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ESSAYS ON THE ENTREPRENEURSHIP-GROWTH NEXUS: AN AGGREGATE ANALYSIS

A Ph.D. thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy

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ABSTRACT

Theoretically, entrepreneurship has been deemed crucial to economic growth. However, the literature has failed to give governments clear guidance on policy since the empirical evidence linking entrepreneurship to economic growth has been mixed. We suggest that part of the reason for these contradictory findings could be that entrepreneurship has been mispecified in the economics literature as entry density or R&D. We propose that a more accurate characterisation of entrepreneurship at the macro-level is EO. Using a sample that covers data of 93 countries over the period 1980-2008, firstly, we employ factor analysis to confirm EO as an aggregate level, reflective, unidimensional second-order construct with three indicators that covary: risk taking, innovativeness and proactiveness. Secondly, we use system GMM analysis to investigate the determinants and drivers of EO. We find that the control of corruption, banking development and human capital influence the level of EO that countries possess. However, this impact is non-linear with threshold effects and is contingent on the level of development and institutions, which are in turn shaped by inequality. Thirdly, we establish that EO and its deviation, positively predict growth and that this association is enhanced by policies and institutions. Moreover, our results suggest that the control of corruption, banking development, inequality and human capital are the determinants of EO and not economic growth as policies and institutions by themselves do not increase output. Innovative, risk taking and proactive entrepreneurial firms and entrepreneurs do. The results of this study suggest government officials, who wish to promote entrepreneurship and economic growth, should revisit their emphasis on promoting policies that erroneously encourage entry density and consider encouraging innovativeness, proactiveness and risk taking.

DECLARATION

I, Thanti Sibonelo Mthanti, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Thanti Sibonelo Mthanti

Signed at ……

On the …….. day of …… 2014

DEDICATION

This thesis is dedicated to my late parents Nomsa Caldas Gloria Mthanti and Fanley Hendry Mthanti.

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I would like to thank my supervisor Professor Kalu Ojah for your guidance and friendship. Your mentoring and teaching have made me grow as a person. I will certainly miss the conversations and debates we had. Oddly, in this crazy country of ours, it took getting to doctoral level for me to find a fellow African who believed I was capable. And for that, I thank you.

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All errors and omissions are, of course, mine.

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Chapter 1

INTRODUCTION

1.1 Background to the study

The causes and sources of economic growth have occupied scholars since Adam Smith (1776) published the "inquiry into the nature and causes of the wealth of nations". In 1956, Robert Solow (1956) developed the seminal neoclassical growth model which advanced our knowledge of the growth process. The neoclassical model explicates how capital and labour link to produce output. However, after accounting for labour and capital, a significant residual, called technological progress, remained when trying to attribute growth to its underlying sources (Griliches, 1996). Thus, Solow's neoclassical growth model neglected to clarify fully the origins of economic growth (Larroulet and Couyoumdjian, 2009).

Romer (1990) sought to address Solow's (1956) shortcomings and developed endogenous growth theory which adds knowledge to the traditional factors of production, labour and capital. Endogenous growth theory seeks to explain the residual that cannot be attributed to labour and capital in the neoclassical model. Romer (1990) argued that technological progress is fostered by knowledge which is non-rival and non-excludable, thus generating positive externalities within an economy (Arrow, 1962a). He deemed R&D and human capital as crucial drivers of economic development through knowledge spill-overs. However, Romer (1990) could not explain how this knowledge is diffused. Analogous to Solow's (1956) model where technological progress was exogenous, in Romer's (1990) model knowledge diffusion is also exogenous (Braunerhjelm, 2008).

Audretsch and Keilbach (2005) have sought to address the shortcomings of endogenous growth theory by clarifying how knowledge is diffused. They follow Schumpeter (1942) who delineated an economic process of creative destruction fostered by competitive, innovative firms that propelled the dynamic development of the economy. Audretsch and Keilbach (2005) add to Schumpeter's insights by proposing the idea of a knowledge filter which prevents basic knowledge from being economically beneficial. Transforming this basic knowledge into firm-specific knowledge requires effort and resources, and entrepreneurship serves as a conduit that penetrates this knowledge filter serving as a link between new knowledge and economic growth. Thus innovative firms propel the dynamic development and growth of the economy by penetrating the knowledge filter. In this model, entrepreneurship is the vital link in knowledge diffusion and consequently, technological progress and economic development.

Thus theories of economic growth, from Solow (1956) to Audretsch and Keilbach (2005), have identified essentially the outcomes of entrepreneurship- technological progress, innovation and knowledge diffusion- as the main sources of economic growth. However, at the macro-level, what is entrepreneurship? Further, what are its antecedents and consequences? Moreover, how does a nation's incentive structure and institutional design affect the relation between entrepreneurship and economic growth?

1.2 Entrepreneurial orientation (EO)

Entrepreneurship can be defined as new entry into competitive markets such as business founding, new product introductions and globalization (Miller, 2011). The process of that new entry, that is, the how has been defined as entrepreneurial

orientation (EO). Miller (1983, p. 771) submits that an entrepreneurial firm is “one that engages in product-market innovation, undertakes somewhat risky ventures and is first to come up with ‘proactive’ innovations, beating competitors to the punch”. Lumpkin and Dess (1996, p. 136–137) characterise EO as “the processes, practices, and decision-making activities that lead to new entry”.

The sub-constructs of EO have also been defined in literature. Innovativeness can be described as an inclination to experiment and be creative that leads to new goods and/or services (Lumpkin and Dess, 1996). Proactiveness is characterised as a tendency to aggressively pursue new opportunities rather than those of reaping widely known existing opportunities or cost-cutting (Miller, 1983). Lastly, risk taking is the propensity of an economic agent “to make bold moves, those that risk significant capital and face a good deal of uncertainty” (Miller, 1983, p. 771).

1.2.1 Unit of analysis

An important consideration when investigating entrepreneurship is the unit of analysis. Entrepreneurship and EO have been studied at different levels of aggregation: individuals, groups and firms. Kilby (1971) associated entrepreneurship with individuals because of its relation with radical invention. Some scholars apply it to small businesses because of small businesses’ linkages to economic growth (Birch, 1979). Lumpkin and Dess (1996) contend quite strongly that “new entry” as the critical manifestation of entrepreneurship is primarily a firm-level phenomenon. However, Miller (2011) has noted that innovative entry could be by a new firm, by an existing firm (intrapreneurship) and/or by a nation state. The essential question we ask is: can one nation state devote more resources to innovative activity, take risks and invest more in longer term, uncertain outcomes as well as be more pro-active in

diversifying its economic base than others? We believe the answer is yes and agree with Miller (2011) that EO can manifest at the level of the nation state. Thus, we adopt it as the unit of analysis in our study.

1.2.2 Why EO?

Entrepreneurship at the aggregate (national) level has traditionally been measured as a stock variable, which is, counting the number of "entrepreneurs". The Global Entrepreneurship Monitor's (GEM) primary measure of entrepreneurship is the Total Early-stage Entrepreneurial Activity (TEA) Index. The TEA measures the incidence of start-up businesses (nascent entrepreneurs) and new firms (up to 3.5 years old) among the adult population (i.e., individuals aged 18–64 years). Further, the self-employment ratio, defined as the proportion of the labour force who are self-employed or business owners (Audretsch, Keilbach and Lehmann, 2006, Gleaser, 2007 and Carree, Van Stel, Thurik and Wennekers, 2002) and the private employment ratio, characterised as the percentage of the labour force that is hired by the private companies (Li, Yang, Yao and Zhang, 2009 and Li, Yang, Yao, Zhang and Zhang, 2012) have also been used as measures of entrepreneurship at the macro-level. However, these measures do not accurately quantify the innovative new combinations that foster the dynamic growth of the economy as argued by Schumpeter (1934). Nor do they measure Solow's (1956) technological progress, Romer's (1990) knowledge or Audretsch and Keilbach's (2005) knowledge diffusion.

The main argument that economists make is that entrepreneurship drives economic growth by improving total factor productivity or Solow's residual. However, recent studies grounded on GEM evidence suggest the relationship between entrepreneurial activity and a country's level of economic development is U-shaped

(Wennekers, van Stel, Thurik and Reynolds, 2005). Further, in developing countries, entrepreneurship and job creation are positively associated only if self-employment and informal companies are disregarded from the data (Ghani, Kerr and O'Connell, 2011a and 2011c). This raises the question: do all small business owners, some of whom may be necessity entrepreneurs who enter a new business because they need an income to survive, for example street vendors (Sonobe, Akoten and Otsuka, 2011), improve productivity? The evidence suggests not and we propose that a more accurate characterisation of entrepreneurship at the macro-level is EO. Further, the manifestation of this EO (i.e., innovative activity, risk taking and proactiveness) is the critical variable that defines whether a country is entrepreneurial or not.

1.2.3 Context

As Miller (1983, 2011) contends, EO and its drivers are unique in diverse kinds of context. Further, as we have suggested, entrepreneurship at the macro-level encompasses innovation, proactiveness and risk taking. However, we expect that the entrepreneurial processes, as Schumpeterian theory submits, would appear differently in dissimilar contexts. At the country level, national laws, financial development, corruption, policies and levels of institutional development can impact the character of entrepreneurship (Johns, 2006). We would therefore, for example, expect EO to manifest differently in Zimbabwe than in Germany. Thus, the categorisation of countries as low income and/or developed may result in more precise and scientifically legitimate knowledge that takes into account the distance to the technological frontier and the level of institutional development (Aghion and Howitt, 2009).

1.3 The Drivers of EO

We have a limited understanding of why rates of EO would vary across countries and why some countries may be more innovative, risk taking and pro-active than others. A greater understanding of these differences may assist firms, investors and government policy makers in spurring economic growth**.** Abramovitz (1994, p. 24) suggests, the determinants and drivers of technological upgrading can be characterised as the "countries' level of education and technical competence, the commercial, industrial and financial institutions that bear on their abilities to finance and operate modern, large-scale business, and the political and social characteristics that influence the risks, the incentives and the personal rewards of economic activity". Therefore, we investigate financial market development, social cohesion, human capital and the control of corruption as potentially important factors that may affect the rate of entrepreneurship across countries (Biggs and Srivastava, 1996, Aterido et. al, 2009). These institutional constraints may be particularly important in developing countries where entrepreneurs face a hostile environment in comparison with developed economies (Vivarelli, 2012).

1.3.1 Financial Market Development

Joseph Schumpeter (1912) was one of the originators of the idea that financial institutions are critical because they appraise and finance entrepreneurs' innovation and the launching of new products to market. King and Levine (1993) also adopt a similar line of reasoning and argue that the evaluation and sorting of entrepreneurs by financial institutions lowers the cost of enabling productivity improvement and fuels economic development. Empirically, Beck, Levine and Loayza (2000) find that financial institutions have a large, positive impact on total factor productivity growth,

thus influencing overall economic growth. In addition, countries with high levels of financial market development are better able to support the growth of capital intensive industries (Rajan and Zingales, 1998 and Beck, Demirgüç-Kunt, Laeven and Levine, 2008). Further, financial institutions and markets ease the trading, hedging, and pooling of risk, thus impacting economic growth by varying savings rates and resource distribution. This encourages investment in projects with higher risk and superior expected returns (Devereux and Smith, 1994; Obstfeld, 1994 and Rajan and Zingales, 1998). In contrast, developing countries are unable to support infant industries since firms are credit and equity rationed (Ayyagari, Demirgüç-Kunt, and Maksimovic, 2008). Thus, financial sector distortions or underdevelopment can inhibit entrepreneurship and consequently decrease the rate of economic growth (King and Levine, 1993). Levine (2005, p. 85) concludes that "the preponderance of evidence suggests that both financial intermediaries and markets matter for growth even when controlling for potential simultaneity bias".

1.3.2 Social Cohesion

Maxwell (1996, p. 13) describes social cohesion as "the processes of building shared values and commonality of interpretation, reducing disparities in wealth and income, and generally enabling people to have a sense that they are engaged in a common enterprise, facing shared challenges, and that they are members of the same community". Easterly (2006, p. 4) defines social cohesion as "the nature and extent of social and economic divisions within society". Ritzen and Woolcock (2000, p. 9) suggest "social cohesion is a state of affairs in which a group of people demonstrate an aptitude for collaboration that produces a climate for change". Further, Easterly (2006) suggests socially cohesive societies are more likely to promote growth,

ensure that both the rich and poor share the sacrifices and rewards of change, offer equal opportunities for all citizens and facilitate greater social mobility. For example, inequality may signal lack of access to finance resulting in fewer opportunities to invest in education and entrepreneurship (Berg and Ostry, 2011).

Moreover, inequality makes it difficult for government to adjust to shocks (Rodrik, 1999) and leads to comparatively harsh debt crunches (Berg and Sachs, 1988). It follows that corruption by economic elites could create inefficiencies and, thus lead to decreased economic growth (Barro, 2000). In contrast, socially cohesive countries are more likely to support EO because of their greater ability to collaborate and develop innovations. Furthermore, the risks inherent in uncertain, long-term investments are more likely to be borne by all members of society, not just the poor. Lastly, the proactive actions necessary to attack new markets require purposeful, cohesive action that is more likely in cohesive societies with agreed on long-term objectives than other scenarios.

1.3.3 Human Capital

Becker (1964) defines "human capital as skills and knowledge that individuals acquire through investments in schooling, on-the-job training and other types of experience". Additionally, Pfeffer (1994) has suggested that education, knowledge, experience and skills are important for the success of entrepreneurial firms. Empirically, Millán, Congregado, Román, Praag and Stel (2012) analyse to what extent the education levels of employees may affect the entrepreneur's productivity and find support for the hypothesis that education positively impacts entrepreneurial success. They find that a high share of people in a region holding tertiary education is positively associated with the entrepreneur's productivity. As a result, venture

capitalists seek management teams with solid management skills and experience (Zacharakis and Meyer, 2000) in countries with high-end human capital (Aizenman and Kendall, 2008). Moreover, Sonnentag and Frese (2002) suggest that human capital might be even more crucial in the future since work environments are becoming more knowledge-intensive. An inference that can be drawn from the preceding literature is that levels of EO could be influenced by human capital and higher education.

1.3.4 Corruption

Baumol (1990) contends that based on the quality of existing political, economic and legal institutions, entrepreneurship can be productively innovation or unproductively rent seeking, corruption or organized crime. Further, he suggests that this allocation is greatly affected by incentives society offers to such activities. Empirically, Olken and Pande (2012) find evidence that, as Baumol (1990) suggests, corruption responds to incentives. However, they also note that over time, corrupt officials change their strategies to pursue rents. Similarly, Anokhin and Schulze (2009) find a positive relationship between the control of corruption, productivity and investment in innovation and entrepreneurship. Likewise, positive associations between the control of corruption and total factor productivity (Lambsdorff, 2003; Rivera-Batiz, 2002), per capita growth in GDP (Kaufmann and Kraay, 2003), bond spreads (Ciocchini, Durbin and Ng, 2003), capital investment and foreign direct investment (Lambsdorff, 2003), have been established. It seems self-evident that good institutions and low levels of corruption would support EO, thus facilitating higher rates of economic growth.

1.4 The consequences of EO

Extensive research has been conducted on the performance consequences of EO at the firm level. The majority of EO researchers have used the Resource Based View (RBV) theory to argue that EO provides a sustainable competitive advantage to firms (Rauch, Wiklund, Lumpkin and Frese, 2009). The RBV view suggests that learning, knowledge and information acquired from exploring entrepreneurial opportunities generate resources that are inimitable, rare and valuable. These resources help firms attain a competitive advantage and achieve superior performance outcomes (Barney, 1991). Raunch et al. (2009) performed a meta-analysis on 51 studies that explored the performance implications of EO. Their findings suggest that there is a significant correlation between EO and firm performance.

Tang, Tang, Marino, Zhang and Li (2008) have examined the EO-performance relationship in emerging markets, with somewhat interesting results. They conducted the study in China and found an inverted U-shaped, curve-linear relationship. Low-EO and high-EO firms showed poor performance. In contrast, middle-level EO firms had a positive relationship with performance. Su, Xie and Li (2011) also confirm these findings. However, they note that the EO-performance relationship is positive in established firms. They submit that these results indicate that new firms suffer from “the liability of newness” (Freeman, Carroll and Hannan, 1983).

However, minimal research has been conducted on EO at the aggregate level. As we have argued before, theories of economic growth, from Solow (1956) to Audretsch and Keilbach (2005), have identified essentially the outcomes of entrepreneurship, technological progress, innovation and knowledge diffusion as the main sources of economic growth. EO, as the manifestation of entrepreneurship,

would be expected to improve economic growth and therefore, the impact of EO on economic growth needs to be investigated.

1.5 Purpose of the study

The purpose of this research is to define and measure entrepreneurial orientation (EO) at the aggregate level. Furthermore, we investigate the potential institutional drivers of EO at the aggregate level such as financial market development, social cohesion, human capital and the control of corruption. Lastly, we examine the performance implications of EO and its' determinants on economic growth.

1.6 Problem statement

Theoretically, entrepreneurship has been deemed crucial to economic growth (Audretsch and Keilbach, 2005) and government policy makers have sought to encourage entrepreneurship, in order to foster development, to varying degrees of success. However, literature has failed to give governments clear guidance on policy since the empirical evidence linking entrepreneurship to economic growth has been mixed. For example, recent studies based on GEM data have identified a U-shaped relationship between a country's rate of entrepreneurial activity and its level of economic development (Wennekers, van Stel, Thurik and Reynolds, 2005).

We suggest that part of the reason for these contradictory findings could be that entrepreneurship has been mispecified in the literature as entry density. We propose that a more accurate characterisation of entrepreneurship at the macro-level is EO and argue that the manifestation of this EO (i.e., innovative activity, risk taking and pro-activeness), is the critical individual variable that defines where a country is entrepreneurial or not. However, EO has not been defined at the national level nor

have its drivers been explicated. Further, its outcomes have also not been investigated.

1.6.1 Objectives of the study

- The first objective is to define and develop a measure of EO at the aggregate level.
- The second objective is to test whether financial market development, social cohesion, human capital and the control of corruption (the hypothesized drivers of EO) have a positive association with EO.
- The third objective is to test whether EO has a positive influence on economic growth.
- The fourth objective is to ascertain whether the hypothesized enablers of EO enhance the EO-growth relation.

1.7 Research Questions

In other words, the research questions implicit in the two stated objectives of the study are:

1. Does entrepreneurship manifest at the aggregate level as EO?
2. Does EO have a positive impact on economic growth at the aggregate level?
3. Is this growth impact context dependent? That is, does it vary depending on the proximity of a country to the technological frontier?
4. Further, what are the institutional drivers of EO at the aggregate level?
5. Lastly, do these institutional enablers enhance the EO-growth relation?

All these questions relate to the importance of entrepreneurship to economic growth. Further, financial market development, the control of corruption, human capital and inequality are also potentially important factors that can affect the rate of entrepreneurship across countries (Biggs and Srivastava, 1996, Aterido, Hallward-Driemeier and Pagés, 2009). These institutional factors and policies may be particularly important in developing countries where entrepreneurs face a more constraining environment than in with developed economies where entrepreneurs are generally enabled by a supportive environment (Vivarelli, 2012). Thus a reasonable set of answers to these questions would assist firms, investors and government policy makers in spurring economic growth across all levels of development.

1.8 Significance of the study

First, we make an important theoretical contribution to economics and entrepreneurship theory by defining EO at the aggregate level and linking it to growth. We investigating the nation state as our basic unit of analysis and ask: can one nation state devote more resources to innovative activity, take risks and invest more in longer term, uncertain outcomes, and be more pro-active in diversifying its economic base than others? We agree with Miller (2011) and believe that the answer is: yes EO can manifest at the level of the nation state.

Second, we make a significant methodological contribution by devising aggregate level, objective secondary measures of EO and its' sub-constructs (risk taking, innovativeness and proactiveness). Entrepreneurship at the aggregate level has traditionally been measured as a stock variable (i.e., counting the number of "entrepreneurs") or classified as innovation. The self-employment ratio, defined as

the proportion of the labour force who are self-employed or business owners (Carree, Van Stel, Thurik and Wennekers, 2002; Audretsch, Keilbach and Lehmann, 2006; Gleaser, 2007), and the private employment ratio, characterised as the proportion of the labour force that is employed by the private sector (Li, Li, Yao, Zhang, and Zhang, 2009 and Li, Yang, Yao, Zhang and Zhang, 2012) have also been used as measures of entrepreneurship at the macro-level. We propose that a more accurate characterisation of entrepreneurship at the macro-level is EO and argue that the manifestation of this EO reflected variously in innovative activity, risk taking and pro-activeness, is the critical variable that defines whether a country is entrepreneurial or not. Aggregated theory-based single synthetic indicators such as EO, GDP and the Human Development Index (HDI) help us understand our economic and social realities and therefore, can assist policy makers devise strategic interventions. For example, GDP highlights aggregate income in a country whereas the HDI enlightens us about the overall well-being of the population. Similarly, EO informs us whether a country is entrepreneurial or not.

Lastly, we make significant empirical contributions to literature by first, evaluating the EO-growth relation. Second, by assessing whether policies and institutions, such as banking development, human capital, social cohesion and the control of corruption are drivers of EO. Third, by determining whether indeed these hypothesized enablers, enhance the EO-growth relation. A greater understanding of these associations may assist firms, investors and government policy makers in spurring economic growth**.** Moreover, potential drivers of EO such as financial market development, a transparent regulatory environment and the control of corruption are potentially important factors that can affect the rate of entrepreneurship across countries (Biggs and Srivastava, 1996, Aterido, Hallward-Driemeier and Pagés,

2009). Consequently, ascertaining their relevance would enable countries to implement appropriate policies for entrepreneurship led growth.

1.9 Conclusion

In this Chapter, we have introduced the key elements of this study, EO and the entrepreneurship-growth relation. Further, we discussed how EO might help clarify this relationship. In Chapter 2 a detailed review of literature is conducted to explicate the important issues around EO and the entrepreneurship-growth nexus, as to identify the gap in literature. The methodological paradigm and development of the measures of EO and its' sub-constructs, are discussed in Chapter 3. Chapters 4 and 5 are self-contained analysis and empirical results evident from the two main objectives of the study. In Chapter 6 we conclude.

Chapter 2

LITERATURE REVIEW

Introduction

Adam Smith (1776) argued that the average level of prosperity in a country could be measured by the annual produce of labour that could be saved and/or consumed. In economics literature this annual produce or annual gross domestic product (GDP) is a proxy for economic well-being and a measure of prosperity. This GDP's growth determines the well-being of billions of people and enables under-developed countries to escape poverty and achieve prosperity (Sorensen and Whitta-Jacobsen, 2010). For example, in North America and Western Europe, GDP per capita is several multiples greater than what it was only a hundred years ago. Likewise, Japan, Korea and Taiwan have achieved developed status through high economic growth. In these developed countries, GDP growth has improved individual welfare, increased life expectancy, and enabled the population to live a longer, healthier and more meaningful life.

Some developing countries are following suit. Rapid economic growth in China has also reduced the number of people living in poverty from 53 percent of the national population to 8 percent (Ravallion and Chen 2007). In 2010, Brazil and India grew at 6.6% and 8.8% respectively, lifting millions of people out of poverty. In contrast, the relative absence of economic growth in some poor countries, especially African countries, has left millions of people hungry and living in abject conditions. What accounts for these cross country differences in growth outcomes and how can this process of economic growth, which leads to a higher GDP per person and increased welfare, be initiated? Rodrik, Subramanian and Trebbi (2004, p.132) suggest "it is

hard to think of any question in economics that is of greater intellectual significance, or of greater relevance to the vast majority of the world's population".

To answer this question, we resort to the Schumpeterian paradigm which suggests that growth is generated by a random sequence of quality-improving innovations and embodies Schumpeter's (1942) idea of "creative destruction". In this paradigm entrepreneurship and innovation are deemed crucial to growth since entrepreneurial firms facilitate economic growth by innovating, taking risks and proactively building new markets (Schumpeter, 1934). Therefore they are a crucial conduit for developing, assimilating and diffusing knowledge and technology. In addition, as the world economy becomes more knowledge-based and globalised, Gilbert, Audretsch and McDougall (2004) argue that entrepreneurship policy may emerge as the key policy instrument for promoting economic development, similar to monetary and fiscal policies which were the mainstays for enabling employment creation and economic growth in the post-war industrial economy. Thus the success or failure of a developing economy depends on its' entrepreneurial dynamics (McMillan and Woodruff, 2002).

However, economic growth in Schumpeterian theory is highly context-dependent. Howitt (2000) submits that countries behind the technological frontier, will exhibit more replicative entrepreneurship than countries that are well developed and technologically sophisticated which tend to focus on radical innovation, that is, they launch innovations that surpass the best technology available before the innovation. Similarly, Fagerberg and Srholec (2008) suggest that capabilities related to the exploitation and generation of knowledge have become vital for economic performance recently, in both developed and developing countries, particularly when such know-how is broadly defined. Likewise, Lee and Kim (2009) pinpoint higher

education and R&D as the binding constraints to long run economic growth for middle-to-high income countries.

In the following paragraphs we evaluate four major economic growth paradigms, namely: the Neoclassical Growth Model, the AK Model, The Product Variety Model and The Schumpeterian Model. We review literature on these models and also discuss a relatively new addition to growth theory, the Knowledge Spill-over Theory of economic growth.

2.1 The Neoclassical Growth Model

The neoclassical model, developed by Solow (1956) and Swan (1956), is the dominant theory in growth economics. Solow (1956) and Swan (1956) assume that markets are perfectly competitive and the rate of technological change is determined exogenously by noneconomic forces. Aghion and Howitt (2009) submit that in the neoclassical model the growth process is described by two equations namely:

- first, a production function where aggregate output GDP is equated to a function of aggregate capital and labour according to a Cobb Douglas function with diminishing returns to capital(K) and labour(L) and a constant productivity parameter,

  $$Y = AK^{\alpha} L^{1-\alpha}, \quad (1)$$

  where $0 < \alpha < 1$ such that output involves decreasing returns to capital and A is a productivity parameter.

