.172)	(0.1010)
	constant	-9.14***			constant	-10.82****	
		(2.830)				(3.104)	
	observations	764	764		observations	764	764
Standard errors in parentheses				Standard errors in parentheses			
**** p<0.001, *** p<0.01, ** p<0.05, * p<0.1				**** p<0.001, *** p<0.01, ** p<0.05, * p<0.1			

As Table 2 shows above, where democratic transition is the dependent variable, the log coefficient for education is both strongly positive and significant (p-value: 0.06) at the 10% level. When displaying the results in log odds ratios, our model shows that for every 1 unit increase in this variable, the log odds of democratic transition occurring increase by a factor of 4. This is a strong result which is in accordance with our findings in Chapters 1 and 2, and the results of Sanborn and Thyne's (2013) analysis who also find that each of their education measures are also robustly associated with democratisation at the 10% level. Our detailed description the 73 democratic transitions in our dataset show that student-led movements and protests preceded and were instrumental to a large number of democratic transitions, in, but not limited to, Argentina, Greece, Turkey, Thailand, Ghana, Bolivia, Honduras, Uruguay, Sudan, the Philippines, South Korea, Mongolia, Benin, Mali, Central African Republic, Malawi, Peru, Ecuador, Bangladesh, Taiwan, Indonesia and Kyrgyzstan for example. The influence of student activism, and therefore increasing education, is overwhelming.

Our results are made more interesting by the fact that GDP per capita, as has been noted by other authors and suggested by our descriptive analysis, is insignificant. The log odds ratio of 1 indicates that democratic transition is as likely to occur at any level of income. This is an important result as the theoretical literature strongly advocates that rising income levels are an important determinant of democracy. From the standpoint of econometric studies however our results agree with those of Przeworski and Limongi (1997), Havard, Knutsen and Rod (2012) and Aidt, Albornoz and Gassebner (2012) under a comparable time period of reference. Taking into account Boix and Stokes' (2003) criticism of Przeworski and Limongi's (1997) study, arguing that their sample

is subject to selection problems and omitted variable bias by not controlling for the initial level of income, we find that in doing so for our study made no material difference to our results. Boix and Stokes (2003) study found GDP per capita to be significant on their 1850 to 1990 panel, however it is important to note that on such a long timeframe there are unable to include other key variables of interest (such as education) owing to data availability limitations.

Our results concur with Havard, Knutsen and Rod (2012), that the combination of a non-robust effect of GDP per capita and relatively robust effects of the education variables provide further indications that the type of economic transformation processes, rather than whether income increases in aggregate or not, is what matters for democratisation. Furthermore, our results agree with the one found in Chapter 1, that GDP per capita did not exert a significant effect on democracy once education was controlled for. We also noted in Chapter 1 and Chapter 2 that there is a strong endogenous relationship between income and education with requires careful consideration and analysis.

Inflation too is shown to be strongly significant (p-value 0.028), increasing the likelihood of democratic transition by 1.6 times for every 1 unit increase. Our detailed descriptions of the democratic transitions which have occurred between 1970 and 2012 (Appendix 1) show that inflationary pressures were oftentimes a source of grievance and cause of popular protest which resulted in democratic change, so we are not surprised by this result. As we highlighted in our econometric review, Hendrix, Haggard and Magaloni (2009) and Arezki and Brückner (2011) found that rising food prices significantly increased the incidence of anti-government protests and riots and political instability.

Similarly, GDP growth is found to be negative and highly significant (p-value 0.003) in our model, indicating that output contractions do indeed have an important impact on democratic transition. Increasing GDP growth by 1 unit decreases the likelihood of transition by half; the inverse therefore shows that decreasing GDP growth by 1 unit doubles the likelihood of transition. Economic decline was also found to be the cause of a number of democratic transitions over the last 40 years. Our result therefore agrees with that found by Burke and Leigh (2010) who found that autocratic change is more likely to occur after output contractions, and disagrees with those studies which found no significant effect on democratic transition (Przeworski and Limongi 1997, Gasiorowski 1995 Gleditsch and Choung 2004). Combining the results for inflation and economic decline therefore, our results show that macroeconomic crisis is a strong catalyst for democratic change.

Oil rents per capita reduced the log odds of transition by a factor of 0.65 as we expected (p-value 0.001). This means that a 1 unit increase in oil rents makes democratic transition almost 2/3rds less likely to occur. We highlighted previously that the inclusion of this variable in our analysis served both to control for the level of GDP per capita that results from natural resource utilisation, and thus is unaccounted for productive economic development, and also as a proxy for barriers against institutional and regime reform as mentioned in the studies of Beck and Laeven (2005) and Sonin (1999). Oil revenues enable governments to use low tax rates and patronage to relieve pressures for greater accountability; they increase funding for internal security; and they fail to bring about the social and cultural changes that accompany economic growth from productive sources that

tend to produce democratic government. Oil rich countries are also more able to pacify protesters seeking democratic change with generous social packages, such as our example of Saudi Arabia during the Arab Spring highlighted. We further note that the countries from our sample with the highest oil rents have not become democratic.

Our results also show that having a recently democratised neighbouring country increases the likelihood of democratic transition threefold (p-value 0.027). This pays credence to Huntington's (1991) theory that democratic transitions occur in waves and are subject to a contagion effect; also found to be significant in the studies of Gleditsch and Choung (2004) and Strand, Hegre, Gates and Dahl (2013). We have also seen from our review that the democratic transitions which have occurred over the past 40 years have been strongly influenced by the pro-democracy movements in other countries. As we highlighted the People Power Revolution of 1986 in the Philippines was a source of influence for South Korea's own pro-democracy movement in 1986/87 and the "8888" uprising in the Burma in 1988. The successful overthrow of the communist regime in certain Eastern European countries after the collapse of the Soviet Union galvanised movements elsewhere in the region to follow in their footsteps. The Hausman tests' finding that random effects rather than fixed regression was appropriate for our analysis further highlights that the unobserved country level effects are uncorrelated with, and independent of, the other covariates, showing that democratic transitions do not occur in isolation but are also a product of internal country and external world events which do not impact countries in the same way.

Lastly our results find that a military regime is also more than 8 times more likely to become democratic than other regime types (p-value 0.001). This result strongly concurs with Geddes's (2009) survey of the literature, which notes that military regimes are more easily destabilised by poor economic performance and can result in more orderly negotiated transitions to democracy as the military elite, fearing factionalization amongst themselves, make the first moves toward political liberalisation. We saw that this was apparent in Turkey, Pakistan Guatemala and Ecuador for example. Our descriptive statistics section showed that in our time frame the number of military regimes has reduced significantly from 28 in 1970 to 6 in 2012. Geddes (2009) finds contrarily that one-party authoritarian regimes are likely to survive longer, through first allowing some participation by moderate opponents and then at the last will prefer democracy over another authoritarian regime which would exclude them. And indeed our sample shows that multiparty regimes increased in number from 17 in 1970 to 29 in 2012. As a result we are not surprised by the strong significance of the military regime variable in our regression.

The results for the permanent democratic transition model are especially instructive. The significance of our education variable increases from a p-value of 0.06 to 0.025 and now increases the log odds of democratic transition by a factor of more than 8 for every 1 unit increase. This is double the effect shown for the previous model. This result highlights that education is highly important not just for democratic transition but especially for sustaining democratic transition.

Our macroeconomic crisis variables are also much more important for permanent democratic transition; the log odds and significance for inflation and output contraction have increased notably. Whilst the significance and log coefficient for military regimes has reduced, with a p-value of 0.002, though it still increases the odds of

democratic transition by 5 times compared to other regime types. Oil rents per capita maintain a similar level of significance (p-value 0.002) and reduce the odds of democratic transition by almost 2/3rds. Democratic contagion remains as important for temporary and permanent democratic transition and GDP per capita remains insignificant.

It is also important to highlight the baseline probability of democratic transition shown by the constant in the random effects logit models in table 2. For democratic transition, the likelihood of transition is negative and significant at the 1% level when the independent variables are held constant. For permanent democratic transition the log coefficient is larger and more significant. This tells us that in the absence of any change in our dependent variables, democratic transition is significantly unlikely to occur, and indeed is less likely to occur. We surmise this is as result of regime duration whereby with each proceeding year the stronghold of the autocratic regime becomes more entrenched. Ultimately without change taking place, such as a macroeconomic crisis, to serve as a catalyst, democratic transition will simply not magically occur. Fundamentally this result highlights that an educated society is not enough on its own to bring about democratic transition which answers a key question in the education-democracy literature, notably, why some educated countries are not democratic if education positively influences democracy; that it may just be a matter of time until a catalytic event occurs.