- Secondly, a law of motion that equates capital accumulation to investment and capital depreciation,

  $$\Delta K = sY - \delta K, \quad (2)$$

  where sY indicates aggregate savings and δK represents capital depreciation.

This model implies that in the long run per capita GDP (Y/L) does not depend on economic conditions but that rather it is driven by productivity parameter A. Without technological progress the economy can grow only by accumulating capital. However, this capital accumulation eventually dissipates due to diminishing marginal returns of capital. Thus, in the long-run changes in aggregate per capita national income are caused by exogenous technological change and the growth rate of the population. The neoclassical model was further developed to integrate endogenous consumer optimization (Cass, 1965 and Koopmans, 1965), government spending, debt and the deficit (Blanchard, 1985), uncertainty (Brock and Mirman, 1972) and human capital as a third factor of production (Mankiw, Romer, and Weil, 1992).

In spite of these developments, the neo-classical model still does not account for how technological progress occurs (Aghion and Howitt, 2009). Further, the process of innovation and technological diffusion is not specified. Moreover, Aghion and Howitt (2009) argue that these innovations and efforts to diffuse them are economic decisions since they imply costs and benefits, and are therefore made by economic agents seeking profit. In addition, Jones and Manuelli (2005) question why, if cross-country differences in economic growth rates and welfare are merely due to differences in access to innovations, should access to these innovations differ amongst various countries? The neoclassical model leaves the rate of technological change and innovation exogenous and hence unexplained. Therefore the model cannot explain sustained long-run growth and cross-country differences in growth outcomes. This basic weakness in the Solow-Swan (1956) model was the driving force behind the development of endogenous growth models (Aghion and Howitt, 2009).

2.2 Endogenous Growth Models

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Technological change, as previously argued, depends on economic decisions because industrial innovations, the accumulation of human capital, the funding of science and the diffusion of technology require the commitment of financial resources (Aghion and Howitt, 2009). Endogenous growth theories take some of this endogeneity into account in modelling the long-run growth rate. Further, by integrating endogenous technology into growth theory, endogenous growth models imply that economic agents must have an economic incentive to improve technology. In contrast, in the neoclassical model all economic output accrues to labour and capital and none to innovation (Aghion and Howitt, 2009).

2.2.1 The AK Model

The first endogenous growth model, the AK model which is based on Arrow's learning by doing theory, maintained the competitive equilibrium assumption of the neoclassical model and endogenised growth by relying on external accumulation of knowledge by firms. Arrow (1962) argued that technological progress is attained through a process of learning-by-doing by a collective of firms in the production process. However, this learning by doing was deemed exogenous to individual firms in their own production of capital goods.

Formally, the aggregate production function in the AK model is linear in the homogeneous stock of capital:

$$Y = AK, \tag{3}$$

with A the productivity parameter and capital accumulates according to the same transition equation as the neoclassical equation:

$$\Delta K = sY - \delta K$$

And thus the economy's long-run growth rate is:

$$g = \frac{\Delta K}{K} = sA - \delta \quad (4)$$

The AK model, unlike the neoclassical model, suggests that capital accumulation and the resultant learning-by-doing during the accumulation process causes technological progress that increases the marginal return to capital and, thereby counteracting the effects of decreasing marginal returns to capital noted by Solow (1956). Further, the model implies that by increasing savings and improving the efficiency of resource allocation, countries can attain a higher long-run growth rate.

However, the AK model does not differentiate between capital accumulation and technological change. The physical and human capital that is accumulated as well as the intellectual capital that results from externalities are aggregated as the same variable. Therefore, when using this model, we can't determine whether economic growth is due to capital accumulation and/or innovation and similar to the neoclassical model, technology is not endegonised. Firms maximise their profit by merely paying labour and capital their marginal products, without offering any additional payment for innovation (Aghion and Howitt, 2009).

The AK model was initially developed by Harrod (1939) and Domar (1946) and advanced by other scholars to account for inter-temporal consumer maximization (Romer, 1986), human capital accumulation (Lucas, 1988), the impact of fiscal policy (King and Rebelo, 1990) and the terms of trade (Acemoglu and Ventura, 2001) on growth.

2.2.2 The Product Variety Model

The shortcomings of the AK paradigm led scholars to develop innovation-based growth models. Romer (1987), using the monopolistic competition framework developed by Dixit and Stiglitz (1977), introduced an endogenous model of growth based on increasing product variety. The production function takes the form:

$$Y_t = \sum_{0}^{Nt} K_{it}^{\propto} \, di \qquad (5)$$

Where Nt denotes different varieties of intermediate product and Kt the capital stock. Aggregating, the production function yields:

$$Y_t = N_t^{1-\alpha} K_t^{\propto} \qquad (6)$$

Based on Young's (1928) argument that increased specialisation stimulates and supports growth, Romer (1990) submitted that productivity growth comes from an expanding variety (Nt) of specialized intermediate products (innovations) and the growth rate of Nt determines the growth of output per capita. He argued that an increase in Nt increases output by allowing a given capital stock to be shared amongst an increased number of products that display diminishing marginal returns. In this model technology is a non-rival, partially excludable good and thus, perfectly competitive markets are rejected. Each novel innovation is compensated by monopoly rents and it is the expectation of these rents that encourages entrepreneurs and research activities aimed at finding new varieties. Moreover, a growing set of product varieties of the same quality prevents aggregate capital from running into diminishing returns, hence sustaining long-term economic growth.

Romer's (1990) thesis was based on, firstly, the premise that technological change is crucial to economic growth. Secondly, on the assumption that technological change results from the intentional actions of profit maximising economic agents. Lastly, on the notion that the defining characteristic of technology is that it can be reproduced at zero cost once the initial fixed development costs have been incurred (Aghion and Howitt, 2009).

The main inferences that can be derived from the product variety model are that an economy with a higher stock of human capital will exhibit faster growth, the rate of technological change is susceptible to the rate of interest and lastly, free international trade can enable faster growth (Romer, 1990). Empirical papers have tested Romer's (1990) product variety model with mixed results. Broda, Greenfield and Weinstein (2006) used trade data to test whether imported goods that result in greater product variety increased productivity and found support for the effects of product variety on productivity levels and growth. The results suggest that imported variety has a small impact on productivity in developed countries whereas the impact of new varieties in developing countries is substantially higher.

However, Aghion and Howitt (2009) suggest that product-variety model seems significant because it assumes away the obsolescence of old intermediate inputs. They observe that if old technology was rendered redundant by new innovations, the product variety parameter in Solow residual would decline thus increasing the impact of diminishing returns to capital and reducing per capita growth. In addition, they note that the model suggests that exit is damaging to growth because it diminishes product variety. However, Comin and Mulani (2007) and, Fogel, Morck and Yeung (2008) have found that both exit and entry and the turnover of dominant firms are

positively associated with innovation and per capita GDP growth, supporting Aghion and Howitt's (2009) basic thesis.

2.2.3 The Schumpeterian Model

The shortcomings of the Romer (1990) approach led Aghoin and Howitt (2006) to develop a model of endogenous growth based on Schumpeter's (1934) notion of creative destruction that could account for the impact of entry and exit on the growth process. In Schumpeterian growth theory, growth comes from quality-improving innovations and key economic variables such as the country's distance to the technological frontier or how its degree of financial development affect economic growth have an impact on the rate of economic growth (Aghoin and Howitt, 2006). In particular, the Schumpeterian paradigm implies that faster economic growth generally implies a higher rate of firm turnover, because a process of creative destruction generates entry of new innovators and exit of former innovators.

Schumpeterian theory begins with a production function specified at the industry level:

$$Y_{it=}A_{it}^{1-\propto}K_{it}^{\propto}, \qquad where\ 0 <\propto< 1 \tag{7}$$

A_{it} is a productivity parameter for industry *i* at time *t.* In this equation K_{it} is the capital stock used in this industry. Schumpeterian theory assumes that all sectors are similar. Thus, aggregate output is merely the summation of sector specific output Y_{it} . Thus aggregate output is basically the Cobb-Douglas aggregate production function:

$$Y_t = A_t^{1-\propto}K_t^{\propto}, \tag{8}$$

where the technology parameter, A_t , is the weighted aggregate sum of industry specific A_{it}'s. Similar to Solow's model, economic growth depends on the growth of the productivity parameter A_t.

The Schumpeterian paradigm submits that growth is generated by a random sequence of quality-improving innovations. It embodies Schumpeter's (1942) idea of "creative destruction". Thus, growth results from innovations that raise productivity by improving the quality not merely the quantity of product varieties. The entrepreneurial process is endogenised by taking into account the costs of research and the likely rewards of successful innovation. Further, Schumpeterian theory suggests that there are two inputs to the innovation process, namely:

- "the private expenditures made by the prospective innovator, and
- the stock of innovations that have already been made by past innovators".

Therefore a country can merely be implementing existing technologies (U_n) or conducting radical innovation(U_m). The adjustment in the aggregate technology parameter A_t is:

$$A_{t+1} - A_t = U_n(\gamma - 1)A_t + U_m(\bar{A} - A_t) \quad (9)$$

And the economic growth rate:

$$g_t = (A_{t+1} - A_t)/A_t = U_n(\gamma - 1) + U_m(a^{-1} - 1), \quad (10)$$

where

$a_t = A_t/\bar{A}$

is a measure of relative development or the distance to the technological frontier.

Schumpeterian theory also suggests that the stock existing of innovations and the incremental innovations facilitated by private expenditures made by entrepreneurs, are both factors that affect the rate of innovation. The theory further implies that countries that are well developed and technologically sophisticated tend to focus on radical innovation, that is, they launch technological innovations that surpass the best technology available. Conversely, developing countries are in catch-up mode and as a consequence, they tend focus on assimilating existing innovations that help them draw near the global technology frontier. In the latter case the innovation is just implementing technologies that have been developed elsewhere. Therefore, growth in Schumpeterian theory is highly context-dependent. Accordingly, the theory is well suited to assessing how a country's growth outcomes will differ with its closeness to the technological frontier and the degree to which the country is likely to converge to that frontier and critically, what kinds of economic policy adjustments are necessary to maintain growth as the country approaches the frontier (Aghoin and Hewitt, 2006).

Moreover, the Schumpeterian growth paradigm emphasizes creativity and innovation. In contrast, the AK approach emphasizes saving and capital accumulation as important to growth. Further, unlike the product variety model, where innovation causes productivity growth by creating new, but not necessarily improved varieties, the Schumpeterian model explicitly models radical innovation and assigns an important role to entry and exit of firms and the mobility of workers. This is supported by Aghion, Blundell, Griffith, Howitt, and Prantl (2004) who investigated the effects of technologically advanced entry-threat on average TFP growth of incumbent UK manufacturing establishments. They found that entry-threat tends to increase the average productivity growth of existing firms. Similarly, Comin and Mulani (2007) have found that industry turnover is positively related to earlier

R&D. In addition to these results, Fogel, Morck and Yeung (2008) studied large corporate firms in 44 different countries over the 1975-1996 period and found that GDP growth is positively associated with the turnover of dominant firms.

2.3 The Knowledge Spill-over Theory of Entrepreneurship

Although the Schumpeterian paradigm takes into account quality-improving innovations that raise productivity by improving the quality and not merely the quantity of product varieties, it does not account for how these quality improving innovations are disseminated. Similarly, the Solow, AK and product variety models also do not explain how new knowledge is dispersed. They assume that innovation automatically spills-over and is commercialized. These models infer investments in R&D and human capital mechanically impact output and that new knowledge is equivalent to economic knowledge.

However, Audretsch and Keilbach (2005) contend that new knowledge which is generated by innovation is not merely non-excludable and non-exhaustible but it also has a greater degree of uncertainty, higher asymmetries and greater transactional costs than the other factors of production such as labour and capital. Further, they note that when it comes to innovation, there is also uncertainty about the production process and as a result, whether sufficient demand for the new product exists. In addition, Anselin, Varga and Acs (2000) and Cohen, Goto, Nagata, Nelson and Walsh (2002) find that knowledge diffusion is constrained by geography and transaction costs. Therefore, acquiring technological capabilities through knowledge diffusion is not costless and thus is endogenous. Knowledge diffusion mechanisms that have been identified in literature are:

- the scientific literature and patents (Deng, 2007),

- networks, spin-offs from firms and knowledge institutions (Audretsch and Feldman, 1996 and Powell , Koput, and Smith-Doerr, 1996),
- human capital mobility (Moen 2005),
- international trade, foreign direct investments and direct communication (Branstetter, 2006 and Soete and Ter Weel, 1999).

In addition, Audretsch and Keilbach (2005) note that there is a gap between investments in knowledge and the commercialization of knowledge, or economic knowledge. This gap is characterised as the knowledge filter. It is the existence of the knowledge filter, or knowledge not commercialized by existing firms, that generates the knowledge spill-over entrepreneurial opportunities. Audretsch and Keilbach (2005) contend that only entrepreneurship can penetrate the knowledge filter. Entrepreneurs use knowledge generated in one organizational context to create a new firm thus facilitating the spill-over of knowledge and permeating the knowledge filter (Audretsch and Keilbach, 2005).

Moreover, they observe that entrepreneurship and the knowledge filter as well as its impact varies across specific contexts and depends on a broad range of factors, spanning individual characteristics, institutions, culture and laws. As an example they suggest that the differing growth outcomes between the West and the former Soviet Union and her Eastern European allies were due to the Wests' superior institutional context to support entrepreneurship and commercialize investments in new knowledge. They argue that although both the West and the former Soviet Union invested in the creation of new knowledge, the divergence in growth and economic performance emanated from differences in the knowledge filter and the superior capacity in the West for entrepreneurship to help surmount that knowledge filter (Audretsch and Keilbach, 2005). Consequently, by serving as a conduit for

knowledge spill-overs, entrepreneurship provides the missing link between investments in new knowledge and economic growth (Audretsch and Keilbach, 2005). Accordingly, entrepreneurship is an important mechanism permeating the knowledge filter to facilitate the spill-over of knowledge and ultimately generate economic growth.

The knowledge spill-over theory of entrepreneurship endogenised the dissemination of innovations that are not appropriated by institutions that discover them. It challenges the assumptions made by Schumpeterian, product variety and AK growth theories that innovation is equivalent to economic knowledge and further, that this new knowledge automatically spills over. The gap between innovation and new economic knowledge (the knowledge filter), results in a lower level of knowledge spill-over. An entrepreneur is an agent of change, who recognizes an opportunity, penetrates the knowledge filter and ultimately chooses to act on that opportunity by starting a new firm.

What have we learned from reviewing the literature on models of economic growth? The neoclassical model taught us that in the long run, per capita GDP (Y/L) depends on exogenous technological change and the growth rate of the population. The AK model aggregated capital accumulation and technological progress and suggests that increasing savings and improving the efficiency of resource allocation is important for a higher long-run growth rate. Romer (1990) submitted that productivity growth comes from an expanding variety of innovations. Thus countries that seek to attain a higher level of growth should invest in R&D and human capital to increase their product variety.

The Schumpeterian paradigm submits that growth is generated by a random sequence of quality-improving innovations. It embodies Schumpeter's (1942) idea of

“creative destruction”. Thus, growth results from innovations that raise productivity by improving the quality not merely the quantity of product varieties. The Schumpeterian model explicitly models radical innovation and assigns an important role to entry and exit of firms and the mobility of workers. Further, the theory distinguishes between implementing existing innovations and developing new innovations. This implies that countries that are well developed and technologically sophisticated tend to focus on radical innovation and conversely, developing countries are usually in catch-up mode. Audretsch and Keilbach (2005) note that there is a gap existing between investments in knowledge and the commercialization of knowledge (or economic knowledge) because knowledge spill-overs are bounded by geography and transaction costs (Anselin et al., 2000 and Cohen et al., 2000). Audretsch and Keilbach (2005) contend that only entrepreneurship can penetrate the knowledge filter as entrepreneurs use knowledge generated in one organizational context in another, to create a new firm, thus facilitating the spill-over of knowledge and permeating the knowledge filter.

The following section reviews entrepreneurship theory at the firm level. We discuss the nature of opportunity; whether opportunities are discovered or created and link those debates to economics literature. Further, we also formally introduce the construct EO, discuss its dimensions and performance implications; and link it to the aggregate level.

2.4 Entrepreneurship theory

Opportunity is the central construct of entrepreneurship theory (Venkataraman, 1997). Schumpeter (1942) suggested that that creative destruction processes occur when new opportunities displace existing business models. Entrepreneurs are said to find, make and recognize these opportunities (Alvarez and Barney, 2007;

Sarasvathy, Dew, Velamuri and Venkataraman, 2003). Eckhardt and Shane (2003, p. 336) suggest opportunities are “situations in which new goods, services, raw materials, markets and organizing methods can be introduced through the formation of new means, ends, or means-ends relationships.” According to Sarasvathy et al. (2003, p. 142), “An entrepreneurial opportunity consists of a set of ideas, beliefs and actions that enable the creation of future goods and services in the absence of current markets for them”. Likewise, Shane (2003, p. 22) submits that entrepreneurship is “an activity that involves the discovery, evaluation, and exploitation of opportunities to introduce new goods and services, ways of organizing, markets, processes, and raw materials through organizing efforts that previously had not existed.” In fact, Busenitz, West, Shephard, Nelson, Chandler and Zacharakis (2003) contend that opportunity is an important concept that frames the boundary and exchange conditions of the entrepreneurship field.

Entrepreneurship can manifest at different levels of analysis. Amit, Glosten, and Mueller (1993) contend that entrepreneurship can happen within an incumbent firm. In addition, opportunities can also be sold to existing organizations or to other individuals. Shane and Venkataraman (2000) assert that entrepreneurship does not necessitate, but may include, the formation of new firms. Further, they maintain that even though finding an opportunity is a necessary prerequisite for entrepreneurship, it is not sufficient. They argue that it is the uniqueness of opportunities themselves that persuade people to exploit them. Following the discovery of an opportunity, an entrepreneur must still decide whether to exploit the opportunity or not. Additionally, Shane and Venkataraman (2000) suggest that the development of an entrepreneurial opportunity necessitates that the entrepreneur believes that the expected discounted value of the entrepreneurial endeavour will be sufficient to

offset the opportunity cost of other opportunities foregone, the lack of liquidity of the investment of time and money and a premium for bearing risk (Kirzner, 1973; Schumpeter, 1934). They further note that the exploitation of opportunities by entrepreneurs is shaped by the following factors:

- "Large expected demand (Schmookler, 1966; Schumpeter, 1934),
- high industry profit margins (Dunne, Roberts and Samuelson, 1988),
- a young technology life cycle (Utterback, 1994),
- the density of competition in a particular opportunity space is neither too low nor too high (Hannan and Freeman, 1984),
- that the cost of capital is low (Shane, 1996), and
- population-level learning from other entrants is available (Aldrich and Wiedenmeyer, 1993)".

Thus research at the firm level has demonstrated that, on the aggregate, entrepreneurs develop opportunities with greater expected value. However, what are the factors that shape how entrepreneurial opportunities are created or discovered?

Literature suggests that decision biases that affect strategic decision makers (Gaglio, 2004), the availability of social capital (De Carolis and Saparito, 2006), engagement in behavioural, cognitive and action learning (Lumpkin and Lichtenstein, 2005) and past experiences (Bingham, Eisenhardt and Furr, 2007) are some of the factors that have an impact on the discovery, creation and implementation of entrepreneurial opportunities. In addition, Shane (2001) shows that prior distribution of knowledge decides who detects opportunities. Opportunity recognition has also been associated with pattern recognition (Baron and Ensley, 2006) and the ability to observe and experiment (Dyer, Gregersen and Christensen, 2008). Although considerable efforts

have been made to understand the antecedents of opportunities, this research has mainly been conducted at the individual level of analysis. We are still not clear about how opportunities are discovered and exploited at the aggregate level.

Moreover, scholars have also investigated the potential moderators of the individual-opportunity nexus. Moderators include individuals' ability to develop social capital as well as their cognitions (De Carolis and Saparito, 2006), firm age (Patterson, 1993), low opportunity costs (Amit, Muller and Cockburn, 1995), risk and uncertainty (McMullen and Shepherd, 2006) and at the level of the firm, the skills needed to identify opportunities (Hitt, Ireland, Camp and Sexton, 2001). Lastly, research suggests that the outcomes of opportunity development are firm founding (Shane, 2001), small firm growth (Davidsson, 1991) and new venture growth (Thakur, 1999). The emphasis in literature on new firm creation emanating from opportunity exploitation is inspired by Schumpeter's (1934) notion of creative destruction.

2.4.1 Discovery or Creation

As previously stated, opportunity is the fundamental construct of entrepreneurship theory and there is broad consensus in literature that entrepreneurship entails the finding of opportunities as well as the exploitation of those opportunities (Venkataraman, 1997). However, entrepreneurship literature differs on how these opportunities manifest. Are they discovered or created (Alvarez and Barney, 2007)? Thus there is no agreement regarding the nature of opportunities (Hansen and Shrader, 2007). Opportunities are depicted as either existing certainties ready to be discovered or as a representation of an entrepreneur's distinctive vision (Alvarez and Barney, 2007).

Discovery theory posits that vigilant entrepreneurs systematically search the environment for opportunities to provide new services or products. Shane (2003) suggests that political as well as regulatory vagaries, technological transformations, and social and demographic vagaries are a source of these opportunities. Conversely, Sarasvathy and Venkataraman (2011) question how and by whom are these opportunities left for the vigilant entrepreneur to find and cash in? In contrast to discovery theory, they suggest that opportunities emanate from the entrepreneurial process itself. Therefore, creation theory submits that the entrepreneurial process is the vital source of these economic opportunities. In this model, entrepreneurs do not wait for exogenous shocks to form opportunities and then provide agency to those opportunities, they act (Baker and Nelson, 2005; Sarasvathy, 2001a).

Short, Ketchen, Shook and Ireland (2010) suggest that literature will converge to a balanced position that acknowledges that some opportunities are created whereas others are discovered. This debate is analogous to the debate in economics literature that questions whether innovative or imitative entrepreneurship facilitates economic growth. Schumpeterian growth theory suggests that entrepreneurship is highly context-dependent. Consequently, in well developed countries, where the focus is on radical innovation that can't be merely observed by alert entrepreneurs, the emphasis would be on exploration and creation. In contrast, alert entrepreneurs in developing countries that are in catch-up mode, can recognise and implement innovations from advanced countries that help their nations draw near the global technology frontier. Thus, literature at both the aggregate and the firm-level seems to be converging towards the same understanding.

2.5 Entrepreneurial Orientation (EO)

In the preceding section we have reviewed literature on the individual-opportunity nexus and addressed whether these opportunities are created or discovered. In this section we review the literature on firm-level entrepreneurship in particular, EO and link EO to the aggregate level.

Lumpkin and Dess (1996, p. 136) define EO as "the processes, practices and decision-making activities that lead to new entry". Pearce, Fritz and Davis (2010, p. 219) characterize EO as "a set of distinct but related behaviours that have the qualities of innovativeness, proactiveness, competitive aggressiveness, risk taking and autonomy." Gartner (1988) contends that entrepreneurship manifests through actions. This implies that EO is behaviour that can be observed through the display of sustained innovation, risk taking and action that is crucial to the exploration, creation and exploitation of opportunities (Covin and Lumpkin, 2011).

Covin and Lumpkin (2011) assert that the occasional exhibition of entrepreneurial behaviour is insufficient to infer the existence of an EO. This entrepreneurial behaviour has to persist over time for entities to be deemed entrepreneurial. Miller (1983) posits that EO is a construct that encapsulates what it means to be entrepreneurial. Covin and Lumpkin (2011) concur that the construct of EO signifies what it means for a firm to be entrepreneurial at the most basic level. Thus EO is the manifestation of what it means to be entrepreneurial, represented by behaviour sustained over time, which is shared by entities exhibiting entrepreneurship. Table 1 lists the definitions of EO as they have evolved from the early 1970s till today.

Table 1: Definitions of Entrepreneurial Orientation

Mintzberg (1973)	"In the entrepreneurial mode, strategy-making is dominated by the active search for new opportunities" as well as "dramatic leaps forward in the face of uncertainty" (p. 45).
Miller and Friesen (1982)	"The entrepreneurial model applies to firms that innovate boldly and regularly while taking considerable risks in their product-market strategies" (p. 5).
Miller (1983)	"An entrepreneurial firm is one that engages in product-market innovation, undertakes somewhat risky ventures, and is first to come up with 'proactive' innovations, beating competitors to the punch" (p. 771).
Merz and Sauber (1995) ".	"Entrepreneurial orientation is defined as the firm's degree of proactiveness (aggressiveness) in its chosen product-market unit (PMU) and its willingness to innovate and create new offerings" (p. 554)
Lumpkin and Dess (1996)	"EO refers to the processes, practices, and decision-making activities that lead to new entry as willingness to innovate and take-risks, and a tendency to be aggressive toward competitors and characterized by one, or more of the following dimensions: a propensity to act autonomously, a proactive relative to marketplace opportunities" (pp. 136–137).
Zahra and Neubaum (1998)	EO is "the sum total of a firm's radical innovation, proactive strategic action, and risk taking activities that are manifested in support of projects with uncertain outcomes" (p. 124)
Voss, Voss, and Moorman (2005),	"We define EO as a firm-level disposition to engage in behaviours [reflecting risk-taking innovativeness, proactiveness, autonomy, and competitive aggressiveness] that lead to change in the organization or marketplace" (p. 1134, [ ] added).
Cools and Van den Broeck (2007/2008)	"Entrepreneurial orientation (EO) refers to the top management's strategy in relation to innovativeness, proactiveness and risk taking" (p. 27).
Pearce, Fritz and Davis (2010)	"An EO is conceptualized as a set of distinct but related behaviours that have the qualities of innovativeness, proactiveness, competitive aggressiveness, risk taking, and autonomy" (p. 219).

Source: Covin and Wales (2012, p.3)

Although EO has mainly been researched as a firm-level phenomenon (Covin and Lumpkin, 2011), it can also manifest at different levels of aggregation. For example, EO can be exhibited by a firm (Keh, Nguyen and Ng, 2007), a spin-off (Walter et al., 2006) and/or an individual (Poon, Ainuddin and Junit, 2006). In addition, as Miller (2011) has suggested, EO can also manifest at the aggregate level. Further, we note

the anomaly that although the corporate entrepreneurship literature has converged on EO as the appropriate description of entrepreneurial behaviour, literature at the aggregate level, which purports to aggregate firm level behaviour, still measures entrepreneurship as a stock variable and considers only one of the composite elements, innovation, as reflective of entrepreneurial behaviour. Risk taking and proactiveness are ignored. Therefore, in this study, we address this anomaly and view EO as aggregate level sustained behaviour and the appropriate unit of analysis is the nation state. Consequently, we analyse the content of entrepreneurship at the aggregate level.

2.5.1 The Dimensions of EO

The dimensionality of EO has not been resolved in the literature. At the firm level, Miller (1983) has suggested it is a unidimensional construct with the expectation that all three dimensions innovativeness, risk taking and proactiveness are simultaneously displayed. Therefore, we embrace Miller's (1983) conception of EO as a composite of three dimensions: innovativeness, risk taking and proactiveness (Miller, 1983, Covin and Slevin, 1997).

2.5.2 Innovativeness

The first of the three dimensions, innovativeness, is defined by Lumpkin and Dess (1996, p. 142) as a firm's inclination "to engage in and support new ideas, novelty, experimentation and creative processes that may result in new products, services or technological processes". Innovation is classified as either product-market innovation and/or technological innovation and it is an important element of how firms explore or create opportunities and thus it is a vital element of EO.

At the aggregate level, innovation has also been deemed crucial for growth. Theoretically, the Schumpeterian paradigm suggests vertical innovations that replace existing products are the main sources of economics growth. Similarly, Romer (1990) also noted that productivity growth comes from an expanding variety of innovations. Freeman and Soete (1997) concur with the assertion that innovativeness is positively related to growth. However, they contend that innovation is also shaped by the external environment. They argue that innovation interacts with institutions, culture and policies to impact economic growth and therefore it is the broader national systems of innovation that facilitates development, not merely R&D.

The innovation-output nexus also has been empirically verified in the literature (Mansfield, 1981; Hall and Mairesse, 2006). Hasan and Tucci (2010) use global patent data to evaluate the association between both the quality and quantity of innovation as well as economic growth. Employing a sample of 58 countries between 1980 and 2003, Hasan and Tucci (2010) show that both innovation input and output are positively related to GDP growth nearly across all economic stages of economic development. They argue that firstly, countries that host entrepreneurial firms with superior quality patents grow faster and secondly, that an increase in the rate of patenting results in higher GDP per capita.

Innovativeness enhances development by facilitating knowledge flows and technological spill-overs that benefit all enterprises (Griliches, 1992), and improving productivity as well as new firm formation (Kirchhoff, 1994). Similarly, Wennekers and Thurik (1999) find that innovation spurs economy wide productivity, new business formation, employment growth as well as output growth by encouraging entrepreneurial firms to upgrade and diffuse their technological capabilities

(Audretsch, 1995). Therefore, innovativeness is important for countries that seek to increase their product variety and consequently attain a higher level of growth.

2.5.2 Risk taking

The second of the three dimensions, risk taking, is defined by Miller (1983) as the preparedness to commit resources to opportunities and accept business risk without the certainty of knowing whether those resources will be recovered. Shapira (1995) suggests that risk reflects the distribution of uncertain outcomes and their probabilities. Therefore, a risky investment is one for where the variance in outcomes is large. Since decision makers prefer low compared to higher risk (Shapira, 1995), precarious investments in innovation and its diffusion may as a result suffer from a lack of investment. Di Gregorio (2005) suggests that entrepreneurial firms are adept at coping with and surmounting uncertainty. They ameliorate risk by adopting strategies that exploit the existence of uncertainty and the maximization of upside risk. They employ arbitrage/prediction, real options, control and adaptation to exploit opportunities and maximise upside risk. Therefore, firms that employ these entrepreneurial risk management strategies enable investment leading to economic growth.

Furthermore, Comin and Philippon (2006) suggest that firm level risk taking enhances economic growth by reducing aggregate level volatility. Risk taking and the resultant increase in firm level volatility reduce aggregate level volatility by decreasing the correlation of growth rates amongst different firms. Empirically, Comin and Philippon (2006) find that firm correlation with the rest of the economy is somewhat moderated by new firm entry as well as high variance enhancing R&D activity. Similarly, Chun, Ha and Kim (2014) confirm a link between firm

heterogeneity and long-run economic growth. Using U.S. firm-level data they demonstrate that firms' technological heterogeneity enables R&D financiers to diversify, resulting in higher R&D investment and as a consequence, higher long-run economic growth. Therefore, firm heterogeneity occasioned by risk taking may reduce aggregate volatility and enhance economic growth due to the diversification benefit which enables the financing of even more risk taking!

Empirical literature has investigated possible barriers to such investment and risk-taking, such as the lack of financial development. Financial development facilitates risk taking by enabling entry of new competitors as well as reducing collateral constraints (Bernanke, Gertler, and Gilchrist, 1996), leading to lower aggregate volatility and higher growth. King and Levine (1993) have argued that financial intermediaries are useful at identifying entrepreneurs who can manage risks and improve the rate of technological innovation. They analysed cross-country data and found that financial development correlates with long-run economic growth, capital accumulation and productivity growth. Similarly, Rajan and Zingales (1998) used cross-industry sectoral-level data and found that growth in sectors that relied on external finance was positively related to financial development. Thus investment, risk taking and antecedents to risk taking, such as a financial market development, are clearly associated, according to the literature, with economic growth.

2.5.3 Proactiveness

The third and last of the three dimensions, proactiveness, is defined by Miller (1983) as the tendency to engage in strategies of proactive engagement to build the business rather than those of harvest or retrenchment (Miller, 1983). Lumpkin and Dess (1996) suggest that being proactive implies taking initiative to anticipate and

pursue new opportunities. In addition, Venkataraman (1989, p. 949) has described proactiveness as “seeking new opportunities which may or may not be related to the present line of operations, introduction of new products and brands ahead of competition, strategically eliminating operations which are in the mature or declining stages of life cycle". Therefore, using Venkataraman’s (1989) definition, we assert that proactiveness relates to activities of search and discovery of opportunities.

Firm level literature has positively associated EO with international search and discovery activities such as exporting (Ibeh and Young, 2001), internationalization preparation (Knight, 2001), export performance (Mostafa, Wheeler and Jones, 2005) and global technological competencies and unique products development (Knight and Cavusgil, 2004). At the aggregate level, Schumpeterian growth theory provides support for these activities of search and discovery. It suggests that growth can emanate from implementing existing innovations discovered by alert countries. Pietrobelli (1996) suggests that countries that are proactive and engage in activities of search and discovery access existing innovations through:

- “The movement of goods through international trade;
- The movement of capital through inward and outward foreign direct investment (FDI and OFDI)
- The movement of people through migration, travel, and foreign education of students and workers;
- international research collaboration and;
- diffusion through media and internet of disembodied knowledge”;

2.5.4 EO and Performance

Literature on the EO-performance relationship has been mainly at the firm-level. We highlight some of the literature that may have relevance for our study. Rauch et al. (2009) carried out a meta-analysis of 51 research papers that investigated the EO-performance association and they found the "true" correlation between EO and firm performance is 0.24. The EO-performance association has also been examined in emerging economies, with quite fascinating results. Su, Xie and Li (2011) and Tang, Tang, Marino, Zhang and Li (2008) investigated the role of EO in firm performance in a Chinese context. Both studies established that the EO–performance relationship is inverse U-shaped in new businesses whereas it is positive in established firms. They submit that this is "because new ventures suffer from the liability of newness" (Freeman, Carroll and Hannan, 1983 p. 559) and that "established firms have the resources, legitimacies and social ties and role formalization" that new ventures lack.

Rauch et al. (2009) argue that EO exhibits a comparable relation between perceived financial performance, perceived nonfinancial indicators of performance, and archival performance at the firm-level. Further, they suggest that "the EO-performance relationship remains robust to modifications in performance dimensions and common method variance, memory decay or social desirability concomitant with self-reporting of performance does not generally constitute a peril to the validity of the EO-performance relationship" (p. 780). It is importance to note that this EO-performance relation has been only established at the firm level. What are the aggregate level implications?

To conclude, we view EO as a composite of innovativeness, risk taking and pro-activeness. Further, it aggregates the important variables the different economic

schools of thought seem to emphasize: risk taking (the AK model), proactiveness (Schumpeterian model) and innovativeness (Romer's product variety model). In addition, we deem EO to be a sustained behaviour not disposition, unidimensional and the unit of analysis is the aggregate level. Further, we argue that at the aggregate level EO is best characterised as a joint function of innovation, proactiveness and risk taking. We suggest that this is the appropriate definition of entrepreneurship at the aggregate level and that entrepreneurial countries manifest innovative, risk taking and proactive behaviour. Further, context matters at the aggregate level. This is consistent with the arguments of Miller (1983) and Covin and Slevin (1989) and Schumpeterian theory. In the following paragraphs, we will review literature on the entrepreneurship growth-nexus and ask: do countries that innovate, take risks and act, achieve higher GDP per capita growth?

2.6 The entrepreneurship growth-nexus

Entrepreneurship is deemed important to economic growth. Audretsch, Keilbach and Lehmann (2006, p. 5) argue that "entrepreneurship makes an important contribution to economic growth by providing a conduit for the spill-over of knowledge that might otherwise have remained un-commercialized." Entrepreneurs are deemed to engage in innovation and business activities that lead to knowledge spill-over, technological progress and innovation (Audretsch and Feldman, 1996), thus facilitating economic growth. In empirical analyses Audretsch and Keilbach (2004) find that entrepreneurship has a positive relationship with growth in industrial and transition countries. Similarly, Berkowitz and Dejong (2005) find that entrepreneurship in post-Soviet Russia, subject to institutional and policy constraints, is positively related to growth. Further, McMillan and Woodruff (2002) compare entrepreneurship in four transition economies and find that the relative success of a transition program is

shaped by the quality of entrepreneurs in the transition economy. Likewise, Acs, Audretsch, Braunerhjelm and Carlsson (2012) investigate the relation in 18 countries using panel data and find that entrepreneurship; R&D and human capital are positively associated with economic growth. Lastly, van Praag and Versloot's (2007) meta-analysis of 57 studies finds that entrepreneurs contribute to employment creation, productivity growth and innovation.

However, van Stel, Carree and Thurik (2005) suggest that the entrepreneurship-growth nexus is non-existent in developing or poorer countries and the impact of entrepreneurship on growth seems to depend on context. Wong, Ho, and Autio (2005) submit that entrepreneurial activities in developing countries do not equate to higher economic growth. Larroulet and Couyoumdjian (2009) suggest that in Latin American countries the link between entrepreneurship and growth is low since the high levels of entrepreneurship exhibited do not lead to high levels of economic growth. Naude (2011) submits that this weak relationship in developing countries is largely because most entrepreneurs in poor countries operate in the informal sector and informality in poor countries is a way of escaping poverty and starvation. Naude (2011) contends that given the nature of informality, necessity entrepreneurial endeavors are less likely to be productive, compared to opportunity entrepreneurship**.** Similarly Beck, Demirguc-Kunt and Levine (2003) posit that informal entrepreneurs are generally not seen as drivers of economic growth and consequently, Banerjee and Duflo (2007, p. 162) warn that "it is important not to romanticize these penniless entrepreneurs."

In spite of the preceding paragraph, the inconsistent link between entrepreneurship and growth is not merely because of the presence of informal sector entrepreneurs in poor countries. Koellinger (2008) suggests that the majority of business start-ups

in developed countries also engage in marginal, replicative economic activity or fail soon after their foundation. Further, he notes that the potential impact of these marginal entrepreneurs on the macro-economy is trivial. Likewise, Bowen and de Clercq (2008) submit that marginal entrepreneurs are motivated by a lack of employment alternatives and thus, an upsurge in unemployment during recessions prompts growth of marginal entrepreneurship (Thurik, Carree, Van Stel and Audretsch, 2008 and Faria, Cuestas and Mourelle, 2010). In both developed and developing economies, informal replicative entrepreneurs who are not innovative proliferate. Baumol, Litan and Schramm (2007, p. 3) note that "replicative entrepreneurship is important in most economies because it represents a route out of poverty, a means by which people with little capital, education, or experience can earn a living. But if economic growth is the object of interest, then it is the innovative entrepreneur who matters." Clearly, this implies that the causes of the weak link between entrepreneurship, defined as a stock variable, and growth are less causal and deeper than the informal sector in poor countries.

We submit that the confusion emanates from the theoretical and empirical misunderstanding of the entrepreneurship-growth nexus. In economics literature, the Solow model (1956), Romer's (1990) product variety model and the Schumpeterian growth model, economic growth is generated by technological change. Whereas Solow's model does not account for how technological change comes about, Romer (1990) endogenizes technological change by submitting that it is a result of knowledge and human capital accumulated within the economy. The Schumpeterian model adds vertical innovation to the endogenous growth model based on Schumpeter's (1934) notion of creative destruction that could account for the impact of entry and exit on the growth process. Thus the theoretical literature on

endogenous growth submits that technological change, which is occasioned by entrepreneurship, is vital for economic growth.

However, in some empirical work this technological change is merely defined as expenditure on R&D. This characterization does not explain how innovation is diffused. As Schumpeter (1912, pp. 88-89) noted:

"Economic leadership in particular must hence be distinguished from 'invention'. As long as they are not carried into practice, inventions are economically irrelevant. And to carry any improvement into effect is a task entirely different from the inventing of it, and a task, moreover, requiring entirely different kinds of aptitudes. Although entrepreneurs of course may be inventors just as they may be capitalists, they are inventors not by nature of their function but by coincidence and vice versa ... it is, therefore, not advisable, and it may be downright misleading, to stress the element of invention as much as many writers do".

Minniti and Lévesque (2010) argue that literature on economic growth concentrates on R&D since historically there has been a positive association between growth and sustained research investments (Peretto, 1999). However, Acs, Arenius, Hay and Minniti (2005) note that countries, such as Sweden and Japan, which have large R&D expenditure compared to China, have experienced zero or low growth whereas China has grown significantly with minimal R&D expenditure (Hsiao and Shen, 2003).

Where researchers have also sought to directly measure entrepreneurship, Koellinger and Thurik (2012) contend that the definition of entrepreneurship they use seems to change to fit the results. They argue that scholars have erroneously used the self-employment ratio, R&D expenditure, total entrepreneurial activity (TEA) of the GEM, opportunity entrepreneurship and the ratio between necessity and opportunity as an indicator of entrepreneurship only if it seems positively associated with economic growth. The only common factor with these measures is that they

deem entrepreneurship to be a stock variable or they only consider one of the composite elements, innovation, as a reflection of entrepreneurial behaviour. Risk taking and proactiveness are ignored.

However, as we have argued in the preceding paragraphs, at the aggregate level entrepreneurship is best characterized as EO. Therefore, innovative countries also have to assume risks, invest and proactively attack international and domestic markets in diffusing the technologies in order to grow. It follows that merely counting the number of new firms and/or the number of self-employed will tell us very little about innovation, risk taking and pro-activeness and consequently nothing about entrepreneurship and growth. As we have noted in the preceding paragraphs, marginal entrepreneurs, for example street vendors (Sonobe, Akoten and Otsuka, 2011), do not innovate, do not take risks and are certainly not proactive. Thus, the studies assessing the entrepreneurship-growth nexus have shown conflicting results precisely because they have not been studying what they are purporting to study. Moreover, although the relationship between entrepreneurship and economic growth is often assumed, the exact nature of such a relationship is still unknown (Minniti and Lévesque, 2010), since EO has not been investigated at the aggregate level.

2.7 Institutional and policy drivers of entrepreneurship

We have a limited understanding of why rates of EO vary across countries and why some countries may be more innovative, risk taking and pro-active than others. As previously stated, EO has been researched mainly as a firm level phenomenon and antecedents such as firm size, technology and environmental hostility have been identified (Raunch et al., 2009). However, at the aggregate level potential drivers have not been investigated.

Entrepreneurship literature suggests institutions and policy variables such as the stock of human capital are possible antecedents of entrepreneurship. Economic growth in Schumpeterian theory is highly context-dependent, thus we would expect the effect of institutions and the stock of human capital on entrepreneurship to vary depending on the distance to the technological frontier. Naude (2011) argues that institutions help create an environment where entrepreneurship can thrive and help economic growth. Vivarelli (2012) suggests that institutions may be particularly important in developing countries where entrepreneurs face a hostile environment in comparison with developed economies. Howitt (2000) submits that countries behind the technological frontier, will exhibit more replicative entrepreneurship partly because of institutional barriers and poor education. Larroulet and Couyoumdjian (2009) contend that weak institutions occasion risk-averse investment behavior as seen in societies with financial-market constraints and politic instability. In addition, they note that the quality of entrepreneurship also varies because of international differences in the stocks of human capital. Therefore, they assert that the lack of human capital as well as weak institutions may explain the weak relationship between entrepreneurship and economic growth in poor countries.

Although institutions may indeed be important in shaping entrepreneurship, Naude (2011) argues that a number of dynamics muddle our understanding of the role of institutions. Firstly, he suggests that institutions are endogenous and as a result are a product of economic development; secondly, entrepreneurs themselves may shape institutions; thirdly, policy reforms required to create good institutions may be contingent and subject to other factors; fourthly, institutional reform may result in the further entrenchment of parasitic elites and a rise in rent seeking behavior and lastly, inequality may impact institutional reforms and institutional building.

Nevertheless, institutions and policies have largely been investigated in literature as determinants of economic growth. However, we argue they are, correctly, the determinants of risk taking, proactiveness and innovativeness, and not necessarily direct determinants of economic growth. Therefore, institutions and policies enable EO, thus facilitating economic growth. As Abramovitz (1994, p. 24) suggests, the determinants and drivers of technological upgrading can be characterised as the "countries' level of education and technical competence, the commercial, industrial and financial institutions that bear on their abilities to finance and operate modern, large-scale business, and the political and social characteristics that influence the risks, the incentives and the personal rewards of economic activity". Therefore, we investigate financial market development, social cohesion, human capital and the control of corruption as potentially important factors that may affect the rate of entrepreneurship across countries (Biggs and Srivastava, 1996, Aterido et. al, 2009). In the following section, we will review literature on these potentially important determinants and drivers of EO.

2.7.1 Financial Market Development

To begin with, Schumpeter (1912) made the theoretical argument that financial institutions are important for growth because they evaluate and finance entrepreneurs' innovation and launching of new products to market and thus their absence would inhibit EO and consequently decrease the rate of economic growth. Levine (2005, p.6) concurs and posits that "financial development involves improvements in the (i) production of ex ante information about possible investments, (ii) monitoring of investments and implementation of corporate governance, (iii) trading, diversification, and management of risk, (iv) mobilization

and pooling of savings, and (v) exchange of goods and services". Thus financial institutions, through executing these functions, may affect savings and investment decisions and consequently economic growth.

The relation between financial development and growth has also been evaluated empirically. King and Levine (1993) evaluate the relation between financial development and growth amongst 77 countries during the 1960 to 1989 period. They find that financial development is positively associated with long-run growth across developed and developing countries as well as sub-Saharan African countries. Beck, Levine and Loayza (2000) employ panel VAR estimates and show a similarly significant, positive causal effect of financial development on economic growth. Furthermore, countries with high levels of financial market development are better able to support the growth of capital intensive industries (Rajan and Zingales, 1998 and Beck, Demirgüç-Kunt, Laeven and Levine, 2008). In contrast, developing countries are unable to support infant industries since firms are credit and equity rationed (Ayyagari, Demirgüç-Kunt, and Maksimovic, 2008).

Financial institutions and markets ease the trading, hedging, and pooling of risk, thus impacting economic growth by varying resource distribution and savings rates. This encourages investment in projects with higher risk and superior expected returns (Devereux and Smith, 1994; Obstfeld, 1995 and Rajan and Zingales, 1998). Thus, financial sector distortions can inhibit entrepreneurship and consequently decrease the rate of economic growth (King and Levine, 1993). Levine (2005, p. 85) summarises the empirical literature on the link between financial development and growth and concludes that "the preponderance of evidence suggests that both

financial intermediaries and markets matter for growth even when controlling for potential simultaneity bias".

However, Khan and Senhadji (2003) question the association between banking development indicators and economic growth. They show that when using panels to estimate growth equations, this relation becomes statistically insignificant. Likewise, Zhang (2003) employ both panel data and time-series data for 8 Asian countries for the1960-99 period and demonstrate that banking development hinders economic growth. Levine (2002) suggests that these contradictory results could be because banks with market power may extract a greater share of future profits from firms than they should; secondly, banks are conservative and thus a large banking sector may hinder firm innovation and growth; and lastly, in firms with poor cooperate governance, banks may connive with inefficient managers if these managers serve their interests (Black and Moersch 1998).

Shen and Lee (2006) also investigate the relationship between financial development and real GDP per capita growth in 48 countries. They demonstrate that only stock market development has a positive relation with economic growth. On the other hand, banking development hinders growth especially in middle-income, Latin American, Sub-Saharan African and East Asian countries. Lee and Mathews (2010) argue that for developing countries, it's not only the size of the banking sector that matters but the manipulation of interest rates. Interest rates should be kept low for industries targeted for catch up and allowed to float higher in non-targeted sectors. They note all the successful countries of northeast Asia followed this policy of "financial restraint" (Hellman, Murdock, and Stiglitz, 1997).

2.7.2 Social Cohesion

Social cohesion is defined by Easterly (2006, p. 4) as “the nature and extent of social and economic divisions within society”. Baumol et al. (2007) posit that in many unequal societies the existence of unproductive, parasitic elites may frustrate entrepreneurship. Similarly, Persson and Tabellini (1991) submit that inequality is harmful to economic growth. Using two data sets, the first one pools data from the 19th century for the U.S. and eight European countries and the second one is comprised of data from a broad section of both developed and developing countries. They find that for both samples inequality is negatively related to economic growth. Persson and Tabellini (1991) argue that this negative relation exists since in a society with distributional conflict growth promoting activities such as the accumulation of capital and the production of knowledge are likely to be constrained. Socially cohesive countries are therefore more likely to support EO because of their greater ability to collaborate and develop innovations. Further, the risks inherent in uncertain, long-term investments are more likely to be borne by all members of society, not just the poor. Moreover, the proactive actions necessary to attack new markets require purposeful, cohesive action that is more likely in cohesive societies with agreed on long-term objectives than other scenarios.

In contrast, Forbes (2000) finds a positive relationship between inequality and growth. Banerjee and Duflo (2003) suggest changes in inequality in either direction lower growth. Similarly, Barro (2000) also finds that association between inequality and growth depends on the level of economic development. He finds that higher inequality lowers growth in poor countries whereas it promotes growth in developed countries. He submits that the Kuznets curve, which implies a decline in inequality

with rising income, is a clear empirical regularity. Shin (2012) explains Barro's (2000) findings by suggesting that in developed countries the rich save more than the poor, thus enabling the capital accumulation necessary for growth. Therefore any income redistribution would reduce the savings needed for investment and growth. In contrast, the poor are under credit constraint in developing countries. As a result they do not participate in investing or production activity. Further, in volatile and poor countries, income inequality may lead to political and social instability that causes economic growth to decline. Likewise, Berg and Ostry (2011) suggest that higher inequality is robustly associated with a lack of growth persistence. They note that even poor countries have been able to attain high rates of growth for a few years. However, these countries have lacked the ability to sustain it. Berg and Ostry (2011) submit that closing the inequality gap could help poor countries enjoy longer growth spells.

2.7.3 Corruption

Baumol (1990) argues that corruption has a negative impact on entrepreneurship, which we define as EO. He contends that based on the quality of prevailing economic, political and legal institutions, entrepreneurship can be productive (innovation) or unproductive (rent seeking, corruption or organized crime). Likewise, Anokhin and Schulze (2009) note that high corruption may increase levels of uncertainty and transactions cost for an entrepreneur and consequently reduce the number of positive net present value opportunities that can be exploited. Thus reducing corruption may increase the number of innovative opportunities that are exploited. In empirical analysis, Anokhin and Schulze (2009) find a positive association between the control of corruption, productivity and investment in

innovation and entrepreneurship. Likewise, a positive relationship between the control of corruption and capital investment and foreign direct investment (Lambsdorff, 2003), per capita growth in GDP (Kaufmann and Kraay, 2003), bond spreads (Ciocchini, Durbin and Ng, 2003), and total factor productivity (Lambsdorff, 2003; Rivera-Batiz, 2002), has been established.

However, Ehrlich and Lui (1999) argue that higher corruption does not necessarily have a negative impact on economic growth. They find that corruption mediates the relation between growth and bureaucratic inefficiency such that, in countries with inefficient administration, corruption may facilitate growth. Similarly, Aidt, Dutta and Sena (2008) show that when corruption reduces bureaucratic meddling, its negative impact on growth is reduced. Further, Olken (2005) suggests that the majority of empirical studies do not measure objective corruption instead they calibrate people's subjective perceptions of corruption. He examines villager's perspective on corruption using both perception-based and objective measures. He finds that perceptions of corruption amongst villagers are affected by social trust and ethnic heterogeneity and cautions that using perceptions to measure corruption in countries that are not socially cohesive may lead to misleading results.