What we can take from our results is that whilst education is the strongest and most important factor to bring about democratic change, change will not occur in a vacuum. Macroeconomic crisis is a key, and in our view, a catalytic determinant of democratic transition, and further, that transition is most likely to occur under a military regime type, which is most vulnerable to macroeconomic crisis.

We now proceed to perform robustness checks using alternative measures of inflation, GDP per capita and GDP growth. Table 3 below shows the regression output when using the WDI measures of GDP per capita and GDP growth. We see that the results are almost identical to Table 2 when using the ERS equivalent data.

Table 3 Income and Growth Robustness Checks

		9	10			11	12
Dependent	Independent	RE	OR	Dependent	Independent	RE	OR
democracy	logeduc	1.42*	4.12*	permanent democracy	logeduc	2.16**	8.69**
		(0.756)	(3.112)			(1.007)	(8.754)
	loginflation	0.39**	1.48**		loginflation	0.57***	1.76***
		(0.202)	(0.297)			(0.232)	(0.408)
	logwdipc	0.20	1.22		logwdipc	0.01	1.01
		(0.312)	(0.38)			(0.342)	(0.345)
	logwdigrowth	-0.70***	0.50***		logwdigrowth	-0.56**	0.502**
		(0.223)	(0.110)			(0.282)	(0.161)
	l.contagion	1.22**	3.40***		l.contagion	1.622***	5.06***
		(0.519)	(1.761)			0.624	3.160
lmilitary	2.20***	9.02***	lmilitary	1.52**	4.57**		
	(0.654)	(5.90)		(0.714)	(3.264)		
logoilpop	-0.34***	0.71***	logoilpop	-0.31**	0.73**		
	-0.125	(0.089)		-0.160	(0.118)		
constant	-9.84****		constant	-10.41****			
	(2.483)			(2.94)			
observations		724	724	observations		724	724
Standard errors in parentheses				Standard errors in parentheses			
**** p<0.001, *** p<0.01, ** p<0.05, * p<0.1				**** p<0.001, *** p<0.01, ** p<0.05, * p<0.1			

When democracy is the dependent variable (Table 4, columns 9 and 10) all of our variables maintain the same level of significance and both the coefficients and the size of the standard errors are incredibly similar to those in Table 2, columns 5 and 6. There are 40 less observations and only the magnitude of the effect of inflation and the oil rents per capita variables are a touch smaller. When permanent democracy is the dependent variable, the same similarity holds except that the significance of economic growth has reduced from the 0% level to 5% and the coefficient has increased by over a third (from -0.95 in Table 2, column 7, to -0.56 in Table 4, column 11). As a result increasing GDP growth by 1 unit decreased the likelihood of transition by almost two-thirds according to the log odds-ratio with the ERS growth measure (Table 2, column 8) but with the WDI measure it decreases the likelihood by half (Table 4, column 12). However as the results are remarkably similar whether we use the ERS or WDI GDP per capita and GDP growth measures we conclude that our results are robust and will continue to use the ERS data for our additional robustness tests.

In Table 4 below we trial the use of alternative measures of inflation; IMF inflation, WDI inflation and the Penn World Tables GDP deflator.

Table 4 Inflation Robustness Checks: Democracy

Dependent	Independent	13	14	15	16	17	18	19	20
		RE	OR	RE	OR	RE	OR	RE	OR
democracy	logeduc	1.42*	4.14*	2.00**	7.43**	2.27**	9.71**	2.40**	11.053**
		(0.754)	(3.12)	(1.012)	(7.516)	(1.076)	(10.447)	(1.062)	(11.734)
	loginflation	0.49**	1.64**						
		(0.225)	(0.369)						
	logimfinflation			0.09	1.090				
				(0.254)	(0.276)				
	logwdiinflation					0.060	1.062		
						(0.262)	(0.278)		
	logpenndeflator							-0.04	0.96
								(0.211)	(0.203)
	loggdpcc	0.03	1.03	0.42	1.52	0.45	1.57	0.35	1.42
		(0.319)	(0.329)	(0.442)	(0.671)	(0.454)	(0.713)	(0.406)	(0.575)
	loggdpgrowth	-0.70***	0.50***	-0.74***	0.48***	-0.69**	0.50**	-0.81***	0.44***
		(0.235)	(0.117)	(0.272)	(0.13)	(0.280)	(0.141)	(0.264)	(0.117)
	l.contagion	1.20**	3.31**	1.419**	4.13**	1.71***	5.53***	1.45**	4.28***
		(0.543)	(1.796)	(0.583)	(2.408)	(0.599)	(5.526)	(0.575)	(2.46)
	lmilitary	2.15***	8.61***	2.865***	17.55***	3.08***	21.82***	2.98***	19.63***
		(0.660)	(5.685)	(0.895)	(15.709)	(0.936)	(20.419)	(0.853)	(16.744)
	logoilpop	-0.43***	0.65***	-0.55***	0.58***	-0.55***	0.58***	-0.53***	0.59***
		(0.132)	(0.086)	(0.161)	(0.093)	(0.165)	(0.095)	(0.166)	(0.098)
	constant	-9.14***		-13.26***		-14.14***		-13.15***	
		(2.830)		(4.122)		(4.316)		(4.422)	
	observations	764	764	676	676	657	657	662	662

Standard errors in parentheses
 **** p<0.001, *** p<0.01, ** p<0.05, * p<0.1

When comparing the regression output using our original ERS inflation data (columns 13 and 14) against those containing the IMF (columns 15 and 16) and WDI (columns 17 and 18) inflation measures and then the Penn GDP deflator (columns 19 and 20), we see that the latter three models contain roughly 100 fewer observations. This is because these alternative inflation measures lack data for many countries in Eastern Europe, Latin America and Africa prior to and at the time of their democratic transitions which the ERS dataset contains. In comparing the inflation data across sources at the time of transition (see Appendix 2) we see many similarities but also some marked differences, which Deaton and Heston (2010) explained is possible even when sources use the same underlying ICP price data.

Most importantly, unlike the ERS inflation data (significant at the 5% level), all three alternative inflation measures are insignificant. The significance is instead attributed to education and across all alternative models the coefficient on education is larger and significant at the 5% level instead of the 10% level. The standard errors on the education variable using the IMF, WDI and Penn data however are larger, and much more so when using the log-odds ratios where the standard errors are approximately 2 times, 3 times and 4 times larger than in the ERS

inflation model respectively. The log coefficient and log odd ratios for the military regime dummy variable are also larger in the regression outputs using the alternative inflation measures; in terms of the odds ratio they border on incredible levels. We see that the odds of a country switching from a nondemocratic to a democratic regime are around 20 times higher for a military regime. This compares to 8.6 times higher when using the ERS inflation data. One final point of note is that whilst insignificant, the IMF and WDI inflation measures have positive coefficients, albeit close to zero, whilst the Penn GDP deflator is insignificant with a negative sign, though still very close to zero. Other than these differences highlighted, such as the insignificance of inflation and larger and more significant coefficients for education, the regression output across all four models with different inflation sources remains largely the same. The odds of a country becoming democratic are positively and significantly linked to education and output contraction, particularly under military regimes and for countries whose neighbours have recently become democratic, and negatively and significantly related to natural resource endowment.

When permanent democracy is the dependent variable in Table 5 below, all three alternative inflation measures remain insignificant, whilst our original ERS inflation measure was found to be significant at the 1% level. Once again the education coefficients absorb this significance and across the IMF and Penn models, education is significant at the 1% level compared to the 5% level for the ERS and WDI inflation measures. Though for all three alternative inflation models, the coefficient on education is much larger and, in terms of the odds ratios, reach implausible magnitudes. Increasing education by 1 unit increases the likelihood of transition by almost 43 times, 74 times and 51 times for the IMF, WDI and Penn inflation models respectively compared to the original 8.6 times when using the ERS inflation data. The standard errors for the education coefficient are once again very, very large for the three alternative inflation models compared to ERS in terms of the odds-ratios.