Evrensel (2010) suggests the relationship between high corruption and growth may be more nuanced. He argues that high corruption may have negative relations with both economic growth and economic growth volatility. Evrensel (2010) uses the Ehrlich–Lui (1999) framework to study the corruption-economic growth volatility relation, using a cross-section dataset that contains 121 developed and developing countries. He finds that a higher control of corruption leads to reduced growth volatility. He posits that corruption may lead to increased growth volatility because

corrupt bureaucrats arbitrarily change economic policy, resulting in higher uncertainty and lower expected returns for investment. In particular, he contends that corruption may increase political instability which would then result in increased growth volatility.

2.7.4 Human Capital

Policy variables such as human capital have also been strongly associated with innovation and growth. Becker (1964) defines human capital as skills and knowledge that individuals acquire through investments in schooling, on-the-job training and other types of experience. Borensztein, Gregorio, and Lee (1998) find that human capital accumulation is crucial in absorbing spill-overs from FDI. Dakhli and De Clercq (2004) find strong support for the positive relationship between human capital and innovation. Millán, Congregado, Román, Praag and Stel (2012) find that a high share of people in a region holding tertiary education is also positively associated with the entrepreneur's productivity. Further, Baptista and Mendonça (2010) posit that local access to knowledge and human capital significantly affects entry by knowledge-based firms. In particular, high stocks of human capital enhance the relationship between entrepreneurship and economic growth by enabling entrepreneurs to pursue better quality opportunities (Larroulet and Couyoumdjian, 2009).

Schumpeterian models suggest that human capital is the critical factor that determines a country's ability to imitate and learn advanced foreign technologies (Nelson and Phelps, 1966; Stokke, 2008). Unlike Acemoglu, Johnson and Robinson (2001), who emphasize the importance of institutions, Glaeser, Porta, Lopez-de-Silanes and Shleifer (2004) argue that Western colonizers facilitated development in

their colonies through the higher human capital they possessed, not institutions. Lee and Kim (2009) also argue that human capital is an important policy variable that facilitates technological upgrading amongst countries, therefore facilitating economic growth. They suggest that policy differences such as encouraging tertiary education and innovation can help explain the divergent outcomes in growth between East Asian economies and other middle income countries. Further, in empirical analysis using cross-section, fixed-effects panel and system-GMM estimations, Lee and Kim (2009) find that whereas secondary education and institutions are significant in enabling growth in lower-income countries, improving innovation and higher education is the "binding constraint" in upper middle-to- high income countries. An implication that can be drawn from the preceding literature is that levels of EO could be influenced by human capital since firstly, by definition EO is entrepreneurship and secondly, human capital directly impacts one of the composite elements of EO, innovation.

2.8 Summary and Conclusion of literature review

Schumpeter (1942) delineated an economic process of creative destruction and where the competitive entry of innovative new firms propelled the dynamic development of the economy. But how can this process of economic growth, which leads to a higher GDP per person and increased consumption, be initiated? To answer this question, we adopt the Schumpeterian paradigm which suggests that growth is generated by a random sequence of quality-improving innovations and embodies Schumpeter's (1942) idea of "creative destruction" together with a knowledge spill-over theory of economic growth that suggests that entrepreneurship is crucial to both imitation and dissemination of new innovations.

Moreover, we investigate the nation state as our basic unit of analysis. We ask: can one nation state devote more resources to innovative activity, take risks and invest more in longer term, uncertain outcomes and be more pro-active in diversifying its economic base than others? We also note the anomaly that although corporate entrepreneurship literature has converged on EO as the appropriate description of entrepreneurial behaviour, literature at the aggregate level, which purports to sum firm level behaviour, still measures entrepreneurship as a stock variable and further, considers only one of the composite elements, innovation, as a reflection of entrepreneurial behaviour. Risk taking and proactiveness are ignored.

Furthermore, we proceed to review empirical literature on the entrepreneurship-growth nexus and ask: How do entrepreneurial countries perform? We find an inconsistent link between entrepreneurship and growth is not merely because of the presence of informal sector entrepreneurs in poor countries. The literature suggests that the causes of the weak link between entrepreneurship, defined as a stock variable, and growth may be broader than the informal sector in poor countries since developed countries also show similar and inconclusive results.

In conclusion, the main insight we ascertain from the review of literature is that theory suggests that entrepreneurship causes growth. However, the empirical results are inconclusive. We posit that the weak empirical link between entrepreneurship and growth emanates from the theoretical and empirical misunderstanding of the entrepreneurship-growth nexus. To remedy this concern, we propose EO as the manifestation of entrepreneurship. Thus, we define and measure EO at the aggregate level and assess its' impact on economic growth.

Chapter 3

DEFINING AND MEASURING EO AT THE AGGREGATE LEVEL

Introduction

In this chapter, we define the sub-constructs of EO, and carefully and methodically confirm both the validity and dimensionality of the second-order construct. EO as composite of innovativeness, risk taking and pro-activeness aggregates important variables that the disparate economic schools of thought seem to emphasize but view as distinct: risk taking (the AK model), proactiveness (Schumpeterian model) and innovativeness (Romer's product variety model).

As we discussed in the review of literature, the theoretical literature on endogenous growth submits that technological change, which is occasioned by entrepreneurship, is vital for economic growth. However, in empirical work this technological change has been reduced to invention without explaining how innovation is diffused. Where researchers have argued that entrepreneurship is critical for diffusing knowledge, they have measured entrepreneurship as a stock variable without justifying how simply increasing the number of self-employed linearly, inevitably results in technological change.

Moreover, we note the anomaly that although corporate entrepreneurship literature has converged on EO as the appropriate description of entrepreneurial behaviour, literature at the aggregate level, which purports to aggregate firm level behaviour, still measures entrepreneurship as a stock variable and considers only one of its composite elements, innovation, as reflective of entrepreneurial behaviour. Risk taking and proactiveness are ignored. We argue that invention is not

entrepreneurship and therefore it is not sufficient to drive technological change. Innovations are by definition risky and need investment to be turned into products, firms or divisions of firms. Further, these products may still need to be proactively marketed in order to secure both domestic and international markets. Therefore, we address this anomaly and view EO as aggregate level sustained behaviour that is a composite function of innovativeness, risk taking and proactiveness.

We define EO at the aggregate level as a joint function of enhancing innovative capabilities, investing in risky, unique and uncertain sectors, and proactively seeking new markets and advanced technology. We suggest that this is the appropriate definition of entrepreneurship at the aggregate level and it delineates whether countries are entrepreneurial or not.

3.1 Research Design

The research design involves secondary, longitudinal, panel data. Brooks (2008) notes that panel data contains both cross-sectional and time series elements and thus enables us to study our subject of interest over time. He suggests that the advantages of using panel data are that:

- firstly, it allows us to study a broader range of problems compared to pure time series or cross sectional data,
- secondly, it allows us to study how relationships between variables change over time and,
- thirdly, it enables us to counter the impact of omitted variable bias in regression results.

In addition, secondary data is non-reactive, has high face validity and is quantifiable and thus there is no response bias (Nadler, 1977). The potential limitations of secondary data are:

- it is difficult to access,
- it has potential validity problems, and
- it can lead to coding and interpretation errors.

We note these concerns and proceed to construct a secondary data set from the CANA panel database and the World Bank's World Development Indicators (WDI). The CANA database is a recently constructed dataset comprising of 41 indicators for 134 countries for the period 1980-2008 which contains no missing data (Castellacci and Natera, 2011). Castellacci and Natera (2011) posit that missing data results in developing and less developed economies being neglected when undertaking quantitative studies of innovation, growth and development. They employ Honaker and King's (2010) imputation procedure to estimate these missing values and thus obtain a complete dataset. To ensure reliability, they:

- first, compare the descriptive statistics of the complete versus the original data;
- second, they conduct a graphical inspection of their kernel density graphs and
- third, they evaluate the respective correlation tables to ensure that the complete data set and the original dataset come from the same distribution.

Reliability analysis of the imputed CANA dataset confirms that its' statistical distribution is similar to that of the original data.

The indicators of the imputed CANA dataset measure innovation, social capital, and economic competitiveness, the quality of institutions, human capital and infrastructures. Thus the variables royalty and license fees payments, US patents, scientific and technical journal articles, R&D, domestic credit, secondary enrolment ratio, tertiary enrolment ratio, Internet users, the control of corruption and our measure of inequality, the Gini Index, are all sourced from the CANA database. High-technology exports, agricultural value added, foreign direct investment, exports of goods and services, internet users per 1000 people, gross domestic savings, gross capital formation, GDP per capita in US 2005$, natural resources rents, new business registration density and population growth were all sourced form the World Bank's development indicators database.

3.2 Population and Sample

A population of interest is "the total collection of elements about which we wish to make some inferences" (Cooper and Schindler, 2011 p. 364). In our study the population of interest is all nation states including both developing and developed countries. Our sampling frame is the 134 nation states that have been in existence for more than 10 years and are represented in both the CANA and WDI databases. Further, as we use a non-probability, convenience sample due to practical considerations such as a lack of data for some countries for EO and inequality measures, regression analysis includes only countries that have data for EO and its determinants. The complete sample (illustrated in Appendix A1) covers data on 93 countries, of which 16 are African. Cooper and Schindler (2011) caution that such a convenience sample is more likely to be biased compared to a random sample and that this bias may distort the findings of the study.

3.3 Measuring EO

The majority of EO research investigates firms and as a result relies on the responses of senior executives. In contrast, this research studies the manifestation of EO at the aggregate level and therefore we develop, using secondary data, objective measures of EO and its sub-constructs. EO is evaluated based on Miller's (1983) conceptualization as a joint function of innovativeness, pro-activeness and risk taking. The implicit assumption we make is that the indicators of EO covary, that is, they are complementary and not substitutes. We therefore measure the manifestation of entrepreneurship by operationalizing these three sub-constructs.

Entrepreneurship is a complex, multi-faceted phenomenon that varies according to culture, geography, policies and institutions. Therefore, a single aggregated measure such as EO may not capture all its heterogeneous aspects. Although there may be social, cultural and regional variation within countries, we assume that the nation state is still a meaningful statistical unit of analysis. In addition, due to data limitations and the need to include developing countries in our composite measure, certain indicators are excluded from the analysis. However, despite these constraints due to heterogeneity and data limitations, Archibugi and Coco (2005) suggest aggregated theory-based single synthetic indicators such as EO, GDP and the Human Development Index (HDI) help us understand our economic and social realities and therefore, can assist policy makers devise strategic interventions. For example, GDP highlights aggregate income in a country whereas the HDI enlightens us about the overall well-being of the population. Similarly, EO informs us whether a country is entrepreneurial or not.

3.3.1 Innovativeness

Lumpkin and Dess (1996) defined innovativeness as an inclination to experiment and be creative that leads to new products, services or technological processes. Teece (1986) proposes that "an innovation consists of technical knowledge about how to do things better than the existing state of the art." Rogers (1995) defines innovation as a process that results in the creation of new ideas, objects and practices. At the firm level, innovation is classified as either product-market innovation and/or technological innovation, and it is an important element of how firms explore or create opportunities. At the aggregate level, it may indicate a product or process that is novel and unique in that specific country and context rather than the world as a whole (Rogers, 1995). In particular, at both levels of aggregation, innovativeness may occasion discontinuous change through a process of creative destruction (Nadler and Tushman, 1999).

There is debate in literature about which indicator is an appropriate proxy for innovation. Schmookler (1966) has argued that investment in R&D is an input rather than an outcome of the innovation process and therefore it is a poor indicator of innovativeness. Hall, Jaffe and Trajtenberg (2001) have questioned the utility of patents as a proxy of innovation. Pakes and Griliches (1980, p. 378) concur with Hall et al. (2001) and suggest that "patents are a flawed measure (of innovative output) particularly since not all new innovations are patented and patents differ greatly in their economic impact."

In order to address these concerns and triage the measurement of innovativeness, we operationalise innovativeness as a composite of innovative input, scientific output and technological output. Firstly, innovative input is defined as the total efforts and

investments made to enhance its innovative capability and therefore, following Hasan and Tucci (2010), we measure innovative input using investments in R&D as a percentage of GDP. Secondly, scientific output is characterised as outcomes of research and innovation activities undertaken by academic institutions and following Castellacci and Natera (2013), we use the number of scientific and technical journal articles published per million people as an indicator of scientific output. The advantage of the journal article data is that they are gathered in a consistent manner and from trustworthy sources for all countries. Thirdly, technological output is defined as the aggregate technological output produced by the private sector firms and thus, following Jaffe and Trajtenberg (1999); we employ US patents granted per country of origin as a measure of technological output. This measure is defined as the number of utility patents granted by the United States Patent Office (USPTO) by year and inventor's country of residence per inhabitant. US patents enable scholars to assess the quantity as well as the quality of innovation (Jaffe and Trajtenberg, 1999).

3.3.2 Proactiveness

As previously elucidated in the review of literature, we adopt Venkataraman's characterisation of proactiveness as an activity of search and discovery. Venkataraman (1989, p. 949) defines proactiveness as "seeking new opportunities which may or may not be related to the present line of operations, introduction of new products and brands ahead of competition, strategically eliminating operations which are in the mature or declining stages of life cycle". Lumpkin and Dess (1996) concur and suggest that being proactive implies taking initiative to anticipate and pursue new opportunities.

At the aggregate level, we assume that scanning activity and new opportunities will be at the international level. Therefore, we argue that opportunity search and discovery implies aggressively seeking internationally both new technology and markets. Archibugi and Coco (2005) concur and note that although some countries may be heavy producers of new knowledge but they may be sluggish in applying it whereas other countries may quickly appropriate technology developed elsewhere. Essentially, a country which appropriates and diffuses knowledge through an active outward strategy is more proactive than an insular country. Pietrobelli (1996) suggests that international scanning for technology and markets may involve:

- "The movement of goods through international trade;
- The movement of capital through inward and outward foreign direct investment (FDI and OFDI)
- The movement of people through migration, travel and foreign education of students and workers;
- international research collaboration and;
- diffusion through media and internet of disembodied knowledge";

Therefore, we follow Pietrobelli's (1996) theorising and adopt FDI, the export/GDP ratio, internet users per 1000 people and royalty and license fees payments as measures in order to operationalise proactiveness. Other theoretically justified indicators such as outbound skilled mobility and international research collaboration are excluded due to insufficient data.

The four indicators' definitions were sourced from the WDI database. Firstly, FDI is defined as the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than

that of the investor and is divided by GDP. FDI helps us gauge the degree to which a country has access to foreign technology and managerial knowledge and consequently, the potential impact of knowledge spill-overs on technological upgrading. We find additional support for this measure in both Lall's (1992) and Dunning's (1994) findings that FDI facilitates the transfer of technological and managerial knowledge as well as financial capital from developed to developing countries.

Secondly, we employ the exports of goods and services to measure the outward orientation of country. The exports of goods and services denote the value of all goods and other market services provided to the rest of the world. However, they exclude factor services and transfer payments and to get the export ratio, we divide by GDP. We find support for this measure in Frankel and Romer's (1999) assertion that the export and import channel facilitates the acquisition of technology and knowledge from foreign sources.

Third, we employ royalty and license fees as an indicator of proactiveness. Royalty and license fees payments are characterised as payment per authorized use of intangible, non-produced, non-financial assets and proprietary rights and for the use, through licensing agreements, of produced originals of prototypes, per GDP. The indicator helps us assess the degree of application, externalisation and dissemination of high technology goods, unlike the export ratio which measures a general outward orientation.

Lastly, we utilise internet users, defined as people with access to the worldwide web network divided by the total amount of population, to evaluate the degree to which a country assimilates and disseminates a general purpose technology (GPT). Mazzucato (2011) explains general purpose technologies as technologies that are

pervasive such that they spread to many industries, improve over time and facilitate innovation and the development of new products or processes. For this reason, a country linked to international knowledge flows and proactively upgrading its technological base would quickly disseminate a general purpose technology such as the internet.

In sum, proactiveness at the aggregate level implies firms in a country will seek out technology, export and internationalising opportunities more than firms in countries that are not pro-active. Therefore, these four measures help us identify countries that are upgrading their technological bases through firstly, applying and diffusing knowledge spill-overs and secondly, through proactively seeking new markets through a committed external strategy.

3.3.3 Risk Taking

Miller (2011) suggests that risk taking is the propensity to invest and risk large amounts of capital and as a result, potentially face a lot of uncertainty. Shapira (1995) suggests that risk reflects the distribution of uncertain outcomes and their probabilities. Therefore, a risky investment is one for which the variance in outcomes is large. John, Litov and Yeung (2008) use a country average of the volatility of firm earnings to measure risk taking. However, as we have noted in the review of literature, this might not be appropriate since risk taking at firm-level should, through the diversification effect, result in lower volatility at the aggregate level (Comin and Philippon, 2006). Thus a country with innovative, risk taking firms that pursue aggressive strategies should develop a diversified industrial and export base that lowers aggregate risk. To capture this diversification effect, we reverse score agricultural value-added as a percentage of GDP. Agricultural value-added is defined

as the net output of the agricultural sector summing outputs and subtracting intermediate inputs. Agriculture includes forestry, hunting and fishing in addition to cultivation of crops and livestock production. The line of argument is that countries with a declining share of agricultural value-added are diversifying their industrial base through risk taking and investment whereas those that have a high share of agricultural value-added are not.

In the preceding paragraph we dealt mainly with the uncertainty element of risk taking. However, as Miller (2011) suggests, besides uncertainty, risk taking also implies investing significant capital, suggesting that this construct has a size dimension. At the aggregate level, the magnitude of investment may best be exemplified by the combined private sector and public sector investment practices of that country operationalised as gross fixed investment. Gross fixed investment encapsulates investment in land improvements, plant, machinery and equipment purchases; and the construction of roads, railways, as well as schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Therefore, we would expect a higher gross investment to GDP ratio in entrepreneurial countries that take risks compared to countries that do not. Nevertheless, a major limitation of this measure is that it aggregates investment. Madsen (2002) finds that it is investment in plant machinery and equipment that drives economic growth whereas investment in property is caused by economic growth. However, since we do not have segregated investment data for all countries, we thus use the gross investment ratio to capture the magnitude of risk taking.

In order to triage risk taking and address the temporal dimension as well as our concerns with the gross investment indicator, we employ the domestic savings rate

as an additional indicator. The savings rate is calculated as GDP less final consumption expenditure divided by GDP and indicates the willingness of a country to forgo current consumption to fund long-term investment. It helps explain the portion of investment that is funded from domestic sources which, it is argued, is less volatile than investment financed from foreign sources. Prasad, Rajan and Subramanian (2007) find that foreign capital flows cause currency overvaluation leading to decreased manufacturing exports, higher macro-economic volatility and reduced growth. In addition, Aizenman, Pinto and Radziwill (2004) find that over 90 per cent of the physical capital stock in developing countries is funded from domestic sources. Therefore, the domestic savings rate may indicate the degree to which the economy has access to less volatile sources of long-term funding necessary for EO.

In sum, based on our definition and measurement of the construct, it should be self-evident that risk taking is not capital accumulation. Correctly defined, risk taking is capital accumulation in highly uncertain sectors where the variance in outcomes is large. Adjusted agricultural value-added reflects the propensity to diversify and invest in risky sectors, the domestic savings rate reflects the ability to do so over time and gross investment is an imperfect measure of the magnitude of investment. Hence, we use all three variables to operationalise risk taking.

3.4 Descriptive Statistics

Table 2 presents the descriptive statistics for the indicators of the sub-constructs of EO. We begin with assessing whether the indicators meet the normality assumptions. Adjusted agricultural value added and domestic savings are negatively skewed whereas all the other variables are positively skewed. Additionally, all the

indicators of the sub-constructs are largely leptokurtic and the Bera-Jarque statistic firmly rejects normality ($p<0.01$) for all the indicators of the sub-constructs of EO.

Furthermore, we analyse the first and the second moments of the indicators of risk taking, innovativeness and proactiveness. The average country in the sample saves 19.45% and invests 21.38% of GDP, agriculture adds 14% to the value of GDP and it exports 35.49% whilst receiving 2.89% of its GDP as FDI. In addition, our hypothetical average country invests 0.77% of GDP in R&D whilst earning 0.25% of GDP in royalties and producing 0.17 scientific journal articles per 1000 people as well as receiving 0.18 US patents per 10000 people. The average internet penetration at 7.94% of the population is misleadingly low since in most of the countries the internet technology only became available in the 1990s. Therefore this statistic should be interpreted with caution.

We proceed to analyse the second moment of the variables and note that interestingly, the innovativeness indicators as well as internet absorption and royalty fees have a relatively elevated standard deviation suggesting that there is large variation amongst countries in innovative effort. In contrast, the volatility of the other variables is modest.

Table 2: Descriptive statistics of the indicators of innovativeness, risk taking and proactiveness

	Adjagric	Savings	Investment	FDI	Exports	Internet	Royalties	R&D	Journals	Patents
Mean	85.96	19.45	21.93	2.89	35.49	7.94	0.25%	0.77%	0.17	0.18
Median	89.81	20.70	21.38	1.47	29.92	0.04	0.12%	0.47%	0.02	0.00
Max	99.96	61.14	65.56	51.90	230.27	90.00	11.24%	4.86%	1.28	3.07
Min	27.97	-103.42	2.65	-12.21	2.52	0.00	0.00%	0.00%	0.00	0.00
Std. Dev.	12.39	14.24	6.37	4.42	24.79	17.18	0.75%	0.81%	0.28	0.43
Skewness	-1.38	-2.16	1.22	4.15	2.96	2.64	9.81	1.65	1.78	3.56
Kurtosis	4.93	16.46	7.93	30.41	18.28	9.45	112.77	5.65	5.13	17.29
Jarque-Bera	1071.36	21143.86	3177.08	82408.68	28175.75	7904.45	1412383.00	2037.47	1956.83	28958.29
Prob	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	194962.40	49406.87	55183.92	6972.12	89333.59	21653.01	6.92	2101.04	0.47	0.05
Sum Sq. Dev.	347868.60	515181.90	101984.40	47085.57	1545840.00	803857.90	0.15	1787.14	0.00	0.00
Obs	2268.00	2540.00	2516.00	2411.00	2517.00	2726.00	2726.00	2726.00	2726.00	2726.00

3.5 Estimation Methodology

As discussed in the preceding section, the indicators of EO and its sub constructs were developed from economics and entrepreneurship literature. We adopt Miller's (1983) conceptualisation of EO as a reflective, unidimensional, second order construct with three sub-constructs (indicators): risk taking, innovativeness and proactiveness. In this section, we use correlations and exploratory factor analysis to assess both the validity and dimensionality of EO. Hair, Black, Babin and Anderson (2010) submit that if we have a strong theoretical basis for understanding the relationships between variables, then these indicators, for example, R&D, scientific journals and US patents may correspond to concepts that cannot be described by a single variable such as innovativeness. Hair et al. (2010) suggest that factor analysis, by grouping variables that are highly correlated as factors, helps us determine the underlying relationships amongst the variables being analysed.

Therefore, we employ factor analysis to create new composite measures for risk taking, innovativeness, proactiveness as well as EO.

3.5.1 Validity

We begin by evaluating the validity of EO. Validity is defined as the ability of the indicators to measure the concept of interest, that is, the latent constructs (Cooper and Schindler, 2011). Construct validity evaluated by assessing convergent validity, content validity and discriminant validity (Hair et al., 2010). Hair et al. (2010) suggests that a reflective construct is based on the notion that a latent construct such as EO causes risk taking, proactiveness and innovativeness. Therefore, the casual directionality indicates that entrepreneurial countries exhibit risk taking, proactiveness and innovativeness. The sub-constructs are merely symptoms of EO.

Furthermore, for a reflective, second order construct such as EO, all its sub-constructs are expected to move together. Thus in order to evaluate convergent validity, we assess whether the sub-constructs of EO have a high proportion of common variance (Hair et al., 2010). Consequently, we assess the correlations amongst the sub-constructs with EO. Hair et al. (2010) suggest that they should be greater than 0.3. As Table 3, indicates the correlations between EO and its sub-constructs are high (>0.65), thus establishing convergent validity.

In addition, EO's content validity was assessed. Content validity tests whether every indicator sufficiently characterises the constructs under study (Cooper and Schindler, 2011). Our indicators reflecting risk taking, proactiveness and innovativeness were evaluated by the author's supervisor and his assistant to ensure that indicators sufficiently represent constructs, ensuring content validity (Cooper and Schindler, 2011).

Table 3: Correlation matrix for assessing the discriminant validity of EO

	EO	INNOV	PROACT	RISK	HIGH_TECH
EO	1.00				
Innov	0.68***	1.00			
Proact	0.78***	0.27***	1.00		
Risk	0.81***	0.36***	0.46***	1.00	
High_Tech	0.53***	0.38***	0.47***	0.35***	1.00

Notes:
1. ***, **, and * in the table indicate the levels of significance at 1%, 5%, and 10%, respectively.
2. Proact represents proactiveness, Risk represents risk taking, Innov represents innovativeness and High_Tech represents high technology exports.

To gauge discriminant validity, we use high technology exports to evaluate to what extent EO truly differs from its sub-constructs (Hair et al., 2010). We would expect high technology exports to be the joint outcome of innovativeness, risk taking and proactiveness. Therefore, we test whether EO has a higher correlation with high technology exports than any of its sub-constructs. As Table 3 shows, EO has a higher correlation with high technology exports than any of its sub-constructs, thus establishing discriminant validity. Hair et al. (2010) argue that if a high order factor such as EO explains theoretically related outcomes as well as or better than innovativeness, proactiveness and risk taking, then the higher order construct EO is validated and supported.

3.5.2 Unidimensionality

Dimensionality evaluates the association between the indicators of a construct and to what extent they represent a single construct (Hair et al., 2010). The unidimensionality of EO is assessed through exploratory factor analysis. But before we can evaluate the dimensionality of EO, we must first establish its sub-constructs. Hair et al. (2010) recommend that before a researcher performs factor analysis he

must firstly, ensure that a strong theoretical foundation exists to support the hypothesised structure amongst the indicators and secondly, that the measure of sampling adequacy (MSA) values must be greater than 0.50 for both the overall test and each individual indicator. They recommend that variables with MSA values smaller than 0.50 should be deleted. As illustrated in Table 4, a satisfactory Kaiser-Meyer-Olkin MSA (0.79) indicates that sufficient correlation exists between the indicators of risk taking, proactiveness and innovativeness, and individually for each of the variables, to proceed with factor analysis (Hair et al., 2010) and consequently, none of the indicators are omitted.

Table 4: KMO MSA of the indicators of innovativeness, proactiveness and risk taking

	MSA
ADJAGRIC	0.88*
DOMESTIC_SAVINGS	0.73*
EXPORTS	0.71*
FDI	0.64*
GROSS_INVESTMENT	0.66*
INTERNET_USERS	0.91*
R_D_INVESTEMENT	0.76*
ROYALTY_PAYMENTS	0.75*
SCIENTIFIC_JOURNALS	0.81*
US_PATENTS	0.84*
KAISER'S MSA	0.79*

Notes:
1. * In the table indicates MSA values >0.5.

Table 5 illustrates the number of factors extracted and the factor loadings. Principal factors and varimax orthogonal rotation methods were used to extract the factors and clarify the underlying relationships. Hair et al. (2010) advance that factor rotation maximises the significant loadings of an indicator on each factor allowing easier factor identification, and assisting in achieving a simpler, theoretically sound factor structure. In addition, they recommend that for samples greater than 350 factor loadings that exceed 0.3 are significant. Therefore, we deem indicators with factor loadings greater than 0.3 and factors with eigenvalues higher than 1, significant.

As Table 6 shows, the variables loaded on three factors. Firstly, scientific journal articles, US patents and R&D expenditure loaded cleanly on to factor 1, with loadings greater than 0.3 and no significant cross loadings. These results support our assertion that innovativeness is a composite of innovative input, scientific output and technological output and consequently, we labelled factor 1 innovativeness.

Secondly, as expected FDI, exports and royalty payments and license fees loaded cleanly on factor 2, with factor loadings higher than 0.3 and no significant cross loadings. In contrast, internet users cross loaded on both innovativeness and factor 2. We suggest that this cross loading may be due to internet users being highly correlated with the level of per capita GDP and thus with innovativeness. However, we cannot make nor do we find in literature the theoretical argument that internet users are a measure of innovative capacity or its outcomes. We have suggested that it is more appropriate as an indicator of how countries proactively appropriate and diffuse general purpose technologies. This contention is supported by internet users loading on factor 2 with a loading that is higher than the required minimum 0.3. Thus, using theoretical arguments that are supported by empirical results, we adopt internet users, FDI, exports and royalty payments and license fees as indicators of factor 2 and we label this factor proactiveness.

Thirdly, domestic savings and gross investment load cleanly and significantly on factor 3. On the other hand, adjusted agricultural value-added cross loads on both innovativeness and factor 3. As we have previously noted, Hair et al. (2010) argue that a researcher needs to ensure that a strong theoretical foundation exists to support the hypothesised structure amongst the indicators. In our case, this conceptual foundation posits that the reverse scored agricultural value-added as a percentage of GDP is more suitable as a measure of a diversified industrial base that

lowers aggregate risk. To support our argument Table 6 indicates that adjusted agricultural value-added's loading on factor 3 exceeds the required minimum of 0.3. Therefore we adopt adjusted agricultural value-added, domestic savings as well as gross investment as measures of factor 3 and label this factor risk taking.

Table 5: Exploratory factor analysis of innovativeness, proactiveness and risk taking

Factor Method: Principal Factors

	F1	F2	F3	Communality	Uniqueness
ADJAGRIC	0.60**	0.18	0.25	0.46	0.54
DOMESTIC_SAVINGS	0.36*	0.33*	0.37*	0.37	0.63
EXPORTS	0.35*	0.62**	-0.02	0.51	0.49
FDI	0.24*	0.48*	-0.30	0.38	0.62
GROSS_INVEST	0.15	0.38*	0.16	0.19	0.81
INTERNET_USERS	0.62**	0.07	-0.20	0.43	0.57
R_D_INVESTEMENT	0.86**	-0.30	0.03	0.83	0.17
ROYALTY_PAY	0.32*	0.37*	-0.20	0.28	0.72
SCIENTIFIC_JOURN	0.85**	-0.27	-0.05	0.79	0.21
US_PATENTS	0.75**	-0.38	-0.03	0.71	0.29
Factor	Variance	Cumulative	Difference	Proportion	Cumulative
F1	3.21	3.21	1.87	0.65	0.65
F2	1.34	4.55	0.94	0.27	0.92
F3	0.40	4.95	---	0.08	1.00
Total	4.95	4.95		1.00	
	Model	Independence	Saturated		
Discrepancy	0.08	5.03	0.00		
Parameters	37.00	10.00	55.00		
Degrees-of-freedom	18.00	45.00	---		

Notes:
1. ** In the table indicates factor loadings >0.5 and * in the table indicates factor loadings >0.3.

Table 6: Rotated factors using orthogonal varimax rotation

	F1	F2	F3
ADJAGRIC	0.46*	0.20	0.45*
DOMESTIC_SAVINGS	0.17	0.16	0.56**
EXPORTS	0.05	0.60**	0.37*
FDI	0.03	0.61**	0.04
GROSS_INVESTMENT	-0.03	0.25	0.36*
INTERNET_USERS	0.55**	0.36*	0.04
R_D_INVESTEMENT	0.91**	0.03	0.11
ROYALTY_PAYMENTS	0.15	0.49**	0.10
SCIENTIFIC_JOURNALS	0.88**	0.09	0.06
US_PATENTS	0.84**	-0.03	0.00

Notes:
1. ** in the table indicates factor loadings >0.5 and * in the table indicates factor loadings>0.3

With the sub-constructs of EO established and clearly defined, we proceed to assess the unidimensionality of EO through exploratory factor analysis. As previously stated, we adopt Miller's (1983) conceptualisation of EO as a reflective, unidimensional, second order construct. As a second order construct, EO's indicators are risk taking, innovativeness and proactiveness. Additionally, these sub-constructs are expected to covary. We commence by extracting factor scores that are a composite measure of each sub-construct of EO, using as a guide, the results of exploratory factor analysis described in the previous paragraph. Before we proceed with factor analysis, we note Hair et al.'s (2010) caution that a researcher must ensure that a strong theoretical foundation exists and MSA values are higher than 0.50 for both overall test and each individual indicator. As illustrated in Table 7, a satisfactory Kaiser-Meyer-Olkin MSA (0.63) indicates that sufficient correlation exists amongst indicators of EO, and individually for each of the sub-constructs, to retain all the indicators. As a result none are omitted and we proceed with factor analysis (Hair et al., 2010).

Table 7: KMO MSA of the indicators of EO

	MSA
Proact	0.63*
Risk	0.60*
Innov	0.68*
Kaiser's MSA	0.63*

Notes:
1. * In the table indicates MSA values >0.50.
2. Proact represents proactiveness, Risk represents risk taking and Innov represents innovativeness.

Hair et al. (2010) suggest that unidimensionality implies that indicators are strongly associated with each other and represent a single latent construct. Further, they argue that factor analysis can assist in deciding whether a construct is unidimensional or not by determining the number of factors extracted and the loading

of each indicator on the factor. Hair et al. (2010) propose that the test of unidimensionality is that:

- indicators should be loading highly on a single factor,
- factor loadings >0.50 are considered significant and,
- the percentage of variance explained should be >0.60.

Table 8: EO principal factors

	Loadings				
	F1	Communality	Uniqueness		
Innov	0.48*	0.23	0.77		
Proact	0.56**	0.32	0.69		
Risk	0.61**	0.37	0.63		
Factor	Variance	Cumulative	Difference	Proportion	Cumulative
F1	0.92	0.92	---	1.00	1.00
Total	0.92	0.92		1.00	

Notes:

1. ** in the table indicates factor loadings >0.5 and * in the table indicates factor loadings>0.3
2. Proact represents proactiveness, Risk represents risk taking and Innov represents innovativeness

As Table 8 illustrates, the results for EO largely meet all these recommendations. The sub-constructs all load cleanly on one factor, the factor loadings are all close to or greater than 0.5 and the percentage of variance explained by this factor is 0.92. Thus we conclude that this factor is unidimensional and label it EO.

So far in this section, we have carefully and methodically confirmed both the validity and dimensionality of EO. We have reported these results in the first results chapter of this thesis since EO is a common thread in the entire work. In the following section we discuss country rankings based on EO and its sub-constructs and assess, using descriptive statistics, the relative importance of the constructs.

3.6 Results

We start by ascertaining whether EO and its sub-constructs meet the normality assumptions. Table 9 presents the descriptive statistics for EO, risk taking, proactiveness and innovativeness. The mean and the median differ for all the constructs, indicating the presence of skewness. EO, proactiveness and innovativeness are all positively skewed whereas risk taking is negatively skewed. Additionally, EO and all its sub-constructs are leptokurtic with a peaked mean and fatter tails than the normal distribution and the Bera-Jarque statistic firmly rejects normality ($p<0.01$) for EO and all its sub-constructs.

It is interesting to note that risk taking has the highest mean, whereas innovativeness has the highest standard deviation confirming our observation that the variance in innovative effort amongst countries is higher compared to the variation in risk taking and proactiveness. Furthermore, Singapore has the maximum individual score attained in a calendar year between 1980 and 2008 for proactiveness, risk taking and EO, whereas Israel has the highest score for innovativeness, attained in 2008. In contrast, the African countries Mozambique and Lesotho have the lowest scores for proactiveness and EO respectively.

Table 9: Descriptive statistics of EO and its sub-constructs

	EO	Risk	Innov	Proact
Mean	-0.00	0.00	-0.00	-0.00
Median	-0.08	0.12	-0.42	-0.20
Maximum	3.92	1.88	4.06	6.83
Minimum	-2.45	-4.01	-0.74	-0.83
Std. Dev.	0.74	0.69	0.95	0.78
Skewness	0.88	-0.90	1.91	3.77
Kurtosis	5.57	4.77	6.08	24.44
Jarque-Bera	850.84	593.03	2734.70	51406.08
Probability	0.00	0.00	0.00	0.00
Sum	0.00	0.00	0.00	0.00
Sum Sq. Dev.	1137.34	1062.81	2441.81	1460.17
Observations	2104.00	2223.00	2726.00	2389.00

Notes:

1. Proact represents proactiveness, Risk represents risk taking and Innov represents innovativeness

Table 10 presents the correlations of EO, risk taking innovativeness and proactiveness with several pertinent variables. In the previous section, we validated EO as higher order construct using high technology exports. In this section we assess whether risk taking, proactiveness and innovativeness measure what they purport to measure.

First, we have argued that proactiveness reflects the activities of search and discovery at the international level. Pietrobelli (1996) suggests that the foreign education of students and workers could be an indicator of this search activity. Due to data limitations and the need to preserve our sample we could not use the outbound enrolment ratio as an indicator. However, we can use it to assess construct validity of proactiveness by evaluating whether, for those countries where data availability is not an issue, the outbound enrolment ratio positively correlated to proactiveness. Table 10 confirms that the outbound enrolment ratio has a higher association with proactiveness compared to the other two sub-constructs of EO and this is significant at the 1% level.

Second, we have argued that risk taking at the firm level would, through the diversification effect, reflect reduced aggregate level volatility. In order to establish the construct validity of risk taking we need to ascertain whether this is indeed the case. We find that the correlation between risk taking and growth volatility is negative ($p<0.01$), thus validating risk taking. Third, we operationalised innovativeness as a composite of innovative input, scientific output and technological output. The validity of this construct is supported by its high correlation with the human capital variables, in particular tertiary education.

Table 10: Correlations of the sub-constructs of EO

	EO	Proact	Innov	Risk	Outbound	Tertiary	Secondary	Gdpvol	High_Tech
EO	1.00								
Proact	0.76***	1.00							
Innov	0.66***	0.24***	1.00						
Risk	0.84***	0.43***	0.36***	1.00					
Outbound	0.44***	0.40***	0.27***	0.28***	1.00				
Tertiary	0.63***	0.38***	0.64***	0.42***	0.34***	1.00			
Secondary	0.66***	0.35***	0.56***	0.54***	0.37***	0.77***	1.00		
Gdpvol	-0.13***	0.08	-0.29***	-0.14***	-0.06	-0.01	0.06	1.00	
High_Tech	0.53***	0.46***	0.37***	0.35***	0.10	0.27***	0.23***	-0.13***	1.00

Notes:
1. ***, **, and * in the table indicate the levels of significance at 1%, 5% and 10%, respectively
2. Proact represents proactiveness, Risk represents risk taking, Innov represents innovativeness, High-tech represents high technology exports, Outbound represents outbound tertiary enrolment and Gdpvol represents GDP volatility

3.6.1 Country rankings

Table 11 illustrates country rankings based on risk taking, innovativeness, proactiveness, EO as well as its deviation. We define the deviation of EO (EOdev) as the increase or decrease in EO over a five year period. Table 11 displays the 20 and 10 best and worst performing countries on each measure, respectively. The rankings seem to vary based on level of development for some of the constructs. High income

countries, for example Switzerland and Sweden, dominate both the innovation and EO rankings whereas low and middle income countries fare poorly. On the other hand, the top ranking countries on proactiveness and risk taking include both developed and middle income countries, in particular the former Eastern Bloc countries. Nevertheless, the laggards on these two sub-constructs are middle-to-low income countries. Appendix A2 displays the full country rankings on EO.

The top 20 ranking countries on the deviation of EO include countries across all levels of development. For example, both Vietnam, which is a low income country and Ireland, a high income country, attain top 20 rankings. However, the stragglers as illustrated in Figure 1, who do not seem to be improving their entrepreneurial score at all, are almost exclusively middle income countries, such as South Africa and Argentina. Figure 2 illustrates the consequences of a lack of innovativeness, proactiveness and risk taking. Countries with a constant EO hardly exhibit any growth in GDP per capita over the 29 year period under investigation.

In sum, from these results we can conclude that developed countries score reasonably well on EO whereas the innovative capabilities of developing countries are poor. In addition, it is notable that whilst countries across all levels of development are improving their EO scores, there is a select group of mainly middle income countries that seems to be stuck in an entrepreneurial trap with their EO static over 29 years.

Table 11: Country rankings

	INNOV		PROACT		RISK		EODEV		EO		
	Country	Mean	Country	Mean	Country	Mean	Country	Mean	Country	Mean	Std. Dev.
1.	Switzerland	2.85	Singapore	3.71	Singapore	1.50	Azerbaijan	0.78	Singapore	2.46	0.81
2.	Sweden	2.84	Ireland	2.25	Botswana	0.93	Lao PDR	0.70	Ireland	2.26	0.64
3.	United States	2.82	Belgium	1.95	China	0.77	Belgium	0.69	Belgium	1.39	0.32
4.	Israel	2.56	Azerbaijan	1.09	Ireland	0.76	Iceland	0.64	Switzerland	1.36	0.27
5.	Japan	2.40	Estonia	1.03	Algeria	0.74	Ireland	0.59	Sweden	1.04	0.46
6.	Finland	1.96	Hungary	0.96	Malaysia	0.73	Armenia	0.51	Japan	1.03	0.16
7.	Germany	1.75	Malaysia	0.91	Czech Republic	0.71	Hungary	0.46	Netherlands	0.92	0.30
8.	Canada	1.49	Netherlands	0.72	Norway	0.65	Estonia	0.44	Iceland	0.91	0.49
9.	Netherlands	1.48	Panama	0.66	Switzerland	0.62	Cambodia	0.43	Denmark	0.85	0.38
10.	United Kingdom	1.47	Slovakia	0.66	Estonia	0.62	Singapore	0.41	Finland	0.80	0.50
11.	Denmark	1.47	Czech Republic	0.54	Japan	0.60	Vietnam	0.37	United States	0.79	0.21
12.	France	1.33	Bulgaria	0.49	Thailand	0.59	Georgia	0.36	Estonia	0.78	0.38
13.	Australia	1.04	Slovenia	0.39	Trinidad and Tobago	0.58	Bulgaria	0.32	Germany	0.73	0.22
14.	Belgium	1.03	Switzerland	0.34	Slovakia	0.57	Kazakhstan	0.32	Norway	0.68	0.26
15.	Norway	1.03	Latvia	0.32	Saudi Arabia	0.57	Croatia	0.31	Czech Republic	0.67	0.22
16.	Austria	0.98	Lithuania	0.31	Australia	0.55	Mongolia	0.29	Canada	0.64	0.31
17.	Iceland	0.89	Sweden	0.31	Spain	0.51	China	0.29	Malaysia	0.62	0.42
18.	New Zealand	0.66	Ukraine	0.29	Austria	0.48	Uganda	0.28	Austria	0.58	0.41
19.	Singapore	0.62	Kazakhstan	0.29	Russia	0.48	Denmark	0.28	Slovenia	0.56	0.29
20.	Slovenia	0.39	Trinidad and Tobago	0.24	Slovenia	0.47	Slovenia	0.28	Azerbaijan	0.56	0.78
	Bottom 10										
83.	Pakistan	-0.65	Turkey	-0.48	Georgia	-0.95	Argentina	0.04	Cambodia	-0.82	0.42
84.	Saudi Arabia	-0.65	Mozambique	-0.49	Burkina Faso	-1.08	Philippines	0.03	Pakistan	-0.83	0.14
85.	Thailand	-0.66	Brazil	-0.52	Madagascar	-1.08	Algeria	0.02	Kyrgyzstan	-0.90	0.19
86.	Lesotho	-0.66	Uganda	-0.52	Sudan	-1.12	Jamaica	0.01	Madagascar	-0.94	0.34
87.	Sri Lanka	-0.67	Iran	-0.53	Kyrgyzstan	-1.18	Egypt	0.01	Sudan	-1.02	0.36
88.	Zambia	-0.68	Ethiopia	-0.57	Mozambique	-1.28	Panama	0.00	Mozambique	-1.03	0.44
89.	Ecuador	-0.69	Pakistan	-0.57	Cambodia	-1.31	South Africa	-0.03	Burkina Faso	-1.07	0.13
90.	Indonesia	-0.71	Sudan	-0.59	Uganda	-1.43	Paraguay	-0.03	Lesotho	-1.09	0.63
91.	Honduras	-0.71	India	-0.66	Ethiopia	-1.45	Kuwait	-0.08	Uganda	-1.13	0.40
93.	**Guatemala**	-0.72	Burkina Faso	-0.68	Lesotho	-1.71	Tajikistan	-0.18	Ethiopia	-1.20	0.27

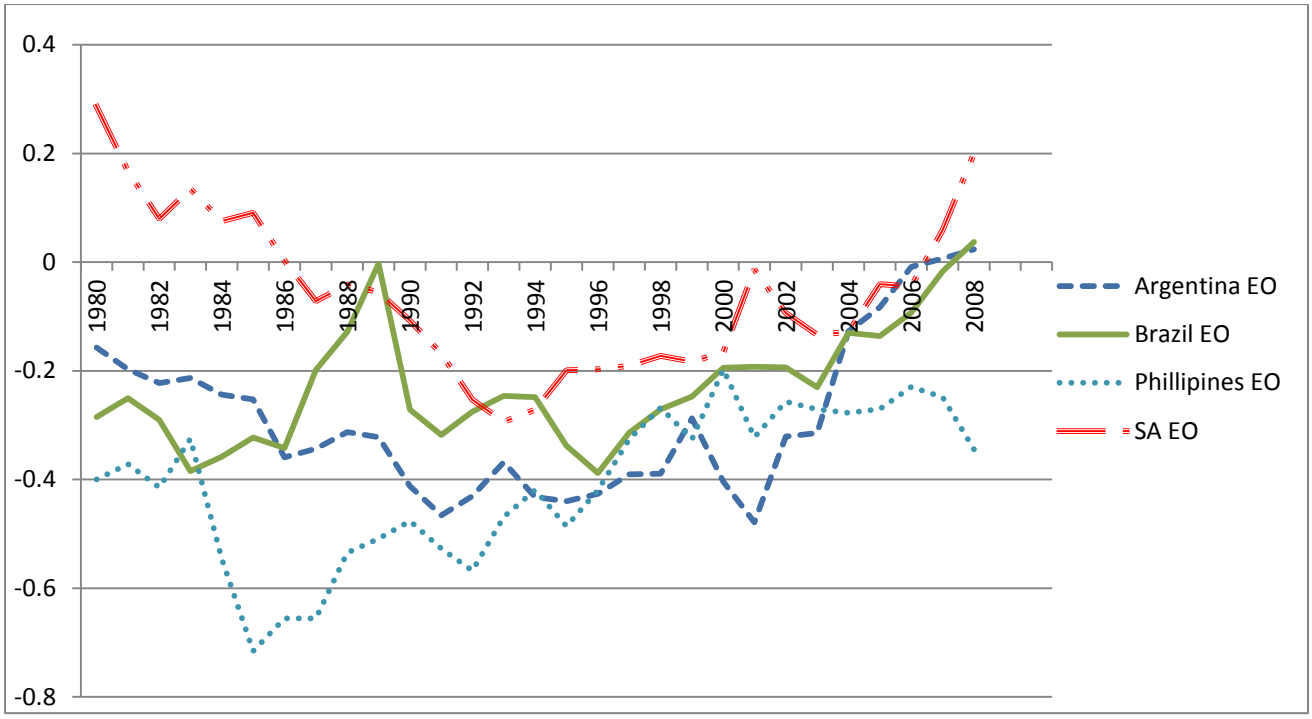

Figure 1: Middle Income EO trap

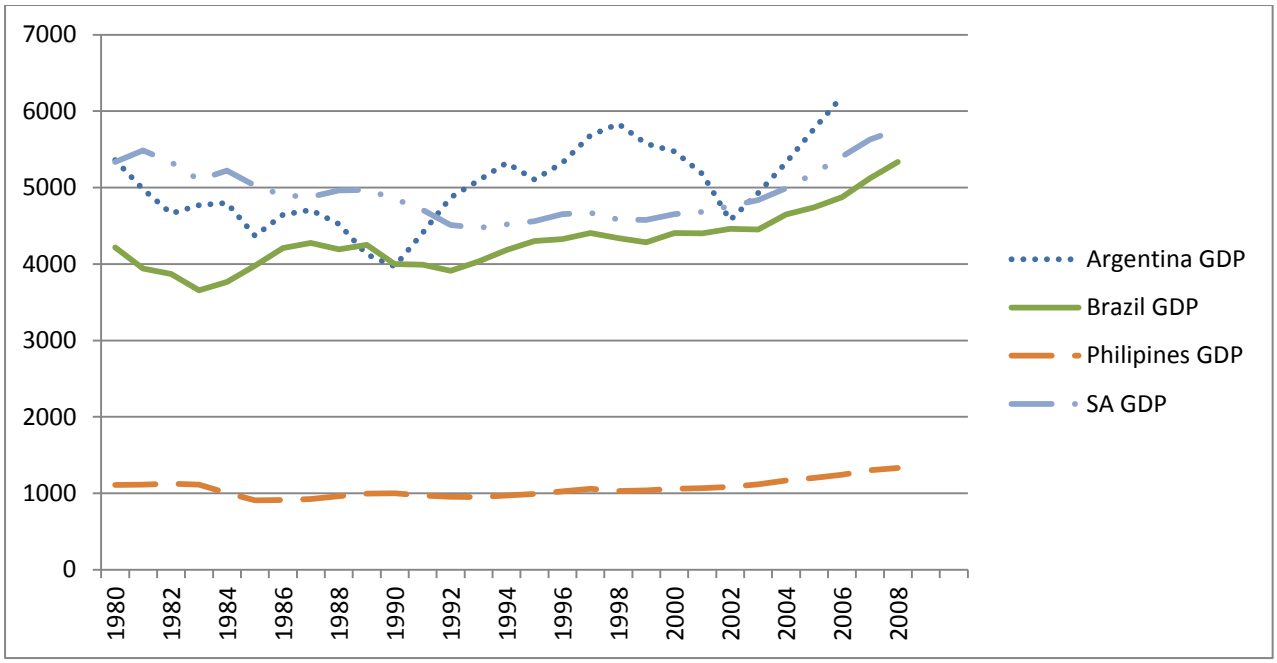

Figure 2: Middle income trap

Furthermore, in order to explain the possible antecedents and consequences of EO, we use the contrasting cases of Singapore and Ethiopia. Singapore achieves the highest score for EO as well as the sub-constructs proactiveness and risk taking

between 1980 and 2008. It also attains a high ranking of 19 on the innovativeness measure. Singapore's case seems to confirm our hypothesis that technological diffusion and upgrading amongst countries is a joint function of risk taking, innovativeness and proactiveness. Firstly, it proactively attracted 12.17% of GDP in FDI, exported a staggering 183.73% and earned 2.9% of GDP by commercialising and diffusing technology. Secondly, Singapore's innovative capacity was upgraded by investing on average 1.35% of GDP in R&D, resulting in 0.35 scientific journals published per thousand people as well as 0.34 US patents awarded per ten thousand people. Thirdly, Singapore took risks, saved and invested 46.80% and 33.77% of GDP, respectively. As a result its economy was further diversified and primary agriculture's contribution to GDP was reduced from a low 1.57% in 1980 to an even lower 0.045% of GDP in 2008.