What appears to be the likely cause of the disparate results for inflation between the ERS dataset and the IMF, WDI and Penn, is that the ERS contains a much larger number of observations, specifically for high inflation countries that transitioned to democracy. In the absence of this data for the other inflation measures, inflation is found to be insignificant and the education coefficient is biased upwards with much larger standard errors, resulting in odds-ratios of truly questionable magnitudes.

As a result we are happy to use the ERS inflation dataset and maintain our conclusion that rising inflation levels yield a positive and significant effect on democratic transition through greater incidence of anti-government demonstrations, as other econometric studies have found using food price indices (Arezki and Brückner, 2011 and Hendrix, Haggard and Magaloni, 2009). Our description of the democratic transitions which have occurred over the last 40 years (Appendix 1) highlight that rising inflation, either as a result of the 1973 oil price shock or IMF structural adjustment programmes, were a leading cause of popular protests which ultimately toppled authoritarian regimes in countries as diverse as Thailand, Sudan, Argentina and Ghana for example.

Table 5 Inflation Robustness Check: Permanent Democracy

Dependent	Independent	21	22	23	24	25	26	27	28
		RE	OR	RE	OR	RE	OR	RE	OR
permanent democracy	logeduc	2.15**	8.62**	3.76***	42.98***	4.31**	74.10**	3.94***	51.22***
		(0.9634)	(8.303)	(1.360)	(58.467)	(2.034)	(150.733)	(1.42)	(72.709)
	loginflation	0.64***	1.90***						
		(0.240)	(0.455)						
	logimfinflation			0.165	1.179				
				(0.279)	(0.329)				
	logwdiinflation					0.11	1.110		
						(0.297)	(0.330)		
	logpenndeflator							-0.047	0.954
								(0.216)	(0.206)
	loggdppc	0.004	1.004	0.28	1.32	0.37	1.45	0.51	1.67
		(0.332)	(0.333)	(0.436)	(0.576)	(0.553)	(0.803)	(0.432)	(0.723)
	logdpgrowth	-0.95***	0.39***	-1.1***	0.33***	-1.04***	0.355***	-1.16***	0.31***
		(0.272)	(0.105)	(0.311)	(0.104)	(0.375)	(0.133)	(0.316)	(0.099)
l.contagion	1.29**	3.63**	1.70**	5.46**	2.107***	8.227***	1.62**	5.04**	
	(0.620)	(2.250)	(0.662)	(3.616)	(0.733)	(6.033)	(0.652)	(3.288)	
l.military	1.65**	5.18**	2.50***	12.14***	2.875**	17.72**	2.86***	17.55***	
	(0.709)	(3.672)	(0.889)	(10.789)	(1.435)	(25.43)	(0.891)	(15.628)	
logoilpop	-0.53***	0.59***	-0.73***	0.48***	-0.74***	0.48***	-0.74***	0.48***	
	(0.172)	(0.1010)	(0.204)	(0.098)	(0.267)	(0.128)	0.208	(0.100)	
constant	-10.82***		-16.00***		-17.95**		-18.03***		
	(3.104)		(4.393)		(7.848)		(5.209)		
observations	764	764	676	676	657	657	662	662	

Standard errors in parentheses
 **** p<0.001, *** p<0.01, ** p<0.05, * p<0.1

We do acknowledge however that inflation is not a particularly straightforward macroeconomic variable as high inflation levels may be endogenous (resulting from economic mismanagement) or exogenous (caused by an oil/commodity price shock) or both (in terms of overnight price rises caused by the removal of subsidies that IMF structural programmes necessitated) and netting out the cause of inflation for any particular country at any point in time is not easy on a large cross-country dataset and it may be the case that one particular type of inflation is associated with democratic transition more than the others. Furthermore, as Deaton and Heston (2010) explain, inflation data can contain inherent measurement error and biases, and complications arise when the International Comparison Program (ICP) data, used to calculate price index numbers or purchasing power parities, is used in different ways by commonly used sources (such as the WDI and Penn World Tables) to give different estimates (and indeed when different baselines are used or sources implement revisions). As a result the study of inflation, and its inclusion in cross-country macroeconomic regressions, is an important and complex topic and one that future research should address urgently.

7. Conclusion

This study sought to contribute to the existing education-democracy literature by investigating the concomitant impact of education and macroeconomic crisis (economic recession and inflation) on the probability of democratic transition, which other studies have either failed to investigate fully or have used an inferior measure of education. In doing so we provided a rich contextual analysis of the democratic transitions which have occurred over the last 40 years drawing especially upon the important role played by students in pro-democracy movements; from the Athens Polytechnic Uprising in 1973 which led to an open anti-military junta revolt in Greece, to the 1990 Wild Lilly Student movement in Taiwan for example, and more recently the Tulip Revolution in 2005 in Kyrgyzstan which served as a precursor to their 2010 democratic transition. Students played a large role in number of transitions in Latin America in the 1980s and 1990s and the democratisation of Eastern Europe after the collapse of the Soviet Union. University students were also the leading instigators of pro-democracy movements in Mali, Benin, Malawi and the Central African Republic in the early 1990s, countries deemed by most measures to have low levels of income and education. We also used a panel of 103 countries for the period 1970-2012 and produced a dataset that is one of the most balanced and up-to-date relative to other studies.

Our key motivation was to answer an important question in the education-democracy literature, namely if education exerts a significant effect on democracy why are educated societies not democratic? Our random effects logistic regression model finds that the odds of democratic transition are greatly increased by higher levels of education as we would expect, but also that inflation, as well as an output contraction and/or low levels of economic growth also exert a strongly significant impact. Our analysis of the democratic transitions which have occurred since 1970 showed that inflationary pressures and economic decline were oftentimes a source of grievance and cause of popular protest which resulted in democratic change, with students largely at the forefront of those demonstrations. Our results also show that the presence of democratic transition occurring in a neighbouring country exerts a positive and significant effect, exactly as Huntington (1991) theorised by his assertion that democracy occurs in waves. Protest movements against incumbent regimes are galvanised by uprisings occurring nearby as we found for the Philippines and the countries in Eastern Europe and Latin America for example.

What is most instructive from our results, is that we uncover the answer to the key question of this thesis. If education leads to democracy, as we found in Chapter 1 using SYS GMM analysis, and shocks to education result in increasing democracy, as we found in Chapter 2 using SVAR analysis, why are educated countries not democratic? Our overview of the reasons which led to democratic transition for the countries in our dataset, coupled with our logistic regression results, show that it may only be a matter of time until a catalytic event galvanises educated societies to take up popular protest. Macroeconomic crisis, through economic decline and high inflation alongside democratic contagion and exacerbated by regime type, serve as a catalyst for an educated society to bring about democratic change.

Conclusion

This thesis sought to contribute to the existing political and economic literature on the relationship between education and democracy through a series of econometric studies. We have used the Blundell-Bond System-GMM estimator on panel data, pioneered the use of Structural Vector Autoregression analysis on a single time series, and used logistic regression on one of the most balanced and up-to-date cross-country panels. In doing so the scope of our study has ranged from the depth and richness of detail afforded by a case-study approach to the breadth of multi-country analysis; from 1890s France to 2010 Kyrgyzstan, whilst providing a detailed set of examples of country-specific democratic transitions which have occurred over the last forty years. The results of our long run, short run, linear, and nonlinear studies have consistently found that education not only exerts a positive and significant effect on democracy, but that education is the strongest predictor of permanent transitions to democracy.

As we have articulated, education serves to deliver democracy through two key transmission mechanisms. The first is through voter turnout and voter preferences, the second is through student activism. For the former, theoretical and empirical studies confirm that the level of education strongly predicts mass endorsement of democratic procedures as well as rejection of non-democratic alternatives (Chong and Gradstein 2009, Evans and Rose 2012, Botero et al 2012). Education is influential in shaping political engagement by teaching people how to understand politics, identify political preferences and pursue political interests. A wealth of evidence confirms that people with higher educational attainment participate more fully in political activities (Campante and Chor, 2011), and Putnam (2001) claims that "education is by far the strongest correlate that I have discovered of civic engagement in all its forms".