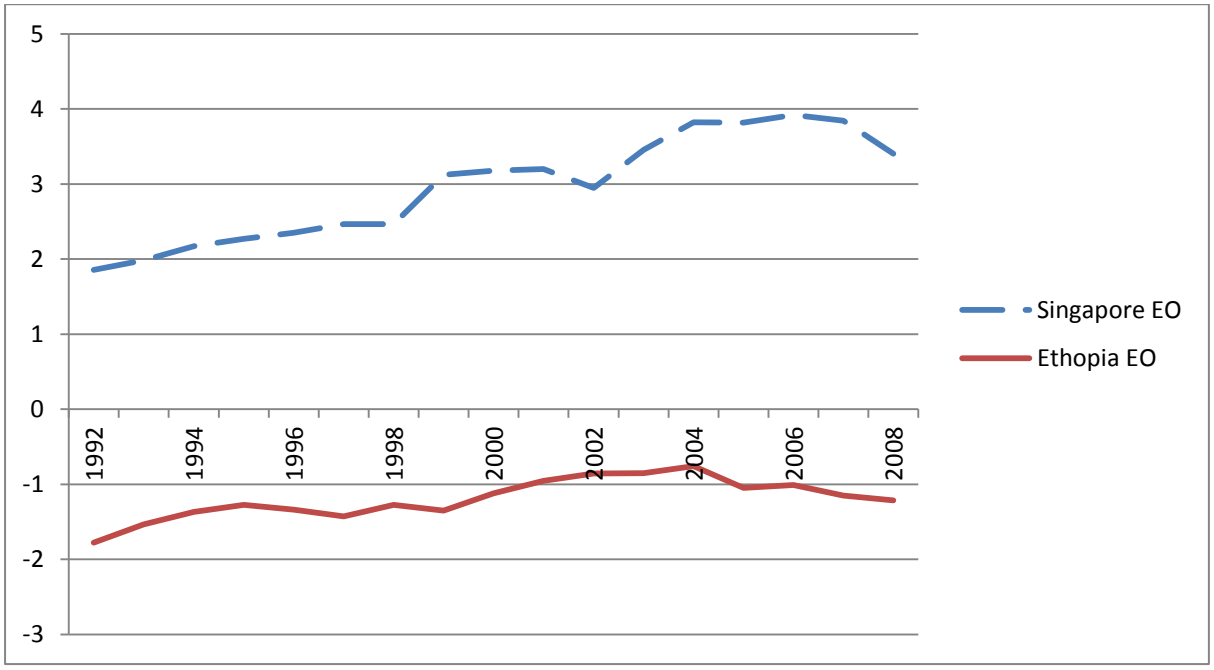

Figure 3: Singapore vs Ethiopia EO

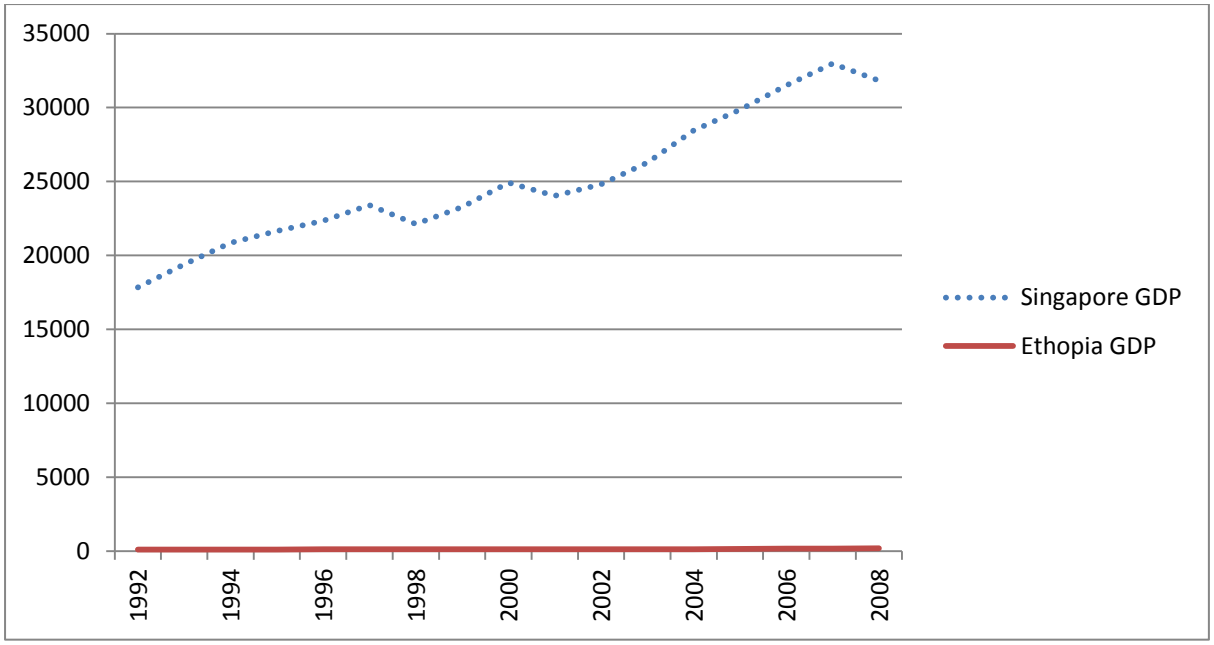

Figure 4: Singapore vs Ethiopia GDP per capita

In contrast, Ethiopia, ranked number 88 on EO, was rather insular, enticing only 2.13% of GDP as FDI, exporting 9.37% of GDP and earning zero royalty fees. In addition, Ethiopia hardly upgraded its innovative capacity spending only 0.19% of its GDP on R&D and publishing 0.003 scientific journal articles per thousand people as well as attaining a paltry zero US patents. Ethiopia barely deferred consumption to fund the necessary diversification of its economy saving only 10.22% whilst investing 19.84% of its GDP, fully expecting foreign stake holders to fund half of its investment needs. Therefore, its economy was not diversified with primary agriculture's contribution remaining a relatively high 49.40% in 2008 from 59.23% in 1980.

The contrasting paths that Ethiopia and Singapore, or more broadly East Asia and Africa, took had consequences. Singapore grew its GDP per capita from US $9933.60 in 1980 to US $31832.71 in 2008, in the process improving its citizens' welfare and attaining developed status. Similarly, another East Asian country China that was at the same level of development as Ethiopia in 1980 increased its GDP per

capita more than tenfold from US $221.65 to US $2402.78 in 2008 by taking risks and shifting its economy toward new sectors, reducing agriculture's contribution from 30.17% in 1980 to 10.73% in 2008. China increased its EO and as a result lifted millions of people out of poverty. In contrast, Ethiopia's or more broadly Africa's failure to diversify its economy and upgrade its technological capabilities led to stagnation, with GDP per capita increasing by a woeful US45$ over 29 years from US $155.37 to US $201.66 in 2008, leaving millions of the country's citizens struggling to barely feed themselves. Figure 3 vividly illustrates the differing paths Singapore and Ethiopia took with a large and an increasing EO gap between the two countries. The resultant GDP per capita gap is illustrated by Figure 4, with Singapore attaining a GDP per capita level a 100 times greater that of Ethiopia.

3.7 Discussion

In this chapter, we have confirmed EO as an aggregate level, reflective, unidimensional second-order construct with three indicators that covary: risk taking, innovativeness and proactiveness. We cogently operationalised aggregate level indicators of risk taking, innovativeness and proactiveness, using objective measures and through factor analysis, confirmed the validity and dimensionality of the sub-constructs of EO.

Innovativeness was validated as a composite of innovative input, scientific output and technological output. Thus, addressing concerns in literature about the individual indicators (Schmookler, 1966, Hall et al., 2001 and Pakes and Griliches, 1980). In addition, innovativeness' high correlation with tertiary education established its construct validity. Second, proactiveness was established as a construct that best reflects the activities of search and discovery at the international level empirically

confirming Archibugi and Coco's (2005) contention that some countries may be heavy producers of new knowledge although they are sluggish in applying it. On the other hand, other countries may quickly appropriate and apply technology developed elsewhere. A significant correlation with the outbound enrolment ratio established proactiveness' validity.

Third, we empirically confirmed risk taking as capital accumulation in highly uncertain sectors. Our contention that adjusted agricultural value-added reflects the propensity to diversify and invest in these risky sectors, the domestic savings rate reflects the ability to do so over time and gross investment is an imperfect measure of the magnitude of investment is corroborated. Comin and Philippon's (2006) argument that risk taking at firm-level should, through the diversification effect, result in lower volatility at the aggregate level was supported by correlation analysis, helping to establish the construct's validity.

With the sub-constructs of EO defined and validated, we proceeded to confirm Miller's (1983) conceptualisation of EO, at the aggregate level, as a reflective, unidimensional, second-order construct with three indicators: risk taking, innovativeness and proactiveness. These three variables loaded significantly on the same factor confirming our assertions. Moreover, the factor analysis results showed that the indicators of EO covary, implying that they are complementary and not substitutes. In addition, construct validity was established by showing that EO has a higher correlation with high technology exports than any of its sub-constructs.

In the introduction, we noted the anomaly that although corporate entrepreneurship literature has converged on EO as the appropriate description of entrepreneurial behaviour, literature at the aggregate level, which purports to aggregate firm level

behaviour, still measures entrepreneurship as a stock variable and considers only one of its composite elements, innovation, as reflective of entrepreneurial behaviour. Our conceptualisation of EO addresses the concern that we cannot measure entrepreneurship and technological progress by merely counting the number of entrepreneurs in a country. Therefore, Banerjee and Duflo's (2007) warning not to romanticize these penniless entrepreneurs has been heeded. Similarly, Acs et al.'s (2005) concern that invention does not adequately account for differences in growth outcomes has been addressed. Our measure considers all of the composite elements of EO as a reflection of entrepreneurial behaviour, not only R&D expenditure.

Furthermore, we have also addressed the issue of the unit of analysis and essentially confirmed Miller's (2011) contention that EO can manifest at the level of the nation state. In addition, as we hypothesized, the question of whether one nation state can devote more resources to innovative activity, take risks and invest more in longer term projects with uncertain outcomes as well as be more proactive in diversifying its economic base than others, has been answered in the affirmative. Although entrepreneurship is a complex, multi-faceted phenomenon that varies according to culture, geography, policies and institutions, we have developed a single aggregated theory-based indicator that helps capture this complexity. In particular, we argue that it is the manifestation of this EO that is the critical variable that defines whether a country is entrepreneurial or not.

3.8 Conclusion

In sum, in this chapter we have theoretically defined and empirically confirmed aggregated theory-based single synthetic indicators of innovativeness, risk taking

and proactiveness. In addition, the manifestation of entrepreneurship, EO, has also been confirmed and validated as an aggregate level second-order construct that is a joint function of enhancing innovative capabilities, and investing in risky, unique and uncertain sectors, as well as proactively seeking new markets and advanced technology. In the following chapter, we shall evaluate its determinants and drivers and try to clarify why rates of EO differ across countries.

Chapter 4

THE DETERMINANTS OF EO: AN AGGREGATE ANALYIS

Introduction

In the preceding chapter, we have defined the sub-constructs of EO and carefully and methodically confirmed both the validity and dimensionality of EO. However, we have a limited understanding of why rates of EO vary across countries. Therefore, this chapter investigates the determinants and drivers of EO. The question we ask is: why are some countries more innovative, risk taking and pro-active than others? To answer this question, we test whether financial market development, social cohesion, human capital and the control of corruption have a positive association with EO and whether this impact varies with the level of development. Summary statistics of determinants of EO and the results emanating from regression analysis are presented, discussed and compared with findings in literature.

Economics literature suggests institutions and policy variables such as the stock of human capital are possible antecedents of economic growth as they enable entrepreneurship. The first school of thought in economics literature propagated by Acemoglu et al. (2001) underscores the primacy of institutions as predictors of economic growth. They posit that large deviations in GDP per capita across countries emanate from differences in the quality of institutions which can shape political and economic incentives in society. As a result, institutions can either promote growth or hinder it. As Adam Smith (1904, p. 472) observed:

"**Commerce and manufactures can seldom flourish long in any state which does not enjoy a regular administration of justice, in which people do not feel themselves secure in the possession of their property, in which the authority of the state is not supposed to be regularly**

employed in enforcing the payment of debts from all those who are able to pay. Commerce and manufactures, in short, can seldom flourish in any state in which there is not a certain degree of confidence in the justice of government"

In contrast, the second school of thought advanced by Glaeser et al. (2004) highlights the importance of human and physical capital accumulation. They contend that growth in GDP per capita is driven by policy variables that even benevolent dictators can pursue. They maintain that "countries that emerge from poverty accumulate human and physical capital under dictatorships, and then, once they become richer, are increasingly likely to improve their institutions" (Glaeser et al., 2004, p. 298). This argument which deems human capital as a critical prerequisite for growth has found empirical support. Firstly, Stokke (2008) finds that human capital is the critical factor that determines a country's ability to imitate and learn advanced foreign technologies. In addition, Lee and Kim (2009) establish that human capital is an important policy variable that facilitates technological upgrading amongst countries, therefore enabling economic growth. Lastly, Dakhli and De Clercq (2004) find strong support for the positive relationship between human capital and innovation.

A more nuanced view has been developed by Lee and Kim (2009) that integrates both institutions and policy variables. Lee and Kim (2009) argue that the factors that drive GDP growth differ according to the stage of that country's development. They suggest that there are two stages of development. The first one involves the transition from low-to-middle income and growth in this stage might be facilitated by improving institutions and primary/secondary education. The second stage involves transitioning from middle-to-high income and technological upgrading and growth in this stage involves improving innovative capabilities. Therefore focussing on

increasing R&D investment and improving human capital accumulation might be more appropriate for countries transitioning from middle to high income (Lee and Kim, 2009).

However, as scholars have debated whether policies or institutions facilitate economic growth and sought to provide evidence for one view or the other, they have failed to ask the critical question they implicitly assume: Do institutions or policies enhance entrepreneurship or as Adam Smith suggests commerce and manufactures? The correct line of argument is that the quality of institutions shape economic incentives that entrepreneurial firms face, thus facilitating commerce and manufactures which then leads to economic growth. Similarly, human capital determines entrepreneurial firms' ability to imitate and learn advanced foreign technologies which results in economic growth. In essence, institutions and policies alter the ability and incentives of firms to innovate and proactively take risks. The clear causal link theoretically is from institutions and policies to entrepreneurship. Nevertheless, scholars simply link institutional and policy variables to growth instead of defining entrepreneurship at the aggregate level and establishing the hypothesized causal link. We maintain that institutions and policies by themselves do not increase output. Entrepreneurial firms and entrepreneurs do. Therefore, institutions and policies are, correctly, the enablers of risk taking, proactiveness and innovativeness and not directly economic growth.

In this chapter, we address this oversight and evaluate institutional and policy variables as determinants of the manifestation of entrepreneurship at the aggregate level, EO. Abramovitz (1994, p. 24) suggests, the determinants and drivers of technological upgrading are the "countries' level of education and technical

competence, the commercial, industrial and financial institutions that bear on their abilities to finance and operate modern, large-scale business, and the political and social characteristics that influence the risks, the incentives and the personal rewards of economic activity". Therefore, we investigate financial market development, social cohesion, human capital and the control of corruption as potentially important factors that may affect the rate of entrepreneurship across countries (Biggs and Srivastava, 1996, Aterido et. al, 2009).

We select these four measures as determinants of EO because they alter the ability and incentives of firms to be entrepreneurial. First, we submit that good institutions, that reduce levels of corruption and arbitrary discrimination, would support EO since risk bearing and innovating require, at a minimum, the assurance the rewards will accrue to the risk taker. Second, we note that the proactive actions necessary to attack new markets require purposeful, cohesive action that is more likely in relatively equal societies with agreed on long-term objectives than other scenarios. Third, we posit that financial institutions are important because they evaluate and finance entrepreneurs' innovation and launching of new products to market (Schumpeter, 1912) and thus their relative absence would inhibit EO (King and Levine, 1993). Lastly, we contend that high stocks of human capital enhance entrepreneurship by enabling knowledge acquisition and better quality innovation (Larroulet and Couyoumdjian, 2009).

However, we also note that EO and its drivers are different in diverse kinds of contexts. Since economic growth in Schumpeterian theory is highly context-dependent, we would expect the effect of institutions and the stock of human capital on entrepreneurship to vary depending on the distance to the technological frontier.

For example, as Lee and Kim (2009) note, tertiary education may be more important than secondary education for technological upgrading in middle-to-higher income countries whereas institutions may be more important for low income countries. Thus a greater understanding of these differences in EO amongst countries shaped by these drivers may assist firms, investors and government policy makers in spurring economic growth. Consequently, ascertaining the impact of financial market development, social cohesion, the control of corruption and the stock of human capital would enable countries to implement appropriate policies for entrepreneurship led growth.

4.1 Research Design

As discussed in chapter 3, we use secondary, longitudinal, panel data that contains both cross-sectional and time series elements in order to investigate the relation between EO and its determinants. The data set is constructed from the CANA panel database and the World Development Indicators (WDI). Our sampling frame is the 134 nation states that have been in existence for more than 10 years and are represented in both the CANA and the World Bank's WDI databases. The complete sample covers data on 93 countries, of which 16 are African.

4.1.1 Independent variables

Our independent variables are: financial market development, corruption, social cohesion and human capital. First, to measure banking development, an important construct because financial institutions evaluate and finance entrepreneurs' innovation and launching of new products to market (Schumpeter, 1942), we assess financial depth (size) of financial institutions. Following Čihák, Demirgüç-Kunt, Feyen and Levine (2012), we adopt the private credit to gross domestic product (GDP) ratio

in order to operationalise banking development. The private credit to gross domestic product (GDP) ratio measures domestic private credit granted to the real sector by commercial banks as percentage of local currency GDP. Due to data limitations and the need to preserve our longitudinal data sample, particularly of African countries, we do not use an indicator of the size of financial markets as a measure of financial development. As Table 12 shows, when we include stock market to GDP ratio the observations are almost halved from 2726 to 1425. Nevertheless, as the indicator of domestic credit is highly correlated with the stock market to GDP ratio, we would expect it to ameliorate some of the negative impact of excluding this measure of financial market development.

Table 12: Correlation matrix of the indicators of financial development

Sample (adjusted): 1988 2008 Included observations: 1425 after adjustments		
	Private credit to GDP	Stock market to GDP
Private credit to GDP	1.00	
Stock market to GDP	0.54***	1.00

Notes:
1. ***, **, and * in the table indicate the levels of significance at 1%, 5%, and 10%, respectively

Second, following Asiedu and Villamil (2000) and Wei (2000), we use the control of corruption and inequality as proxies of institutions because firstly, unlike governance measures they have a direct association with EO. For example, innovation, risk taking and proactiveness can take place in an autocracy such as China or a democracy, such as Sweden. However, corruption in either of these countries would alter the calculus of entrepreneurial firms. They would have to decide whether to use valuable resources on rent seeking and bribery or innovation and risk taking.

Similarly, inequality occasioned by arbitrary discrimination alters the opportunity set faced by talented individuals from minority groups. Exclusion from educational

opportunities and business leadership reduces both the human and entrepreneurial capital stock with possibly dire consequences for EO. Literature suggests that ethnic heterogeneity (Easterly, 2006), a measure of the chances of people belonging to different ethno-linguistic groups and youth unemployment, which reflects a failure to mobilize existing resources and build productive skills (Sala-i-Martín, Bilbao-Osorio, Blanke, Crotti, Hanouz, Geiger and Ko, 2012), are valid indicators of social cohesion. However, due to data limitations and the need to preserve our longitudinal data sample, particularly of African countries, we do not adopt these indicators. As an illustration, when we control for inequality using the Gini coefficient, African countries in our analysis are reduced from 16 to 7. If we were to also include youth unemployment, they would be further reduced rendering any analysis of the impact of social cohesion on Africa meaningless. Thus we employ only the Gini coefficient to calibrate economic gulfs in nation states (Rodrik, 1999).

Inequality may be an important antecedent to EO because social exclusion occasioned by high inequality may lead to low future prospects for the youth and can stimulate political volatility which would render technological upgrading redundant. In addition, the proactive actions necessary to attack new markets require purposeful, cohesive action that relatively equal societies engender. Therefore, inequality is an important indicator for operationalising whether a country is indeed socially cohesive enough to bear the risks occasioned by an entrepreneurial orientation.

Moreover, corruption has generally been determined using perception based indices (Olken and Pande, 2011). Anokhin and Schulze (2009) suggest that the variables employed in creating these indicators include the frequency of bribes, the size of bribes and political corruption by national leaders. Olken and Pande (2011) submit

that perception surveys have superior coverage across a wider range of countries compared to objective measures of corruption. Thus we employ the Corruption Perception Index from Transparency International Index sourced from the CANA database which ranges from 0 (indicating high corruption) to 10 (indicating low corruption). We term this indicator the control of corruption in order to simplify analysis.

Lastly, analogous to Lee and Kim (2009), we calibrate the level of human capital by using both the secondary and tertiary enrolment ratios. The secondary enrolment ratio is defined as ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the secondary level. Similarly, the tertiary enrolment ratio is characterised as the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the tertiary level. Lee and Kim (2009) find that tertiary education and secondary education have a divergent impact on economic growth depending on the level of development. They maintain that this is due to the need for middle income countries to undertake process innovation, adaptations and improvements of technological capabilities in order to grow. Since these are essentially outcomes of EO, we investigate both the secondary and tertiary enrolment ratios as determinants of EO.

Table 13: Descriptive statistics of the determinants of EO

	Control of corruption	Gini Index	Domestic Credit	Tertiary	Secondary
Mean	4.77	37.56	63.29	26.60	72.42
Median	4.07	35.29	53.30	22.58	80.18
Maximum	10.00	77.60	312.78	98.79	170.95
Minimum	1.00	12.10	-121.63	0.00	1.11
Std. Dev.	2.27	10.81	53.19	20.88	30.48
Skewness	0.74	0.56	1.12	0.78	-0.40
Kurtosis	2.42	2.67	5.63	2.91	2.53
Jarque-Bera	288.44	112.58	1360.20	276.49	99.27
Probability	0.00	0.00	0.00	0.00	0.00
Sum	13013.23	74058.90	172532.90	72499.96	197414.00
Sum Sq. Dev.	14017.21	230285.00	7709368.00	1188312.00	2531987.00
Observations	2726.00	1972.00	2726.00	2726.00	2726.00

Table 13 presents the descriptive statistics for the control of corruption, the Gini Index, domestic credit to the private sector to GDP ratio as well as both measures of human capital, the tertiary enrolment ratio and the secondary enrolment ratio. The control of corruption, domestic credit to the private sector to GDP ratio as well as both measures of human capital have data on 93 countries, of which 16 are African whereas the Gini Index has data on only 68 countries, of which only 7 are African.

We begin by evaluating whether the normality assumptions are violated by assessing the third and the fourth moment of the normal distribution. The mean and the median differ substantially for all the four individual variables, indicating the presence of skewness. The control of corruption, the GINI Index, domestic credit to the private sector to GDP ratio as well as the tertiary enrolment ratio are all positively skewed whereas the secondary enrolment ratio is negatively skewed. Moreover, all the determinants of EO are largely mesokurtic (the distribution is flat relative to the normal distribution) except for domestic credit which is leptokurtic. The Bera-Jarque statistic firmly rejects normality ($p<0.01$) for all the determinants of EO.

Furthermore, we analyse the maxima and the minima to begin to decipher patterns amongst countries. First, Japan attained the highest ratio of domestic credit to GDP of 312% in the year 2005 whereas Tajikistan in 1992 had the lowest score in the sample of -121%. Second, Denmark and Finland attain the perfect score for the control of corruption in the year 2000. In contrast, Pakistan achieved the lowest possible reading of 1 on Transparency International's measure in 1996. Third, China has the lowest inequality score of 12 in 1982 while Zambia has the highest Gini coefficient. Lastly, Finland and Australia have the highest score for tertiary and secondary education, respectively whereas the African countries Botswana and Mozambique have the lowest scores for tertiary and secondary education, respectively.

Table 14: Country Rankings: Determinants

Dcredit		**Corruption**		**Gini Index**		**Tertiary**		**Secondary**	
Country	Mean	Country	Mean	Country	Mean	Country	Mean	Country	Mean
1.Japan	268.54	1.Denmark	9.630	1.Zambia	62.91	1.Canada	69.80	1.Australia	120.98
2.United States	174.73	2.New Zealand	9.407	2.Brazil	58.73	2.Finland	68.69	2.Belgium	120.37
3.Switzerland	164.27	3.Finland	9.334	3.Burkina Faso	56.84	3.United States	67.85	3.Denmark	116.83
4.Malaysia	157.74	4.Iceland	9.323	4.South Africa	55.49	4.Slovakia	58.60	4.Netherlands	116.37
5.Netherlands	134.07	5.Singapore	9.223	5.Chile	55.21	5.Norway	56.75	5.Sweden	113.91
6.South Africa	130.40	6.Sweden	9.185	6.Guatemala	54.95	6.New Zealand	55.48	6.Finland	113.59
7.Canada	128.05	7.Canada	9.082	7.Colombia	54.79	7.Australia	55.41	7.Norway	107.37
8.Germany	117.41	8.Netherlands	8.846	8.Thailand	52.78	8.Sweden	52.46	8.Spain	105.39
9.Spain	117.19	9.Norway	8.777	9.Mexico	51.65	9.Belgium	49.39	9.Ireland	103.53
10.Austria	116.13	10.Australia	8.723	10.El Salvador	50.93	10.UK	47.96	10.New Zealand	102.49
Bottom 5									
89.Lithuania	6.64	89.Russia	2.465	64.Iceland	25.08	89.Lesotho	2.18	89.Senegal	16.10
90.Kyrgyzstan	5.04	90.Azerbaijan	2.349	65.Sweden	24.33	90.Ethiopia	2.06	90.Ethiopia	15.66
91.Lao PDR	4.49	91.Madagascar	2.034	66.Finland	24.08	91.Cambodia	1.80	91.Uganda	13.01
92.Tajikistan	-27.14	92.Honduras	1.935	67.Czech Republic	23.95	92.Mozambique	1.52	92.Burkina Faso	8.33
93.Botswana	-29.73	93.Paraguay	1.602	68.Slovenia	23.65	93.Burkina Faso	1.42	93.Mozambique	7.97

Table 14 summarises the country rankings based on the country score on each of the determinants averaged over 29 years over the period in 1980-2008. The

rankings confirm the pattern that was emerging when we analysed maxima and minima. African countries score poorly on measures of inequality as well as both the human capital measures. Developed countries tend to achieve the highest scores across all the variables. Middle income countries perform poorly on both the extension of credit to the private sector and the control of corruption. Interestingly, South Africa seems to have a schizophrenic character. It achieves a top 10 ranking on two seemingly contradictory measures, the Gini Index and the extension of credit to the private sector, unlike its other middle income peers.

4.1.2 Dependent variable

As previously discussed in chapter 3, we adopted and confirmed Miller's (1983) conceptualisation of EO as a reflective, unidimensional, second order construct. As a second order construct, EO's indicators are risk taking, innovativeness and proactiveness. Correlations and exploratory factor analysis were used to confirm both the validity and dimensionality of EO. Table 15 displays the mean, standard deviation and rank of EO for the selected countries between 1980 and 2008. The means of the determinants of EO are also displayed. The top 10 EO countries are all high income countries, with Singapore achieving the highest average EO score over 29 years. The top 10 all score highly on the control of corruption, domestic credit and tertiary education. However, Singapore scores disappointingly on inequality with a Gini Index of 46.02 which is substantially above the sample average of 37.56.

Table 15: Rankings of EO and its determinants

EO Rank	Country	Mean	Std. Dev.	Control of Corruption	Gini Index	Domestic credit	Tertiary
1	Singapore	2.46	0.81	9.22	46.02	81.94	32.62
2	Ireland	2.26	0.64	8.38	33.06	87.80	38.00
3	Belgium	1.39	0.32	6.13	27.04	100.38	49.39
4	Switzerland	1.36	0.27	8.64	33.15	164.27	33.45
5	Sweden	1.04	0.46	9.18	24.33	111.74	52.46
6	Japan	1.03	0.16	6.57	29.81	268.54	38.27
7	Netherlands	0.92	0.30	8.85	29.03	134.07	46.47
8	Iceland	0.91	0.49	9.32	25.08	86.71	34.87
9	Denmark	0.85	0.38	9.63	30.75	93.23	47.43
10	Finland	0.80	0.50	9.33	24.08	66.92	68.69
	Selected Developed						
11	United States	0.79	0.21	7.66	40.28	174.73	67.85
13	Germany	0.73	0.22	8.06	27.55	117.41	35.92
16	Canada	0.64	0.31	9.08	30.03	128.05	69.80
21	United Kingdom	0.53	0.18	8.71	31.16	112.39	47.96
38	Portugal	0.13	0.13	6.35	35.78	106.58	37.14
	Selected African						
25	Botswana	0.50	0.18	6.06	NA	-29.73	2.78
52	South Africa	-0.06	0.15	5.03	55.49	130.40	16.98
80	Senegal	-0.64	0.16	3.49	NA	30.24	4.11
92	Lesotho	-1.09	0.63	3.43	NA	9.94	2.18
93	Ethiopia	-1.20	0.27	3.37	39.34	36.06	2.06
	Selected Eastern European and former Soviet Union						
15	Czech Republic	0.67	0.22	4.84	23.95	71.04	23.16
19	Slovenia	0.56	0.29	5.27	23.65	30.39	43.42
33	Russia	0.19	0.19	2.46	37.78	22.68	30.37
66	Georgia	-0.34	0.29	3.36	37.49	11.01	40.11
87	Kyrgyzstan	-0.90	0.19	4.16	39.07	5.04	28.65
	Selected Latin American						
45	Chile	0.04	0.28	7.03	55.21	85.58	28.04
60	Brazil	-0.23	0.11	3.85	58.73	86.00	10.59
63	Argentina	-0.29	0.14	4.09	46.38	37.52	43.56
71	Uruguay	-0.44	0.18	3.95	43.00	50.33	29.85
77	Bolivia	-0.55	0.17	2.96	NA	42.71	29.39
	Selected Asian						
17	Malaysia	0.62	0.42	5.36	47.34	157.74	17.86
31	China	0.22	0.45	2.68	26.24	98.35	7.27
32	Thailand	0.19	0.32	2.90	52.78	112.16	23.75
74	India	-0.49	0.30	2.87	32.32	52.59	7.23
75	Sri Lanka	-0.50	0.16	3.65	NA	41.39	18.65
46	All	0.00	0.74	4.77	37.56	63.29	26.60

Former Eastern Bloc countries such as the Czech Republic and Slovenia rank highly on EO, inequality and tertiary enrolment exceeding some developed countries, for instance the United Kingdom. Likewise, one of the fastest growing countries over the past 30 years, China, scores highly on EO at number 31 realising a higher grade than both Portugal and Russia. However, China's performance on the determinants

is mixed. It ranks very poorly on corruption and tertiary education, achieving scores well below the sample average whereas it attains a high score on inequality and access to credit by the private sector.

On the other hand, African countries attain very low scores on EO and its determinants, with Lesotho and Ethiopia ranking last and second last, respectively. South Africa is ranked in the middle, number 52 out of 93 countries. South Africa seems to have a similar profile to Latin American countries such as Chile, Brazil, Argentina and Uruguay. They all attain average EO scores of around zero, have high inequality, well-developed financial systems and are moderately corrupt. However, whereas the Latin American group tends to score highly on tertiary enrolment, South Africa performs poorly on this measure compared to them.

Figures 5 to 7 illustrate tertiary education, domestic credit and EO, respectively in selected countries. The figures illustrate that countries that have high human capital as well as developed banking systems seem to attain a high EO.

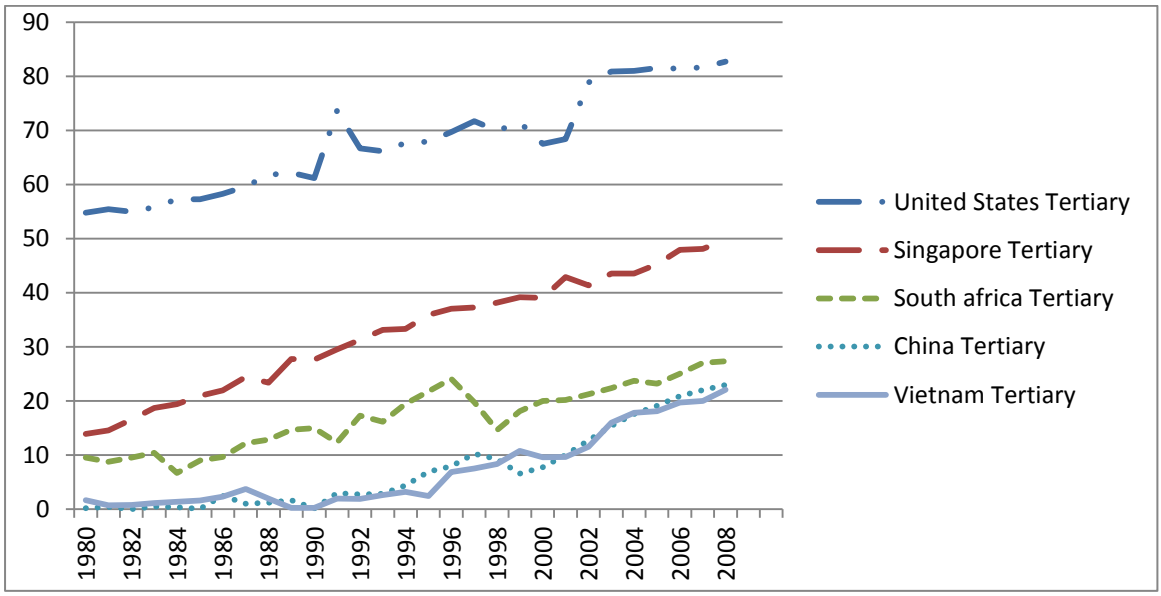

Figure 5: Tertiary education

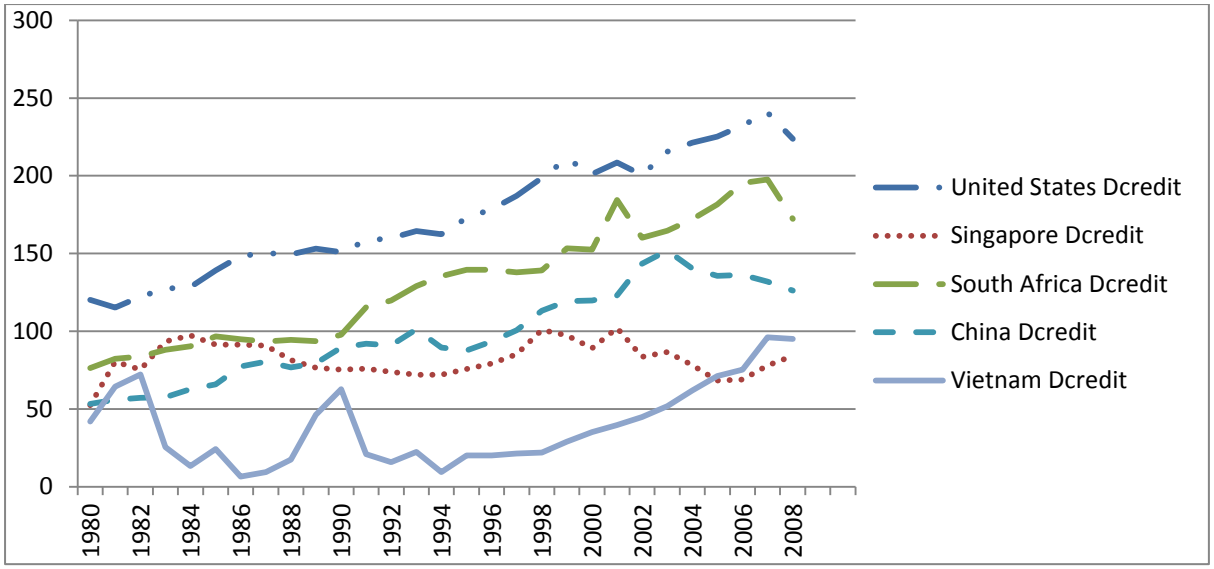

Figure 6: Domestic Credit

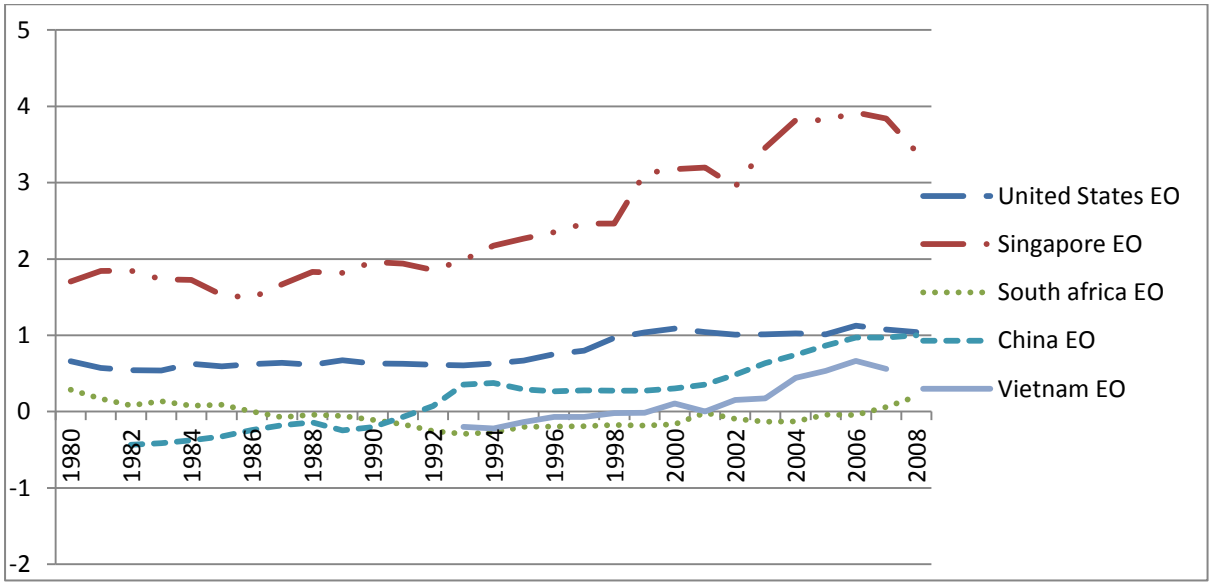

Figure 7: EO

Table 16 presents the correlations between EO, its sub-constructs innovativeness, risk taking and proactiveness and the determinants, the control of corruption, domestic credit as well as the human capital variables tertiary enrolment and secondary enrolment. As Table 16 demonstrates, EO is significantly and positively ($p<0.00$) correlated to the control of corruption, domestic credit, tertiary enrolment and secondary enrolment and as expected, it is negatively related to the measure of inequality, the Gini Index. Similarly, the sub-constructs of EO, innovativeness, risk

taking and proactiveness, are positively (p<0.00) correlated to the control of corruption, domestic credit, tertiary enrolment and secondary enrolment whereas they are negatively related to the Gini Index. Lastly, EO has a higher association with both human capital variables than its sub-constructs, further enhancing the reliability and nomological validity of this research.

Table 16: Correlation matrix of the sub-constructs of EO, EO and its determinants

	EO	Innov	Proact	Risk	Corrupt	Domestic credit	Gini Index	Tertiary	Secondary
EO	1.00								
Innov	0.70***	1.00							
Proact	0.76***	0.25***	1.00						
Risk	0.81***	0.35***	0.43***	1.00					
	0.00	0.00	0.00	-----					
Corrupt	0.67***	0.72***	0.30***	0.42***	1.00				
Domestic credit	0.53***	0.59***	0.18***	0.38***	0.47***	1.00			
Gini Index	-0.40***	-0.44***	-0.12***	-0.27***	-0.35***	-0.16***	1.00		
Tertiary	0.64***	0.64***	0.39***	0.40***	0.52***	0.41***	-0.35***	1.00	
Secondary	0.66***	0.56***	0.35***	0.53***	0.55***	0.37***	-0.49***	0.77***	1.00

Notes:

1. ***, **, and * in the table indicate the levels of significance at 1%, 5%, and 10%, respectively.
2. Innov, Proact and Risk represent innovativeness, proactiveness and risk taking respectively. Corrupt indicates the control of corruption.

4.1.3 Estimation Methodology

We use a panel data set of 93 countries created from multiple data sources to conduct the necessary statistical analysis. Brooks (2008) notes that when using a panel data set we do not assume that the observations are independently distributed since panel data is comprised of both time series and cross sectional elements. Moreover, he suggests that panel data is superior to both time series and cross sectional data since it increases the degrees of freedom, reduces the collinearity

among the independent variables and enables a researcher to control for unobservable individual differences and subtleties.

In our empirical specification, EO is the dependent variable whereas the control of corruption, financial development, social cohesion and human capital are our dependent variables. EO is composed of several persistent series such as FDI and R&D, therefore lagged EO is also likely to be associated with current EO. Hasan and Tucci (2010) suggest that ordinary least squares (OLS) estimates are biased and inconsistent when there are inter-relationships between both the dependent and independent variables in the regression specification. We thus evaluate a linear dynamic panel-data model to capture the effect of the lagged dependent variables on the current dependent variables.

Moreover, entrepreneurship and institutional variables may also possibly be endogenous because of omitted variables and reverse causality (Li et al., 2012). For example, financial market development might be occasioned by financial institutions with a high EO using innovative methods to increase credit availability to the private sector. Likewise, reverse causality cannot be dismissed since countries with a high EO might attain a higher stock of human capital. A high EO may increase demand, and as a result wages, for knowledge workers in innovative sectors and workers may in turn respond to higher returns to education by staying longer in school.

Hasan and Tucci (2010) suggest that this endogeneity can be somewhat ameliorated by the Generalized Method of Moments (GMM) procedure for panel estimation. The GMM technique was specifically devised to mitigate the econometric problems caused by unobserved country specific effects and endogeneity in growth regressions. Blundell and Bond (1998) developed a system GMM estimator which

combines equations of the first differences instrumented by lagged levels with an additional set of equations in levels instrumented by lagged first-differences. First-differencing and lagging allows us to correct for endogeneity bias, check for unobserved heterogeneity and the associated omitted variable bias, as well as for the time-invariant component of the measurement error. Blundell and Bond (1998) argue that the system GMM estimator is superior to the difference estimator since:

- it mitigates the poor instruments problem by using additional moment conditions,
- it is less biased than the difference GMM estimator (Hayakawa, 2007) and,
- the two-step estimator is asymptotically efficient and robust to all kinds of heteroskedasticity.

Li et al. (2012) state that system GMM is not subject to weak instrument and finite sample biases and therefore it may have better finite sample properties. Roodman (2009) suggests that system GMM estimators are best suited for panels with large cross-sectional variables and fewer time periods. In particular, panels (similar to our data) with a linear functional relationship, an autoregressive dependent variable, fixed country effects, heteroskedasticity and autocorrelation are appropriate for system GMM. Moreover, system GMM are advantageous because they employ extra moment conditions that rely on stationary conditions of the first observations (Dutta, Sobel and Roy, 2012). We therefore adopt the system GMM estimators to analyse our data.

The equation takes the following form:

$$EO_{it} = \alpha_0 + \alpha_1 EO_{it-1} + \alpha_2 Corru_{it} + \alpha_3 FinDev_{it} + \alpha_4 SoCo_{it} + \alpha_5 HumanCap_{it} + \alpha_6 \theta_i + \alpha_7 Z_t + \varepsilon_{it} \quad (11)$$

Where *EOit* is entrepreneurial orientation in country *i* at time *t*, the lag *EOit-1* represents the expected persistence of EO as we would expect it to manifest over time and takes into account serial correlation, *CORRUit* represent our measure of corruption, *FINDEVit* measures financial development, *SOCOit* calibrates social cohesion and *HUMANCAPit* evaluates human capital. In addition, θi is the measure of time-invariant country fixed effects, *Zt* is the vector for time dummies and ε_{it} represents the random error term.

4.1.4 Reliability and Validity

In our estimation strategy, we utilise the two-step dynamic GMM estimator, which is asymptotically efficient and vigorous to heteroskedasticity. In addition, we only use internal instruments and external instruments are not used. Blundell and Bond (1998) suggest that in system GMM, instrument validity can be ascertained by employing two tests.

Firstly, we have to ascertain whether the model is identified or not. A model is identified if and only if its parameters can be consistently estimated from observables. Blundell and Bond (1998) propose using the Sargan test of over-identifying restrictions which tests the overall validity of the instruments by analysing the sample analog of the moment conditions used in the estimation process. The Sargan test evaluates whether the instrumental variables used in the regression are uncorrelated to some residuals. If they are uncorrelated, the instruments are deemed valid.

Secondly, Hasan and Tucci (2010) suggest the autoregressive (AR) test. The AR test examines serial correlation in the error terms in both the difference regression and the lagged difference-level regression. The differenced error term is permitted to be to be AR (1). However, AR (2) serial correlation in the differenced error term contravenes the assumption of the GMM technique. Following Hasan and Tucci (2010), we will report the p-value of the Sargan test, the p-value of the AR (2) tests. If the p-values of the AR (2) test and the Sargan test are not significant (>0.05), we will not reject the null hypotheses of over-identification and no second order auto correlation of error terms. We would therefore conclude that the estimation supports the validity of the instruments implying that the estimated coefficients are free of endogeneity bias.

Although the Sargan test and the AR (2) test are helpful in determining the validity of instruments, Roodman (2009) submits that we should also mind and report the instrument rank. The Instrument rank is merely the number of linearly independent instruments used in estimation the regression. Roodman (2009) argues that in dynamic GMM, a high instrument rank can lead to endogenous variables being over fit and the power of the Hansen test being reduced. He suggests that a revealing sign of instrument invalidity is a Sargan test statistic of 1.00. In addition, Roodman (2007) recommends that, to ensure instrument validity, the ratio of the number of cross sections (n) to the instrument rank (i) should be greater than 1, that is, r = n/i =>1. Further, he notes that an r < 1, increases the chances of the regression yielding significant results even though there is no underlying association between variables. Therefore, following Asiedu and Lien (2011), we report the instrument count and r for all our regressions and where r< 1, we reduce the instrument rank by restricting the number of lags of the dependent variable that can be used as instruments.

4.2 Estimation Results

We begin by assessing the correlation matrix of the independent and control variables for collinearity. As Table 17 indicates, the pairwise correlation coefficients show that multicollinearity may be a problem between the human capital variables (0.78) as well as the control variable wealth (GDP) and the control of corruption (0. 82). Hair et al. (2010) argues that multicollinearity can affect the ability of a researcher to represent and understand the effect of each IV in the regression. Furthermore, they note that multicollinearity affects not only the coefficients or the overall model but it can also result in the regression coefficient having the wrong sign.

Nonetheless, Hair et al. (2010) suggest that in some cases this reversal of signs is expected and desirable due to the suppression effect. The suppression effect helps in determining the "true relationship between the dependent and the IVs has been hidden in the bivariate correlations. By adding additional independent variables some unwanted shared variance is accounted for and the remaining unique variance allows for the estimated coefficients to be in the expected direction" (Hair et al., 2010, p. 203). As expected, the control of corruption is correlated to all the determinants and the control variable except for inequality which is negatively related to all the indicators.

Table 17: Correlation matrix of IVs (combined sample)

	Corruption	Domestic credit	Secondary	Tertiary	Gini Index	GDP per capita
Corruption	1.00					
Domestic credit	0.48***	1.00				
Secondary	0.59***	0.37***	1.00			
Tertiary	0.55***	0.38***	0.78***	1.00		
Gini Index	-0.39***	-0.21***	-0.50***	-0.40***	1.00	
GDP per capita	0.82***	0.57***	0.65***	0.64***	-0.50***	1.00

Notes:
1. ***, **, and * in the table indicate the levels of significance at 1%, 5% and 10%, respectively.
2. GDP per capita is measured in US 2005$.

We then run system GMM regressions for all the 93 countries in our sample that vary with the choice of policy and institutional variables. In all the regressions, the log of GDP per capita in 2005 US dollars is included as the basic control variable and EO is the dependent variable. The Sargan and AR (2) tests in the system GMM regressions are not significant ($p > 0.05$), thus we do not reject the null hypotheses of over-identification and no second order auto correlation of error terms. Furthermore, $r > 1$ in all the regressions, suggesting that the Sargan test has sufficient power, and therefore the instruments are valid. The results are displayed in Table 18.

The control variable the log of GDP carries a positive sign and it is significant at the 10% level. The estimated coefficient of lagged EO is positive and significant ($p<0.01$), indicating that EO is persistent and justifying our decision to use the system GMM estimator. Model (1) presents the regression where the control of corruption is the only explanatory variable. The estimated coefficient is negative and significant at the 1% level. However, when we control for inequality in Model (7), the coefficient of the control of corruption changes sign and becomes positive ($p<0.01$). This positive association between EO and the control of corruption is positive and

robust to the addition of domestic credit, tertiary and secondary education as independent variables. This suggests that, all else being equal, lower perceptions of corruption are positively associated with EO in relatively equal societies whereas in countries where distributional conflict may exist, they may not be. These results find support in Olken's (2005) findings that perceptions of corruption may be influenced by social trust.

Table 18: GMM analysis with the determinants as predictors of EO (combined sample)

Dependent variable: EO

Model	1	2	3	4	5	6	7	8	9	10
EO(-1)	0.57 71.88***	0.66 76.51***	0.64 75.39***	0.66 70.38***	0.59 49.91***	0.65 29.31***	0.69 29.28***	0.63 26.73***	0.67 29.89***	0.62 20.11***
Log (GDP)	0.19 11.46***	0.11 6.31***	0.14 6.53***	0.23 9.38***	0.17 5.82***	0.12 2.78***	0.15 3.32***	0.14 3.08***	-	0.10 1.68*
Corruption	-0.08 -12.43***					0.17 12.38***	0.17 13.72***	0.14 8.99***	0.16 9.72***	0.15 9.05***
Domestic credit		-0.00 -1.85**						0.00 6.29***	0.00 9.99***	0.00 8.32***
Tertiary			-0.00 -3.22***		0.01 9.82***	0.00 4.48***			-0.00 -0.58	-0.00 -1.96**
Secondary			0.00 4.53***		0.00 0.43	0.00 3.11***			0.01 4.98***	0.00 3.47***
Gini Index				-0.00 -7.69***	-0.00 -4.21***	0.00 0.93	0.00 0.69	0.00 2.64***	0.00 2.03**	0.00 2.08**
Number of observations	1879	1879	1879	1370	1370	1370	1370	1370	1375	1370
J statistic	81.86	82.50	79.70	55.24	54.37	57.43	55.93	55.75	59.25	57.07
Prob(J-statistic)	0.33	0.31	0.39	0.35	0.38	0.28	0.33	0.34	0.23	0.29
AR(2)	0.19	0.15	0.14	0.19	0.19	0.17	0.16	0.15	0.16	0.16
No of cross sections	92	92	92	68	68	68	68	68	68	68
Instrument rank	80	80	81	55	57	58	56	57	58	59
N/I	1.15	1.15	1.14	1.24	1.19	1.17	1.21	1.19	1.17	1.15

Notes:

1. The dependent variable is EO assessed during the period 1982-2008 using an unbalanced panel with 27 periods included and 93 cross-sections.
2. The regressions including the GINI Index have 27 periods and 68 cross-sections.
3. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively

In model (2), we assess the relationship between the provision of domestic credit to the private sector and EO. The estimated coefficient is negative and this result is

significant at the 5% level. However, when we control for corruption and inequality in model (8), the sign of the coefficient of domestic credit changes from negative to positive. This result is significant at the 1% level. This outcome is robust to adding additional independent variables such as human capital and wealth (log of GDP). We can surmise that, for all 93 countries in the sample, the domestic credit to the private sector to GDP ratio enhances risk taking, innovativeness and proactiveness provided that the country is relatively equal and corruption is comparatively modest. This finding aligns with Black and Moersch (1998) assertion that where there is poor corporate governance and corruption, banking development may hinder EO.