The second transmission mechanism is through student activism. Van Dyke (1998) explains that university students are the population most likely to protest because they are biographically available and free from many of the constraints imposed by full time careers and family commitments. University students are also at a stage in their life when they are developing their belief systems, and are most open to consciousness raising and ideological appeals. Lipset (1972) concurs that "the student population is the most volatile and most easily mobilizable of all social strata" (p195). The motivations for student activism are complex. Altbach (1998) explains that 'generational revolt' plays a key role as students' propensity to 'anti-regime' attitudes because of the nature of the campus culture, youthful idealism and the like. However, political events or key political issues appear to be the main factor which galvanises large-scale student movements into action e.g. protests against war or lack of civil rights and liberties, or economic and social concerns as students worry about future employment opportunities and about their role in society after graduation. Indeed Davis (1962) and Huntington (1968) explain that higher education in modernising countries may lead to unemployment as labour markets are unable to accommodate this large group of skilled workers. The resulting unmet aspirations may lead to political instability and violence. This particular tenet was witnessed throughout the 'Arab Spring' in 2011, as it was the educated, largely unemployed (and frustrated) stratum of society who initiated the protests in similarly styled uprisings to the democratisation processes of South Korea and Taiwan decades previous. In this regard, the influence of education on democracy is convincing. Indeed, education determines the effectiveness of political participation, even in democratic societies (Lauglo and Øia 2007). Since 2010 a wave of anti-austerity protests have occurred throughout Europe in response to deteriorating economic conditions, rising unemployment (especially youth unemployment) and government

spending cuts, with large student-led movements and popular protests occurring in Italy, Spain, Portugal and Greece for example, with a resulting impact on the political landscape. Voters in Greece have already engendered regime change by electing far left anti-austerity party Syriza; and in Portugal, the fiscally conservative parties of Portugal's centre-right coalition government are already losing ground in the polls for their October 2015 election to the anti-austerity opposition Socialists. At the Spanish elections in December 2015, we may see the incumbent centre-right government too replaced by the Socialist party. This highlights that macroeconomic crisis in educated societies serves as source of grievance and popular protest, even in democratic countries, which can result in political change.

We began our study by firstly examining the two-way endogenous relationship between education and democracy and indeed the tripartite relationship with income. As we explained, their relationship is not straightforward, either empirically or conceptually as, whilst education has been found to exert a positive and significant effect on democracy, the political institutions and policies that emerge in democracies themselves serve to deliver education. It would seem to be a virtuous circle that is further complicated by income; as higher income countries with a more educated workforce and democratic, high quality institutions can continue to provide the necessary institutional framework to generate human capital and likewise the human capital to generate high quality, democratic institutional arrangements.

In this regard we sought to net out the endogenous effects of income, to question if democratic institutions produce, or are produced by, education? In which direction is causation stronger and more significant? Exploring static pooled OLS and effects models, as well as static and dynamic System GMM models that allowed us to control for the endogenous effects on a panel of 144 countries over the years 1970 to 2005, we found evidence that democratic political institutions and education exert positive and significant effects on one another. These results are contrary to the findings of notable economists, including Glaeser et al (2004), Acemoglu et al (2005) and Murtin and Wacziarg (2014) who found no effect of democratic institutions on the growth in education. Our key finding is that education, over and above income, exerts a stronger but equally significant effect on the formation of democratic political institutions than the reverse. Causation is stronger from education to democracy than from democracy to education. Our findings from this chapter indicate that countries are therefore best advised to invest in education, in the first instance to generate economic development, and achieve democratic institutional outcomes as a result, rather than prioritising democratic reform first.

Our second chapter extended the analysis of the education-democracy relationship beyond the existing econometric literature's use of the Blundell-Bond System-GMM estimator, to pioneer the use of Structural Vector Autoregression in this field. In doing so we concentrated our investigation on a single country, namely France on an annual time series between 1896 and 1994. The utility of these models lie primarily in a function of the SVAR coefficients, namely the structural impulse response function (SIRF) as a moving-average representation of the system. The SIRF shows how democracy responds to an unexpected structural shock in education; how quickly democracy responds, for how many periods the resulting effect may be significant for and how quickly the effect may dissipate, if at all. This is quite different to the regression analysis that has already been undertaken, which models the linear relationship between democracy and education over time. SIRFs can provide a much richer understanding of the education-democracy relationship, both over short and longer time periods. The use of a SVAR model in our study is also motivated by economic theory and our articulation of the recursive nature of the

education-democracy relationship in France; that democracy had no contemporaneous effect on education, but that education affected democracy contemporaneously, a factor which GMM and VAR models, by extension of the econometrics, cannot address. Through our case-study approach which detailed the evolution of education and political change over our time period, we found that the dramatic increase in the average years of education in France during the 1950's and 1960's was on account of the marked increase in the post-war birth rate and the resulting policy action of educational reforms that opened up access to secondary and higher education. Similarly the decline in democracy between 1958 and 1969 was a result of changing from a parliamentary to a presidential system, with a much stronger executive. Our SVAR analysis enabled us to investigate if the education shock and the resulting student protests of 1968 (largely attributed to anxiety over unemployment) had a significant role to play in progressing democracy in France during this time frame. Indeed our results found that the cumulative effect of a 1% shock in education resulted in a 1.08% increase in democracy in the short run. Furthermore, the structural impulse response function highlights that the effect is significant after the 1st year until the 16th year following the shock. On the basis of our case study we find therefore that shocks to education too exert a positive and significant effect on democracy.

The results of our first two chapters however brought us to an interesting juncture. If education and shocks to education exert positive and significant effects on democracy, we were left wondering why some highly educated countries are not democratic. What is the missing link or catalyst required for democratic transition to occur?

In our third chapter therefore we turned to the more recent democracy literature, which has begun to view democratic transition as a result of actions and not just of economic conditions such as rising income levels but to the dynamics of political regimes, the role of external actors, neighbourhood effects, economic decline and idiosyncratic factors specific to each country. The econometric literature in this field has largely focused on the role of macroeconomic crisis on democratic transition, or separately of education and democratic transition, with few studies investigating both. We used logistic regression analysis on a panel of 103 countries over the years 1970 to 2012 to investigate the relationship between education, regime type, macroeconomic crisis and democracy. Our results found that the odds of switching from a non-democratic to a democratic regime is positively and significantly linked to the level of education and inflation, whilst negatively and significantly related to economic growth. Macroeconomic crisis therefore, in terms of high inflation and economic decline as the inverse of economic growth, serves as a catalyst for educated societies to bring about democratic change, particularly when the incumbent regime is military in nature. Furthermore, the presence of democratic transition occurring in a neighbouring country exerts a positive and significant effect, exactly as Huntington (1991) theorised by his assertion that democracy occurs in waves. Student protest movements against incumbent regimes are galvanised by uprisings occurring nearby as we found for the Philippines and the countries in Eastern Europe and Latin America for example. What is most instructive from our results however is that we uncover the answer to the key question of this thesis: If education leads to democracy, as we found in Chapter 1 using SYS GMM analysis, and shocks to education result in increasing democracy, as we found in Chapter 2 using SVAR analysis, why are educated countries not democratic? The answer, we believe, is that some educated countries are not *yet* democratic, but they likely will be in time provided that educational attainment continues to increase and a catalytic event occurs. Our study focused on macroeconomic crisis which engenders popular protests and collective action, which alongside internal regime factionalization and reformist elites ready to take advantage of the political opportunities offered by the protests,

can enable regime change to occur. In other words, when we observe non-democratic but highly educated countries it is a macroeconomic crisis which is catalytically important to bring about democratic change. We found that for permanent democratic transitions (for example, having no subsequent reversal during our time period of investigation) education has the largest log odds coefficient of all of our independent variables and therefore exerts the strongest impact on democracy.

There are a number of ways in which we could improve upon the analysis of our three chapters, or indeed the baton could be passed so that further study by other researchers could expand upon our analysis. Our first chapter used the average years of education from the Barro and Lee 2010 dataset, in its original form, namely 5-year intervals, whilst in our third chapter we used this variable once more but interpolated between the intervals to produce an annual dataset. Furthermore we used the inflation variable from the World Bank World Development Indicators 2010 dataset, whilst in our third chapter we used the inflation variable from the United States Department of Agriculture Economic Research Service's (ERS) international macroeconomic dataset. The latter uses consumer price indices from the IMF International Financial Statistics database and ERS regional aggregations and estimations to produce the most balanced and complete inflation dataset available. As a result our first chapter could be brought further up to date, to 2012 from 2005 and the regressions re-run to assess if or how the results change on a more complete dataset, particularly as it would take into account the additional democratic changes that have taken place in countries since 2005. In addition, our study in Chapter 1 may benefit from categorising the Polity IV scores into their respective regimes, for example autocracies, partial democracies, and full democracies and running the System-GMM regressions on them individually to see how the coefficients for education and democracy change for each category. The recent democracy literature has placed more emphasis on investigating the changes that take place for these partial democracy regime types. Our third chapter also used a binomial regime classification for democracy however this analysis too could be furthered by investigating how the results change when using a trinomial classification as Gasioworksi (1995) and Epstein et al (2006) used in their respective logit and tobit models.

Indeed, partial democracies are especially interesting in the study of the education-democracy relationship and particularly in answering the question, why are some educated societies not *yet* democratic? A key example is that of Hong Kong (coded "Partially Free" by the Freedom House political dataset; Polity IV does not have a code for it). According to Barro and Lee (2010), the average years of educational attainment in Hong Kong was 11.02 (for the population aged +25 and over) in 2010, higher than democratic Taiwan (10.71), France (10.64 years) and Austria (9.89 years) and only 0.8 years less than New Zealand. According to the IMF, Hong Kong also had the 8th highest GDP per capita in 2012, ranking higher than most developed and democratic countries with the exception of the United States, Norway and Luxembourg. Given Hong Kong's wealth and high levels of education we would expect the country to be democratic as the modernisation theorists propose, and indeed commentators would argue that Hong Kong is surprisingly 'stuck' in partial democracy. However in September 2014 a student-led occupation movement began against China's Standing Committee of the National People's Congress (NPCSC) decision to continue to pre-elect several political candidates through its 1200-member nominating committee prior to public vote and disallow electoral reform in Hong Kong for 'one person one vote'. Whilst the movement raged on for months and appears to have been unsuccessful, the student-protests mirrored the events in Taiwan in 1990,

before it gained electoral independence from China in 1996 and became a democracy. It may very well be just a matter of time before a student movement in Hong Kong becomes a popular protest for electoral reform and as Altbach (1998) explains, the success of a student movement should not be judged on its direct impact but on its subsequent aftereffects, even if they occur years later.

Whilst our second chapter pioneered the use of Structural Vector Autoregression analysis in the education-democracy literature on a single time series this analysis could be extended to a panel SVAR context. We were able to use the average years of education variable from The Centre d'Etudes Prospectives et d'Informations Internationales (CEPII) which is in annual format from 1896 to 1994 and provided a rich set of data from which to undertake meaningful case-study style analysis. Most education datasets for large numbers of countries however, such as Barro and Lee (2010) provide data from 1950, which would still afford 60 years of data in 5-years intervals from which we could interpolate to form an annual series (as we did in Chapter 3) and investigate if shocks to education produce the same positive and significant effects on democracy across countries.

Lastly, whilst this thesis provided a coherent story on the relationship between education and democracy which built upon itself chapter by chapter, to find that education exerts a stronger effect on democracy than the reverse, that shocks to education produce positive and significant effects on democracy for several years after and that macroeconomic crisis, through output contraction and inflation, exacerbated by regime type, serves as a catalyst for educated societies to bring about democratic change, we ponder how many more democratic transitions will occur in years to come. As of 2012, 50 of the 103 countries we analysed in our third chapter had not transitioned to democracy, 7 of which are petrostate monarchies, 6 are military regimes, 29 are multiparty regimes, and 6 are single party regimes.

Of the military regimes, as theoretical and econometric studies have indicated that these are the most fragile and likely to transition to democracy, Fiji may be closest to making a change. In September 2014 Fijians went to the polls for the first time since the 2006 coup which ousted the elected multiparty (not democratic) regime and brought international condemnation, sanctions from Australia and New Zealand and the suspension of Fiji from the Commonwealth group of nations. Whilst the incumbent Prime Minister Bainimarama was re-elected (and the Commonwealth re-instated Fiji as a full member) the election was endorsed by some international observers as credible. The elections mark an important step, but it remains to be seen if democracy, last present in Fiji in 1986, will emerge, though it is important to note that Fiji had a higher level of average years of education in 2010 (at 9.96 years) than long standing democracies Italy (9.63 years), Finland (9.84 years) and Portugal (7.42 years). As we highlighted in the introduction to this thesis, the events of 2014 have shown that the study of the education-democracy relationship remains one of the most important and relevant of the social science literature.

Appendix 1:

Democratic Transitions 1970-2012

For Argentina in 1973, democratic elections, which ended 6 years of military dictatorship, occurred against a backdrop of increasing violence and protests, most notably the 1969 “Rosario” university student protests and the “Cordobazo” civil uprisings of students and workers protesting against social injustice and economic decline, further fuelled by regime change in Chile and Uruguay. However the death of newly elected President Peron in 1974 saw the administration undermined by interparty struggles, terrorism from paramilitary groups and economic crisis (particularly following the 1973 oil shock and rocketing inflation; to 444% in 1976) such that a military junta seized power in 1976. Argentina did not return to civilian rule until 1983, the year after the Falklands War.

In Turkey, Nye (1977) explains it was the military that intervened in 1971 to impose a nonpartisan coalition government to put an end to worker strikes, student demonstrations, and parliamentary gridlock over reform measures and guerrilla terrorism that had beset the country, resulting in the 1973 presidential election. Continued social unrest and political instability however resulted in a military coup in 1980.

In Pakistan, it was the defeat in the Bangladesh Liberation War of 1971 with India’s intervention that saw power handed to the Pakistan’s Peoples Party (PPP) and its first civilian President Bhutto elected, with the 1973 constitution being drafted. Shafqat (1998) notes however that Bhutto sought to establish political dominance over state institutions (i.e., military and bureaucracy) which brought a new sense of confidence to political parties and their leaders. Bhutto’s authoritarian propensities saw freedom of the judiciary, press and religion restricted through a series of constitutional amendments and opposition parties grew equally hostile and confrontational. Shafqat (1998) notes that accusations from the right wing Pakistan National Alliance (PNA) of election rigging by the PPP in the 1977 election results led to mass violent demonstrations and resulted in the military intervening in the fragile quasi-democratic set up. The military coup by General Zia imposed a period of martial law that lasted until his death in 1988, where after Hoffman (2011) notes that a political power vacuum saw Pakistan’s military leaders permit democratisation until the country once again slipped back into military-led authoritarianism in 1999 with General Pervez Musharraf’s coup. It would be 2008 before Pakistan was deemed a democracy once more.

There were also permanent democratic transitions in the 1970s. In Greece, in 1975, following the Athens Polytechnic Uprising in 1973 which led to an open anti-military junta revolt (Kassimeris 2005) and combined with the invasion of Cyprus by Turkey in 1974 triggered a series of events that ushered in the restoration of parliamentary democracy following legislative elections in 1974. Portugal’s (1976) transition had its roots in economic decline, exacerbated by the 1973 oil price shock, and led to the Carnation Revolution in 1974 with legislative elections held in 1975. In Spain (1977) the democratic process was prompted by the death of Franco (in 1975), who had designated Prince Juan Carlos, grandson of Spain’s former king as his official successor. Both Spain and Portugal had the support of the newly formed European Economic Community (EEC) (1973) and the United States. Greece applied to join the Community in 1975 (joining in 1981) and Spain and Portugal in 1977 following their restorations to democracy, joining together in 1986. Indeed it was the diplomatic influence of the

EEC, through criticism of the military regime and its human rights abuses in Turkey, which aided Turkey's transition to democracy in 1983 (Ahmad 1985, Dagi 1996). Turkey applied for EEC membership in 1987. Though the European Commission confirmed in 1989 Turkey's eventual membership, the process has been stalled by domestic and external problems, notably Turkey's poor relations with Greece and the conflict in Cyprus and most recently Turkey's widely criticised crackdown on mass demonstrations in June 2013 which led to Germany blocking the start to new EU accession talks.

In Thailand (1975) democratic transition occurred following the 1973 revolution; student-led protests which grew into a popular uprising and democratic movement against the backdrop of increasing inflation from the 1973 oil shock (24% in 1975 from 5% in 1972) resulted in the end of the ruling military dictatorship (Prokati 2009). However, Thailand had not yet produced a political class able to make this bold new democracy function smoothly, with 1975 and 1976 elections failing to produce a stable party majority and with neighbouring South Vietnam, Laos and Cambodia falling to communist forces in 1975, it led to panic and anti-left sentiment, particularly against students. The Thammasat University Massacre of 6th October 1976, wherein more than 100 students protesting against the return to Thailand of their former military dictator Thanom, ousted in 1973, were killed, preceded a military junta seizing power. Thailand would not return to democratic rule until 1992.

In 1978 and 1979, the Dominican Republic and Ecuador (later reversed) transitioned to democracy marking the firsts in the wave of Latin American transitions that occurred through the 1980s and 1990s. Both military regimes had been economic modernisers and both transitions were aided by increasing diplomatic pressure from the US. In the Dominican Republic, following the assassination of their dictator Trujillo of 30 years in 1961, efforts to establish democracy were thwarted by a succession of coups, civil war and American military intervention in 1965 amid concerns of a communist takeover (particularly given the Cuban revolution in 1959 where Fidel Castro replaced the government with a revolutionary socialist state which still governs today). According to Hartlyn (1998) the significant factors in Dominican Republic's case were the international economic context, distrust by an organized business community and factional strife within the ruling party which led to transition from one civilian rule to another without a formal constitutional break.

In Ecuador, following the coup of 1975 and for similar reasons as Turkey in 1973, the military triumvirate in control sought to return the government to civilian rule to heal the divisions between the military forces. After some delay a national referendum in January 1978 resulted in a newly drafted national charter, and presidential elections were held in April 1979, with pressure from the United States and Ecuadorian public consensus leading to a peaceful transition. Ecuador would return to military rule briefly between 2000 and 2002.

In 1979 Ghana held democratic elections following a period of economic deterioration, inflation and strikes and student protests. However the democracy only lasted 2 years before returning to military rule (Hutchful 1997).

From 1980 we usher in the first period of democratic transition in Latin America beginning with Peru (1980), Bolivia and Honduras (1982), Argentina (1983), El Salvador (1984), Brazil and Uruguay (1985), and Guatemala (1986). The experience of these countries show striking similarities, with deepening economic crises and rampant inflation,

worsened by IMF imposed economic austerity measures. Indeed popular placards held during demonstrations were “Out with the IMF” and “Work, Bread, Justice and Peace” (Walton and Seddon 1994). In Peru, after a series of strikes and demonstrations against the new military government following the 1975 coup, and the first of the regions austerity protests in 1976 after drastic, overnight price hikes stemming from the termination of public subsidies of basic goods and services, elections were held in 1980. Peru lost its democratic status in 1992, classified as a multiparty regime instead and did not transition again until 2001.

In Bolivia, the Global Non-Violent Action Database and the US Federal Research Division of the Library of Congress country studies report that the military dictator Suarez stepped down in 1978 following international and internal pressure for Bolivia to hold democratic elections, though several years of military coups ensued until 1981 when General Torrelio took power, supported by the US, and announced a 3-year plan to democratise Bolivia. Miner’s strikes and student demonstrations ensued frustrated with the pace of reform and in September 1982 most notably students blocked the streets of “La Paz” with isolated incidents of violence. Protest movements erupted in the 2nd and 3rd largest cities in Bolivia and resulted in democratic elections in October 1982.

In Honduras, the Meglar Castro’s military regime was replaced by a three-member junta in 1980, hot on the heels of the overthrow of Debayle in neighbouring Nicaragua in 1979, following union and student protests, and a return to democratic rule was promised with elections through 1980 to 1982 culminating in Suazo Córdova being inaugurated as president, ending nearly a decade of military presidents. In Argentina, years of worsening economic performance, high inflation, the Falklands War and student and union protests led to the return of constitutional rule in 1983. In El Salvador, during its civil war (1979-1992) between the military government and the guerrilla group the Farabundo Martí National Liberation Front (FMLN), José Napoleón Duarte was the US-backed (and financially supported) candidate (seen as a symbol for "anti-communist" resistance in Central America) in the 1984 presidential elections which saw El Salvador transition to democracy. In Brazil large and wide-spread demonstrations, in one instance amassing 1.5million people in Sao Paolo, calling for direct elections during 1983-1984, resulted in elections in 1985.

In Uruguay, a country with a strong record of political stability and democracy prior to the 1973 coup, democratic transition resulted from a series of concessions from the regime (Gillespie 1985). Beginning with a referendum in 1980 for a revised constitution which the public voted against, damaging the legitimacy of the regime, pressure mounted for the government to hold free and fair elections in November 1984, which the government reserved the right to cancel if necessary. The Global Non-Violent Action Database reports that the regime further permitted unions and student associations to hold a May Day rally, believed by some as a hope that the specter of the Left would scare the middle class and increase support for the regime, however it resulted in 150,000 people rallying against the government. Strikes and demonstrations occurred in subsequent years, gradually undermining the regime until the November 1984 election and the transition to democracy in 1985.

In Guatemala, the political regime which had used the military to enforce the status quo through repression and control was taken over by a moderate section of the army, which played a dominant role in the transition to democracy. The new military leadership adopted a strategy of open political activity, based on participation and

tolerance and after an initial period of pacification, a new National Assembly was created and the Guatemalan government was demilitarized. In 1986, democratic elections were held.

In Sudan, severe economic deterioration and debt, rising food prices and shortages linked to Austerity measures imposed by the IMF resulted in student led-protests and democratic transition in 1986, though by 1989 the country had returned to military rule (Golder and Wantchekon 2004)

The Philippines democratic transition in 1987 resulted from the People Power Revolution of 1986, which was a series of mass demonstrations, largely initiated and attended by the League of Filipino Students, originating in 1983 against regime violence and electoral fraud in the February 7th elections. The Global Non Violent Action Database reports that opposition leader Corazon held a national rally on February 15th at the Luneta Park in Manila where she called for nationwide civil disobedience to overthrow incumbent Marcos, with turnout surpassing 1.5 million people. The United States Congress condemned the falsified election and voted to cut military support until Marcos stepped down. On February 24, Corazon visited her supporters at the park and inspired opposition members of parliament to write a new resolution that revoked the results of the corrupt election and declared her president. 150 citizens signed their names onto the new proclamation and Corazon was sworn in as president of the Philippines, after 20 years of authoritarian rule, and Marcos fled the country with the help of the United States. The Philippines Power Revolution of 1986 was seen as inspiration for the student-led “8888” uprising in Burma (named after the date it occurred, 8th August 1988) though it did not result in democratic transition there.

In South Korea however, the events in the Philippines were instrumental to their own democratic movement. In 1983 the military regime tried to reverse its policy of trying to cleanse society of activists (notably after the Gwangju massacre in 1980¹) having garnered so much public hostility, that they permitted anti-government professors and students to return to their school and withdrew military police from campuses. In 1984 a group of labour unions created a pro-democracy alliance, and then students from 42 universities and colleges organized the National Student Coalition for Democracy Struggle. Unions and students joined forces in 1985 to create a large umbrella coalition that included religious, farmers, teachers and other groups: the People’s Movement Coalition for Democracy and Reunification (PMCDR). A new opposition political party was formed (New Korea Democratic Party NKDP) gaining the students and unions support, emerging in 1985 as the major opposition in the National Assembly. In 1986 religious activists including the Roman Catholic Cardinal issued statements chiding the government and demanding constitutional revision that would ensure human rights; and a variety of groups organized mass rallies for democratization, heartened by the events in the Philippines. Student and workers held demonstrations calling for the withdrawal of US support for the military regime and by 1987 ordinary South Koreans and the middle class were joining the protest movements which culminated in transition to democracy following the legislative elections of 1988.

In 1989, the ‘fall of the Berlin wall’ marked the beginning of the end of the Soviet Union, with the regime having already begun taking tentative steps towards openness and political liberalization in 1987 with Gorbachev

¹ University students who were protesting peacefully against the Chun Doo-hwan government were shot and killed by government forces, leading to an uprising in the district on Gwangju from May 18th -27th 1980. It is estimated that some 600 people were killed in total.

suggesting that future Communist Party elections should offer a choice between multiple candidates. By 1988 Popular Fronts in the Baltic States were largely in control and the Caucasus had descended into violence and civil war with democratic protests movements, and crippling strikes in Poland were forcing the national government to open a dialogue with the labour union Solidarity. In the spring of 1989, through live, uncensored television coverage, the people of the Soviet Union elected the new Congress of People's Deputies and saw the Communist leadership being questioned and held to account. The toppling of the Communist government in Warsaw in 1989 created a wave of movements and protests resulting in democratic transitions for Bulgaria, Czech Republic, Hungary, Romania, and Slovak Republic in 1990; Croatia, Estonia, Latvia, Lithuania, Slovenia and Ukraine in 1991; and Albania in 1992. The Soviet Union ceased to exist on December 26th 1991. For all the former-soviet bloc countries which successfully democratised, economic decline, inflation and student protests and worker strikes were significant factors which resulted in transition.

The collapse of the Soviet Union and the preceding protest movements which occurred had an impact outside of Eastern Europe, with Mongolia transitioning to democracy in 1992 following student-led protests to overthrow the USSR-supported communist regime. Furthermore, a wave of democratic campaigns occurred in Africa linked to these movements. The Global Non Violent Action database shows that in communist Benin, university students initially protested the government's non-payment of grants and scholarships as well as salaries for teachers and civil servants in 1988, before their movements spread to ordinary citizens and resulted in further demonstrations and strikes calling for reforms. Democratic elections were held in 1991. In Mali, demonstrations by political groups and students began in 1991 to call for a multi-party system against the military regime, exacerbated by austerity induced IMF reforms. Elections were held in 1992 though the country fell back under military rule in 2012. In Central African Republic, worker and student unions too protested for the payment of owed salaries in 1991 and the formation of a multi-party system, which resulted in widespread strikes and demonstrations. They culminated with democratic elections in 1993, and a democratic regime prevailed until 2002 before falling under a military regime. Burundi and Niger both had democratic transitions in 1993, though both only lasted 2 years. In Malawi, student-led protests brought an end to the 30 year single-party rule in 1994. And in South Africa, widespread international condemnation of Apartheid in the 1980s, civil unrest and economic sanctions by the international community saw the President permit the return of the African National Congress and the release of Nelson Mandela in 1990, signaling the beginning of democratic transition which culminated in 1994 with general elections.

Returning to Latin America, another wave of democratic transitions occurred from 1989, with Panama (1989), Chile and Nicaragua (1990), Paraguay (1996) and Mexico (1997) and then lastly Peru (2001) and Ecuador (2002). In Panama, a series of protests and political opposition in 1987 against General Noriega's regime escalated when the latter accused the US of supporting the opposition, leading to the arrest of US diplomatic and military personnel. The US subsequently suspended its military assistance and increased economic sanctions on Panama; Panama in turn declared war on the US in 1989. The US then invaded Panama to seize Noriega to face drug charges in the US; the night before the invasion, opposition candidate Endara and his two vice presidents were sworn in on a US military base to head the government of Panama. In Chile, after several years of national strikes and international calls for Chile to transition to democracy and their support for opposition groups, armed insurgents tried to assassinate general Pinochet in 1986. He survived and in 1987 announced that a national plebiscite would be held

to either approve or reject his continuation as president (similar to De Gaulle's referendum that we highlighted in Chapter 2). Pinochet subsequently lost and left office after 17 years in power, replaced by a democratically elected President from an opposition party. In Nicaragua, opposition parties were permitted to run democratic elections in 1990 by the left-wing Sandinista Front for National Liberation (FSLN) which had been in power since 1979. The events that preceded this, as Williams (1990) explains, were increased US humanitarian aid (amounting to \$49million) and Congress approval of \$9million for the 'promotion of democracy' in Nicaragua, of which \$2.5 million was designated for the opposition alliance, UNO (Union Nacional Opositora). The US government also began pressuring Nicaragua's leaders to contra leaders to return to elections.

In Guyana, the US also helped to engineer the return of Cheddie Jagan, previously ousted from power by the British in 1953, and again in 1964, in collusion with the US, because of his communist orientation. For the first time in 28 years the international community and all political parties in the country agreed that the elections were free and fair.

Whilst some political regime datasets view 1992 as the year of democratic transition in Paraguay, Magaloni et al (2013) use 1996, arguing that whilst the June 1992 constitution established a democratic system of government, and the May 1993 elections brought to power Paraguay's first civilian president in almost 40 years, it wasn't until when General Oviedo peacefully stepped down from the army for violating constitutional bans against military involvement in politics, that multiparty competition was able to take place without military interference.

Mexico transitioned to democracy in 1997, in what was a slow moving process of democratic consolidation through a series of electoral reforms between 1977 and 1996. In Peru, democratic transition followed a protest march led predominantly by students the day before Presidential dictator Fujimori was sworn into office for his third term in 2000. Demonstrations continued thereafter, turning violent, in support of opposition leader Toledo. Alongside continuing disclosure of governmental secretive crimes, these events led to the government's loss of legitimacy and led the US National Intelligence Agency filing an investigation against President Fujimori in September 2000. He left the country the day after, faxing his resignation from Japan several months later (he was later convicted on human rights abuses in 2009).

Ecuador returned to democracy in 2002, following a period of economic decline in 1996 and rising inflation induced by President Bucaram's economic reforms and currency conversion. Early in 1997, unions, students and the general public participated in strikes and demonstrations to demand that the President step down and his neoliberal reforms be overturned. In January 1997 the US ambassador to Ecuador publically denounced the regime as corrupt, allying the US embassy with Ecuador's Congress in opposition to Bucaram. Further strikes and demonstrations continued in February until Congress voted in favor of relieving Bucaram on the grounds that he was mentally unfit to assume office. Congressional leader Alarcon assumed power until the 1998 elections. A further military coup occurred in 2000, evicting elected president Mahuad from power and Vice President Gustavo Noboa Bejarano took over. Magaloni et al (2013) consider 2002 as the year Ecuador transitioned to democracy.

Having detailed the democratic transitions of Latin America we return to the events of the early 1990s in Asia. Sri Lanka held democratic parliamentary elections in 1989 for the first time since 1977, as the elections that should normally have been held by 1983 had been cancelled by the 1982 referendum to afford the government more time to complete work on the programs it had begun. Sri Lanka remained a democracy until 2010.

Bangladesh transitioned in 1991 as public opposition grew to President Ershad's introduction of a controversial District Council Bill in parliament that would allow military officers to serve on local district councils. Strikes and demonstrations ensued but it wasn't until October 1990 when the government closed universities and main schools to quell the protests, that the student body was really galvanised and put pressure on the traditionally divided opposition parties to continue maintaining a united front against Ershad. Further strikes and demonstrations continued until Ershad stepped down from office in December and elections were held in February 1991.

Nepal also transitioned in 1991, against a backdrop of deteriorating economic conditions given the trade and transit dispute with India and the subsequent border blockade by India in 1989. In 1990 pro-democracy movements were coordinated by the Nepali Congress Party (NCP) and leftist groups, though the street protests were suppressed by security forces resulting in deaths and mass arrests. King Birendra eventually bowed to pressure and agreed to a new democratic constitution. The NCP won the first democratic elections with Girija Prasad Koirala as prime minister. Democracy lasted until 2002 when the King dismissed the head of the interim government and indefinitely put off elections scheduled for the following month in the wake of ongoing violence between the Maoist rebels and the army. Democracy was not restored until 2006 when the King agreed to reinstate parliament following weeks of violent strikes and protests against direct royal rule, after which, parliament voted unanimously to curtail the King's political powers.

Thailand transitioned once more to democracy in 1992 following the events of the 'Black May' (17–20th May 1992) student-led popular protests, originating with discontent against the National Peace-Keeping Council who had overthrown the government in a military coup in February 1991 and were due to hold parliamentary elections in March 1992. The Samakki Tham Party won the general election and, on April 7th, announced that Army Commander-in-Chief General Suchinda Kraprayoon, a member of Samakki Tham, was to be Prime Minister which caused outrage as he was not an elected member of parliament. Further strikes and demonstrations persisted until the King intervened over television broadcast. The Samakki Tham Party drafted amendments to the constitution and on May 24th Suchinda resigned as Prime Minister after agreeing that the Prime Minister should be an elected Member of Parliament. By June 30th 1992, the Military Parliament was abolished and a new election was set for September. Military rule returned in 2006 following a coup by General Sonthi Boonyaratglin of the Royal Thai Army. The October election was cancelled, the 1997 Constitution was abrogated, some key ministers arrested, and Parliament dissolved. The new constitution was promulgated with the junta's support. The general election took place in December 2007 and democracy was restored in 2008.

The roots of Taiwan's democratic transition lay in the 1990 Wild Lilly Student movement, a 6 day demonstration from democracy occurring only a year after the Chinese student protests that culminated in the Tiananmen Square Massacre in China. The students protested the inauguration of Lee Teng-Hui to a 6 year term as President, an

election where only the 671 members of the National Assembly voted, only one party was recognized, and one candidate ran. On the first day of his new term Lee Teng-Hui expressed his support of the students' goals and promised full democracy in Taiwan, beginning with reforms to be initiated that summer. In 1996 Lee became Taiwan's first popularly elected leader, taking 54% of the vote in an election in which over 95% of eligible voters participated.

In May 1998, Indonesia's President Suharto resigned; this followed mass protests from students and political opposition groups in the wake of the Asian financial crisis, in 1997/1998, which had awakened the growing middle class to the political corruption of Suharto's regime and his mismanagement of the country's wealth, which became concentrated in the hands of his immediate family and most powerful political elites. Despite Suharto welcoming his 5th term as president in March 1998, student protests continued, further ignited by the deaths of 4 students at Jakarta's Trisaki University by security forces which led to the most violent and extensive riots the country had seen. An estimated 1,888 people died, most of the victims of Chinese descent, while many more were raped or injured. The riots served to weaken Suharto's wavering rule; student demonstrators had also occupied radio stations and played their demands on the airwaves; bus-loads of students also occupied one of the legislature buildings for several days. On May 21st Suharto resigned and democratic transition in Indonesia followed.

Turning to Africa, several democratic transitions occurred from 2000, beginning with Nigeria following the death of their military dictator in 1998 who had been in power since 1993, and Senegal in 2000, following several years of electoral reform. Ghana transition back to democracy in 2001 and Kenya, once more as a result of incremental political improvements since 1991 (Brown 2004) joined Sierra Leone in democratising in 2002 following the end of its decade long civil war. Liberia transitioned in 2006, after their President was formally indicted for war crimes and crimes against humanity for his involvement in both Sierra Leone's civil wars (1991-2002 and 1999-2003) and later by The Hague. It was the UN was installed a transitional government in 2003 before democratic elections were held in October and November 2005. In Zambia it was the death of the president in 2008 (who had been in power since 2001) which prompted emergency elections and a victory for the opposition party. In Niger, it was a military junta which place the incumbent and corrupt president under house arrest, and drafted a new constitution and electoral code but forbade its members and representatives from running for office in the elections. As a result the long standing opposition Nigerien Party for Democracy and Socialism (PNDS) came to power in 2011. Niger therefore provides another example, like Turkey, Pakistan and Guatemala of regime change from within the military to usher in democratic change. Lastly in 2012, largely influenced by the events of the Arab spring, a series of student led anti-government protests over unemployment and economic hardship and lack of basic services occurred in Lesotho. As a result of frustration with the incumbent Prime Ministers 14 year rule, voters at the 2012 elections brought in Lesotho first coalition government (made up of five opposition parties) with no party enjoying a majority.

Turning away from Africa and back to Asia, Kyrgyzstan transitioned to democracy in 2011, 20 years after the fall of the Soviet Union, following the events of the Kyrgyz Revolution of April 2010 (also known as the Second Kyrgyz Revolution, after the largely student-led Tulip Revolution in 2005) which led to the ousting of Kyrgyz president Kurmanbek Bakiyev. The protests were in response to frustration over the perceived corruption and cronyism in the Bakiyev administration, the country's poor economic situation and a recent rise in utility rates caused by Russia

imposing duties on energy exports to Kyrgyzstan. A state of emergency was declared and the protesters responded by taking control over the internal security headquarters and a state TV channel. 88 people were reported to have been killed and hundreds hospitalised. Bakiyev subsequently resigned and fled the country.

Appendix 2: Inflation at Transition across Sources

Country	Year of Transition	Penn GDP Deflator	World Bank Inflation	IMF Inflation	ERS Inflation
Albania	1992	317.50	226.01	226.00	226.00
Argentina	1973	63.52		61.24	61.25
Argentina	1983	357.63		343.81	344.12
Bangladesh	1991	7.95	6.36	6.35	7.69
Benin	1991	2.36			7.26
Bolivia	1982	154.41	123.54	123.53	123.54
Brazil	1985	238.44	225.99	225.99	223.45
Bulgaria	1990	23.44	23.80	23.80	23.80
Burundi	1993	7.71	9.68	9.67	9.68
Central African Republic	1993	0.26	-2.92	-2.91	-2.92
Chile	1990	24.76		26.03	26.03
Croatia	1991	100.01	122.22		124.73
Czech Republic	1990			10.02	6.78
Dominican Republic	1978	4.76	3.48	3.47	3.48
Ecuador	1979	10.90	10.27	10.26	10.27
Ecuador	2002	5.19	12.48	12.48	12.48
El Salvador	1984	12.75	11.51	11.50	11.89
Estonia	1991	105.61			24.97
Ghana	1970		3.03	3.03	11.11
Ghana	1979	39.20	54.44	54.44	54.43
Ghana	2001	22.96	32.91	32.90	32.91
Greece	1975	13.59	13.37	13.36	13.33
Guatemala	1986	34.92	36.93	36.93	36.84
Guyana	1992				13.53
Honduras	1982	2.46	8.98	8.98	9.12
Hungary	1990	23.30	28.97	28.97	28.97
Indonesia	1999	22.10	20.49	20.48	20.49
Kenya	2002	4.21	1.96	1.96	1.96
Korea South	1988	5.20	7.15	7.14	7.15
Kyrgyzstan	2010	13.40	7.97	7.96	7.96
Latvia	1991	162.57			25.00
Lesotho	2012		6.10	6.10	6.14
Liberia	2006	0.99	7.34	7.34	7.20
Lithuania	1991	241.13			11.11
Malawi	1994	6.48	34.65	34.64	34.65
Mali	1992	-1.76	-6.24	-6.24	-6.24
Mexico	1997	17.71	20.63	20.62	20.60
Mongolia	1992	166.48			8.59
Nepal	1991	8.60	15.56	15.55	15.56
Nepal	2006	9.79	6.92	6.92	6.92
Nicaragua	1990			7485.49	96.42
Niger	1993	0.19	-1.22	-1.21	-1.22
Niger	2000	3.48	2.90	2.90	2.90
Niger	2011	0.00	2.94	2.94	2.94
Pakistan	1973	17.38	23.07	23.07	23.07
Pakistan	1988	10.25	8.84	8.83	8.84
Pakistan	2008	15.88	20.29	20.28	20.29
Panama	1989	0.58	0.21	0.20	0.16
Paraguay	1996	10.06	9.80	9.79	9.80

Peru	1980	64.96	59.15	59.14	36.60
Peru	2001	0.96	1.98	1.97	1.97
Philippines	1987	2.69	3.79	3.79	3.79
Poland	1989	276.65	244.55	244.55	244.45
Portugal	1976	18.15	18.25	18.24	18.26
Romania	1990	12.40			3.00
Senegal	2000	5.95	0.73	0.73	0.73
Sierra Leone	2002	6.76		-3.28	-3.75
Slovak Republic	1990				8.62
Slovenia	1991	103.20			11.41
South Africa	1994	8.64	8.94	8.93	8.94
Spain	1977	21.96	24.53	24.52	24.53
Sri Lanka	1989	9.29	11.57	11.56	11.57
Sudan	1986	34.10	24.45	24.45	24.45
Taiwan	1996	2.71			3.07
Thailand	1975	4.64	5.33	5.33	5.33
Thailand	1992	1.20	4.14	4.13	4.14
Thailand	2008	5.96	5.47	5.46	5.47
Turkey	1970	0.00	6.93	6.92	5.26
Turkey	1973	18.99	15.44	15.43	15.85
Turkey	1983	26.68	31.40	31.40	31.36
Ukraine	1991	92.13			91.20
Uruguay	1985	75.24	72.22	72.22	72.22
Zambia	2008	15.25	12.45	12.44	12.45

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United States Department of Agriculture Economic research Service's (ERS) international macroeconomic dataset <http://www.ers.usda.gov/data-products/international-macroeconomic-data-set.aspx>

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