In model (3), we evaluate the relation between human capital variables and EO. As previously indicated, the human capital variables are highly collinear. However, we insert them jointly in the regression to evaluate Lee and Kim's (2009) finding that tertiary education and secondary education's relative importance to technological upgrading depends on the level of development. The tertiary variable is negatively associated with EO ($p<0.01$) whereas the secondary education variable is positively associated with EO ($p<0.01$). However, when we control for inequality in model (5) and both inequality and corruption in model (6), tertiary education becomes positively associated with EO ($p<0.01$), implying high corruption and inequality may hinder the association between tertiary education and EO. The relationship between secondary education and EO on the other hand remains positive and significant at the 1% level and robust to the addition of domestic credit, inequality and wealth as additional predictors (model 10). In contrast, adding the domestic credit and wealth to the regression renders the association between EO and tertiary education insignificant. From these results, we can infer that, for the combined sample and after controlling

for the other determinants of EO and wealth, secondary education is more robust as a predictor of EO compared to tertiary education.

In model (4) we investigate the relation between inequality and EO which we find to be negative ($p<0.01$). However, when we include in the regression the control of corruption and financial development in model (7) and wealth in model (10), the relation becomes positive and significant ($p<0.01$), with the suppression effect once again being demonstrated. This relation remains robust to the addition of the human capital variables to the regression. We therefore conclude that in countries with low corruption, high human capital development as well as a highly developed banking system, inequality is positively associated with EO. This finding confirms Barro (2000) and Forbes (2000) finding that the impact of inequality may vary with the level of development.

4.2.1 Results of middle-to-high income countries

Following Lee and Kim (2009), we categorise countries whose GDP per capita in 2000 is higher than US 3000as middle-to-high income countries whereas countries whose GDP is lower than US $3000 are classified as low income countries. Table 19 presents the correlation matrix of the independent and control variables for middle-to-high income countries. Once again, the association between the human capital variables (0.70) and wealth and the control of corruption (0.75) may indicate potential problems with multicollinearity and the institutional variables have the expected associations.

Table 19: Correlation matrix of IVs (middle-to-high income sample)

	Corruption	Domestic credit	Secondary	Tertiary	Gini Index	GDP per capita
Corrupt	1.00					
Domestic credit	0.37***	1.00				
Secondary	0.49***	0.27***	1.00			
Tertiary	0.44***	0.26***	0.70***	1.00		
Gini Index	-0.38***	-0.09***	-0.55***	-0.39***	1.00	
GDP per capita	0.75***	0.50***	0.62***	0.56***	-0.53***	1.00

Notes:
1. ***, **, and * in the table indicate the levels of significance at 1%, 5% and 10%, respectively.
2. GDP per capita is measured in US 2005$.

Table 20 presents the results for system GMM regressions for all the 51 countries that fall under the middle-to-high income category. We drop the log of GDP per capita in 2005 US dollars as a control variable since we have divided the sample into two, based on income. However, we use wealth as a robustness measure in model (10). Similar to the analysis where we include all countries, EO remains the sole dependent variable. The Sargan and AR (2) tests in the system GMM regressions are not significant (p >0.05), therefore we cannot reject the null hypotheses of over-identification and no second order auto correlation of error terms. Furthermore, r => 1 in all the regressions, suggesting that the Sargan test has sufficient power, and the instruments are thus valid.

With validity established, we proceed to investigate the control of corruption variable as a determinant of corruption. The estimated coefficient of lagged EO remains positive and significant at the 1% level, further vindicating our decision to use the system GMM estimator. Low perceptions of corruption are positively associated with EO (Model 1) and this result is significant at the 1% level. In contrast to the results emanating from regression analysis using the combined sample, the positive

relationship between EO and the control of corruption in middle-to-high countries is positive and robust to the addition of domestic credit, tertiary and secondary education, the Gini Index as well as wealth as independent variables. This suggests that, all else being equal, lower perceptions of corruption are positively associated with EO in middle-to-high income countries and that Olken's (2005) findings that perceptions of corruption are influenced by social trust may not apply to middle-to-high income countries.

Similarly, in model (2) positive relation between the provision of domestic credit to the private sector is positive and significant at the 1% level. This result is robust to the addition of the control of corruption, inequality as well as human capital and wealth as control variables. Model (3) provides support for Lee and Kim's (2009) assertion that tertiary education is more significant for middle-to-high income countries compared to secondary education as a predictor of EO. However, when we control for domestic credit, financial development and the control of corruption, the variable tertiary education becomes insignificant whereas the secondary education variable remains positively and significantly associated with EO ($p<0.01$). These results indicate that tertiary education is strongly associated with financial development, the control of corruption and wealth in middle-to-high income countries.

We also evaluate the relation between EO and inequality which is persistently negative (models 4 and 10, $p<0.01$), in contrast to the sample as whole. However, when we account for the control of corruption, financial development as well as human capital in model (9) this association becomes insignificant. We add wealth in model (10) to assess the robustness of our results. The association between the

control corruption, domestic credit and the human capital variables and EO hardly changes with the inclusion of wealth. Further, wealth itself is not significant at the 10% level. However, the relation between inequality and EO remains negative and strengthened, and becomes significant at the 1% level with the suppression effect once again being demonstrated.

Table 20: GMM analysis with the determinants as predictor variable (Middle-to-high income sample)

Dependent variable: EO

Model	1	2	3	4	5	6	7	8	9	10
EO(-1)	1.06 31.32***	0.77 44.42***	0.87 57.57***	0.98 142.36***	1.09 43.34***	0.95 24.18***	1.00 36.21***	0.96 37.97***	0.94 35.01***	0.87 16.51***
Log(GDP)	-	-	-	-	-	-	-	-	-	-0.25 -1.34
Corruption	0.47 7.93***				0.47 11.02***	0.55 8.57***	0.55 14.64***	0.44 14.61***	0.50 18.01***	0.39 14.84***
Domestic credit		0.00 7.47***						0.00 3.55***	0.00 1.71*	0.00 4.18***
Tertiary			0.01 7.36***			0.00 1.87*	0.00 2.15**		0.00 1.29	0.00 0.85
Secondary			-0.00 -2.68***			0.00 2.37***	0.00 2.91***		0.00 4.79***	0.00 2.00**
Gini Index				-0.00 -3.39***	-0.00 -0.37		-0.00 -1.61	-0.00 -1.10	-0.00 -1.37	-0.01 -2.81***
Number of observations	1036	1036	1036	888	888	1036	888	888	888	883
J statistic	26.17	28.63	35.53	33.85	27.58	24.85	25.38	28.65	26.26	30.60
Prob(J-statistic)	0.45	0.33	0.10	0.14	0.38	0.53	0.50	0.33	0.45	0.24
AR(2)	0.59	0.26	0.26	0.13	0.21	0.91	0.34	0.23	0.31	0.28
No of cross sections	51	51	51	44	44	51	44	44	44	44
Instrument rank	28	28	29	28	29	30	31	30	32	33
N/I	1.82	1.82	1.76	1.57	1.52	1.70	1.42	1.47	1.38	1.33

Notes:

1. The dependent variable is EO assessed during the period 1982-2008 using an unbalanced panel with 27 periods included and 51 cross-sections.
2. The regressions including the Gini Index have 27 periods and 44 cross-sections.
3. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively.

4.2.2 Results low income countries

Table 21 presents the correlation matrix of the independent and control variables for low income countries. The correlations between all the independent variables (IVs), except for human capital indicators, are all less than 0.80. Similar to our findings for

the combined sample and middle-to-high income countries, the correlation between tertiary and secondary education (0.82) may indicate potential problems with multicollinearity. Interestingly and contrary to our previous findings in the combined sample as well as middle-to-high income countries, the correlation between inequality and reduced perception of corruption, although weak, is positive in low income countries. In addition, the association between inequality and GDP per capita is not significant. The control of corruption has the expected relationships with the other determinants.

Table 21: Correlations matrix of the IVs (low income sample)

	Corruption	Domestic credit	Secondary	Tertiary	Gini Index	GDP per capita
Corruption	1.00					
Domestic credit	0.09**	1.00				
Secondary	0.14***	-0.02	1.00			
Tertiary	0.09**	-0.02	0.82***	1.00		
Gini Index	0.09**	-0.09**	-0.25***	-0.04	1.00	
GDP per capita	0.29***	0.23***	0.51***	0.49***	0.05	1.00

Notes:
1. ***, **, and * in the table indicate the levels of significance at 1%, 5% and 10%, respectively.
2. GDP per capita is measured in US 2005$

Table 22 presents the results for system GMM regressions for all the 41 countries that fall under the low income classification. Similar to the regression for high income countries, the log of GDP per capita is used as a robustness measure in model (11) and EO remains as the only dependent variable. The Sargan and AR (2) tests are satisfactory. Furthermore, r =>1 in all the regressions, thereby supporting identification and instrument validity. The lag of EO is also positively related to EO in all the regressions and this is significant at the 5% level.

We begin by assessing the relation between the control of corruption and EO in Model (1) which we find is persistently negative for low income countries and this finding is significant at the 1% level. Model (5) indicates that this negative association between EO and low corruption may be affected by inequality validating Olken's (2005) assertion that perceptions of corruption are influenced by social trust. However, in model (11) we control for domestic credit, inequality, tertiary and secondary education, as well as wealth and confirm that low levels of corruption in low income countries are negatively related to EO and this is significant at the 1% level. These results provide credence to Ehrlich and Lui's (1999) and Aidt et al.'s (2008) view that corruption may moderate the negative impact of bureaucratic inefficiency on enterprise.

Likewise, instead of the positive relation between the provision of domestic credit to the private sector and EO that we find in middle-to-high income countries, this relation is negative in low income countries as displayed in model (2) ($p< 0.05$). The inclusion of the control of corruption in model (5) renders the relationship insignificant although it is still negative. However, the addition of inequality as well as human capital and wealth as control variables in model (11) negates the influence of low corruption and the resulting negative relationship is significant at the 1% level. These results support Shen and Lee's (2006) assertions that banking development may hinder economic growth, in particular in Latin American, Sub-Saharan African and East Asian countries.

Table 22: GMM analysis determinants of EO (low income countries sample)

Dependent variable: EO											
Model	1	2	3	4	5	6	7	8	9	10	11
EO(-1)	0.80 27.23***	0.93 52.03***	0.71 16.21***	0.91 231.71***	0.89 25.36***	0.52 10.24***	0.73 8.63***	0.80 28.43***	0.89 20.15***	0.70 8.59***	0.15 2.12**
Log(GDP)	-	-	-	-	-	-	-	-	-	-	0.59 2.25**
Corruption	-0.14 -7.19***				-0.01 -0.61	-0.13 -5.26***	0.06 1.26	-0.14 -7.28***	-0.01 -0.32	0.61 0.03	-0.12 -4.74***
Domestic credit		-0.00 -2.22**						-0.00 -0.88	-0.00 -2.59***	-0.00 -1.54	-0.01 -3.24***
Tertiary			0.01 3.90***			0.02 4.39***	0.02 3.78***			0.02 3.82***	0.01 1.52
Secondary			0.01 4.14***			-0.13 -5.26***	0.02 8.40***			0.02 6.88***	0.02 6.10***
Gini Index				-0.00 -3.33***	-0.00 -2.84***		-0.00 -1.07		-0.00 -1.04	-0.01 -3.09***	-0.01 -2.01**
Number of observ	855	855	855	470	470	855	470	855	470	470	470
J statistic	28.03	29.17	25.32	21.68	21.64	23.07	17.55	28.63	20.40	15.97	19.69
Prob(J-statistic)	0.36	0.30	0.50	0.42	0.36	0.63	0.49	0.33	0.37	0.53	0.23
AR(2)	0.61	0.28	0.17	0.90	0.94	0.53	0.81	0.57	0.88	0.42	0.94
No of cross sections	41	41	41	23	23	41	23	41	23	23	23
Instrument rank	28	28	29	23	23	30	23	29	23	23	23
N/I	1.46	1.46	1.41	1	1	1.37	1	1.41	1	1	1

Notes:

1. The dependent variable is EO assessed during the period 1982-2008 using an unbalanced panel with 27 periods included and 41 cross-sections.
2. The regressions including the GINI Index have 27 periods and 23 cross-sections.
3. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively.

Model (3) evaluates tertiary education and secondary education as predictors of EO in low income countries. Although both tertiary education and secondary education are significant ($p<0.01$), secondary education has a larger t-statistic. However, controlling for wealth in Model (11) renders tertiary indicator insignificant whereas the secondary education variable remains positively associated with EO and significant at the 1% level. These results confirm a high association between tertiary education and wealth that we found in middle-to-high income countries with suppression effects reducing the impact of tertiary education on EO and thus contradicting Lee and Kim's

(2009) assertion that tertiary education is more important than secondary education for technological upgrading middle-to-high income countries.

In model (4), we evaluate the association between EO and inequality. The relationship between inequality and EO is persistently negative. Including the control of corruption, banking development as well as human capital as IVs in model (10) does not change the negative association between EO and inequality ($p<0.01$). Similarly, adding wealth to the regression in model (11) does not, unsurprisingly, alter the finding that in low income countries inequality inhibits EO ($p<0.05$).

Furthermore, we include wealth in model (11) to assess the robustness of our results. We find that the association between the control of corruption and domestic credit variables with EO become significant at the 1% level and wealth itself is significant at the 1% level. In addition, the relation between tertiary education and EO loses its significance whereas inequality remains negatively related to EO ($p<0.01$). These findings imply that there is significant within sample variation in the association between EO and its determinants amongst low income countries. Therefore there might be other factors besides income, such as geography, that might explain this within sample variation of the determinants of EO.

In the following section we test whether financial market development, social cohesion, human capital, R&D and the control of corruption have a positive association with EO in a sub-sample of low income countries of Africa. In addition we assess whether indeed the impact of the determinants on EO in Africa is different compared to that of its low income counterparts.

4.2.2 Results from Africa

Table 23 presents the correlation matrix of the independent and control variables for African countries. Unlike both high income and other low income countries, the correlations between independent variables (IVs) are high. Specifically, the correlations between tertiary and secondary education (0.95), GDP and domestic credit (0.78), GDP and tertiary education (0.83), GDP and secondary education (0.89) and domestic credit and secondary education (0.71) indicate potential problems with multicollinearity.

Hair et al. (2010) suggest that multicollinearity may reduce our ability to assess whether the estimated regression coefficients are significant in particular, as in the African case, if the sample size is small. They suggest that understanding the bivariate association between IV and the DV may help us understand the broader relationship in the presence of multicollinearity. Therefore, in order to ameliorate the potential impact of multicollinearity and the small sample size, we enter the determinants in models 1 to 4 individually in the regression to assess their relationships and we compare the results to models 9 to 11. To ensure validity, we further triangulate African results using the results of low income countries as a basis for comparison.

Table 23: Correlations Africa

Covariance Analysis: Ordinary

	Corruption	Domestic credit	Gini Index	Secondary	Tertiary	GDP
Corruption	1.00					
Domestic credit	0.69***	1.00				
Gini Index	0.17***	0.15***	1.00			
Secondary	0.41***	0.71***	-0.09	1.00		
Tertiary	0.42***	0.68***	-0.08	0.95***	1.00	
GDP	0.64***	0.78***	0.03	0.89***	0.83***	1.00

Notes:

1. ***, **, and * in the table indicate the levels of significance at 1%, 5% and 10%, respectively.
2. GDP per capita is measured in US 2005$

Table 24 presents the results for system GMM regressions for the 16 African countries. It's important to note that when we control for inequality, the sample size drops to seven. Thus we drop the inequality measure in our robustness regressions models 10 and 11. Moreover, we include natural resource rents, since African countries are large oil and mineral exporters, and the log of GDP per capita as control variables in the robustness model (11). EO is the only dependent variable. The Sargan and AR (2) tests are satisfactory and r => 1 in all the regressions supporting identification and instrument validity. Further, we note that although the lag of EO is positively related to EO, it is not persistent in African countries. In models 7, 9, 10 and 11, after controlling for all the determinants and the control variables, the EO lag loses its significance. In contrast, in both middle-to-high and low income countries the lag of EO is persistent.

We begin by evaluating the effects of corruption on EO in Africa. We find that reduced perceptions of corruption in Africa are negatively related to EO ($p<0.01$). However, as model (5) and (9) illustrate this negative association may be ameliorated somewhat by reducing inequality. Similar to the broader low income

sample, adding domestic credit, inequality, tertiary, secondary education as well as wealth, as IVs and control variables, does not reduce the negative impact of low perceptions of corruption in African countries. This finding is significant at the 1% level.

Table 24: GMM analysis determinants of EO (African sample)

Dependent variable: EO											
Model	1	2	3	4	5	6	7	8	9	10	11
EO(-1)	0.79 289.92***	0.95 94.03***	0.92 45.32***	0.63 5.93***	0.46 1.87*	0.78 164.14***	0.45 1.41	0.70 48.67***	0.56 0.99	0.20 2.19**	0.19 1.85*
Log (GDP)	-	-	-	-	-	-	-	-	-	0.94 5.74***	0.92 6.81***
Natural resource Rents	-	-	-	-	-	-	-	-	-	-	0.02 1.88*
Corruption	-0.17 -26.49***	-	-	-	-0.07 -0.82	-0.17 -21.42***	-0.08 -0.75	-0.19 -16.67***	-0.12 -0.34	-0.26 -4.25***	-0.28 -7.61***
Domestic credit	-	-0.00 -5.26***	-	-	-	0.00 0.64	-0.00 -0.40		-0.00 -0.54	-0.00 -0.49	-0.00 -0.31
Tertiary	-	-	-0.01 -3.76***	-	-	-	-	-0.01 -1.61	0.02 0.57	-0.02 -1.44	-0.01 -0.26
Secondary			0.01 5.08***					0.01 4.71***	0.01 0.23	0.01 2.03**	0.01 1.79*
Gini Index				-0.00 -0.52	0.01 1.53		0.01 1.82*		0.00 0.23		
Number of observations	400	400	400	165	165	165	165	400	165	400	397
J statistic	15.77	11.91	9.49	6.66	2.07	15.15	1.97	11.08	1.31	8.64	5.78
Prob (J-statistic)	0.33	0.61	0.74	0.25	0.72	0.30	0.58	0.52	0.25	0.57	0.76
AR(2)	0.84	0.88	0.78	0.58	0.17	0.83	0.20	0.87	0.24	0.22	0.28
No of cross sections	16	16	16	7	7	7	7	16	7	16	16
Instrument rank	16	16	16	7	7	7	7	16	7	16	16
N/I	1	1	1	1	1	1	1	1	1	1	1

Notes:

1. The dependent variable is EO assessed during the period 1982-2008 using an unbalanced panel with 27 periods included and 16 cross-sections.
2. The regressions including the GINI Index have 27 periods and 7 cross-sections.
3. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively

We proceed to investigate the relation between the provision of domestic credit to the private sector and EO in African countries. Model (2) seems to suggest that, as in other low income countries, banking development is negatively related to EO in Africa ($p<0.01$). However, the addition of inequality, the control of corruption, human capital, natural resource rents and wealth as IVs in models 6 to 11, renders the relation insignificant although the sign remains negative. Based on these results, we can surmise that the relationship between domestic credit to the private sector and EO in African countries is insignificant unlike in the broader sample of low income countries where the relation is significant and negative.

In addition, we also evaluated the association between human capital variables and EO in Africa. We find that there are three important results. First, tertiary education is either negatively related to EO (model 3) or its association with EO is insignificant (models 8, 9, 10 and 11). Second, although secondary education is more important as a predictor of EO than tertiary education in Africa (model 3), adding domestic credit, financial development, natural resource rents, wealth and the control of corruption as IVs and control variables, renders the association between secondary education and EO marginal, being significant only at the 10% (model 11). Third, the association between both tertiary and secondary education and EO is insignificant after we account for inequality (model 9) suggesting that inequality may very well reduce the returns to human capital in Africa.

Although we cannot ascertain any definitive findings about the relationship between inequality and EO in African countries since the sample size is small at 7 when we include the Gini Index, however, the results in models (5) and (9) seem to suggest inequality may have a negative impact on the association between the control of

corruption, human capital, the lag of EO and EO in Africa. As previously canvassed in model (5), inequality renders the strong negative association between low corruption and EO redundant. Similarly, in model (9), inequality renders the association between both human capital variables and EO insignificant and additionally, EO loses its persistence.

Lastly, in our robustness regressions, we add wealth in model (10) and wealth and natural resources in model (11). In both models and similar to the broader sample of low income countries, wealth is also positively associated with EO in Africa ($p<0.01$). Likewise, natural resources also enhance EO in Africa. However, this relationship is weak, being significant only at the 10% level.

4.3 Discussion

In the preceding section, we have investigated the relation between EO and what we argue are its enablers, and made a number of significant findings. First, we confirmed that in the overall (combined) sample and middle-to-high income countries, low levels of corruption are positively associated with EO. This result finds support in Anokhin and Schulze's (2009) assertion that reduced corruption enhances investment in innovation and entrepreneurship. It further supports Baumol's (1990) assertion that the control of corruption can facilitate productive entrepreneurship, thus resulting in innovation.

However, the finding that low perceptions of corruption are positively associated with EO does not seem to apply in low income countries and Africa. In these countries, we find a persistent and significant negative relationship between low corruption and EO, supporting Ehrlich and Lui's (1999) and Aidt et al.'s (2008) view that corruption may moderate the relation between growth and bureaucratic inefficiency. The line of

argument is that corruption ameliorates bureaucratic inefficiency that is prevalent in developing countries and may therefore support EO. This negative relation between EO and low perceptions of corruption is reduced somewhat by controlling for inequality, supporting Olken's (2005) assertion that perceptions of corruption are influenced by social trust. Nevertheless, our results suggest that Olken's (2005) thesis applies only to low income and African countries. For middle-to-high income countries, the positive association between EO and low corruption is unaffected by inequality.

Secondly, we found that for the whole sample, banking development enhances risk taking, innovativeness and proactiveness, provided that the country is relatively equal and corruption is comparatively modest. The positive association of domestic credit extension to the private sector with EO was also supported in middle-to-high income countries, vindicating Levine's (2005) assertion that banking development supports entrepreneurship and consequently improves the rate of economic growth. However, Levine's (2005) thesis seems to be contingent on the level of development. In low income countries and Africa, we found that banking development hinders EO, validating Khan and Senhadji (2003), Zhang (2003) and Shen and Lee's (2006) contention that banking development impedes growth especially in Latin American, Sub-Saharan African and East Asian countries with corrupt political systems and weak institution.

Similar to the relationship between EO and the control of corruption, this negative association between banking development and EO in low income countries is ameliorated somewhat by inequality and the control of corruption. These results seem to point to the importance of institutions in facilitating a positive relationship

between banking development and EO. A plausible explanation for this finding is that in low income countries with weak institutions, credit may be allocated corruptly to people of the same ethnic group leading to resources being wasted in inefficient projects. In addition, Levine (2002) suggests large banks with market power may extract rents and a greater share of future profits from firms than they should and further, in firms with poor cooperate governance, banks may connive with inefficient managers if these managers serve their interests (Black and Moersch, 1998).

As a conjecture, we suspect that for developing countries it may not be the size of the banking sector that matters but rather which projects or sectors credit is allocated to. In particular, the critical factor for technological upgrading in developing countries, may be the manipulation and reduction of interest rates in industries targeted for catch up (Lee and Mathews, 2009), rather than banking development. In contrast, in middle-to-high income countries, due to better quality institutions that reduce corruption and arbitrary discrimination, credit is allocated more efficiently enhancing risk taking, innovativeness and proactiveness and consequently, technological upgrading.

Thirdly, we assessed the relation between human capital variables and EO. Across the different samples we found that, after accounting for collinearity, they are positively and significantly related EO. However, we noted that in Africa inequality and natural resource rents hinder the relationship between human capital and EO. Although the association is positive, it is weak suggesting natural resource wealth and inequality may very well reduce the returns to human capital in Africa. Overall though, we find that the human capital variables are more important than the institutional variables, the control of corruption and inequality, in influencing EO in

low income countries, supporting Glaeser et al.'s (2004) contention that Western colonizers facilitated development in their colonies through the higher human capital they possessed, not institutions. Similarly, Millan et al.'s (2012) finding that a high share of people in a region holding tertiary education is also positively associated with the entrepreneurial productivity provides further credence to these results.

In contrast, Lee and Kim's (2009) assertion that secondary education is significant in enabling technological upgrading in low income countries whereas higher education is the "binding constraint" in middle-to-high income countries, could not be supported. We found that after controlling for low corruption, banking development, inequality and wealth, secondary education was still positively associated with EO whereas tertiary education was not. We suggest that there may be two reasons for this finding. Firstly, tertiary education is highly correlated to low corruption, banking development and wealth. However, Lee and Kim (2009) did not control for these variables and therefore the indicated relationship they find may be spurious and largely due to omitted variable bias. Secondly, secondary education is a feeder to the tertiary sector and both these variables are highly correlated. Therefore, it is a misnomer to suggest that a country can have a strong tertiary education system without having a strong secondary system. In fact our results suggest that a strong secondary education system may be a prerequisite for an effective higher education system.

Fourthly, we evaluated the association between EO and inequality. We find that inequality is highly collinear with reduced corruption, human capital and banking development. Due to this collinearity, we could not definitively establish a direct causal link between inequality and EO. For example, for the sample, as a whole,

inequality is positively related to EO. However, the relationship between EO and inequality, for both the middle-to-high and low income samples, is negative suggesting that the non-linearity may not be due to the level of development. Literature has also found contradictory results between income inequality and growth. Forbes (2000), Aghion and Howitt (2002) and Okun (1975) find a positive association whereas Persson and Tabellini (1994), Acemoglu (1998) and Sukiassyan (2007) find a negative relation. Amos (1988), Barro (2000) and Banerjee and Duflo (2003) suggest the relation is inconclusive.

A possible reason for these seemingly contradictory findings is that inequality partially shapes the relation between institutions and policies, and EO. Easterly (2006) contends that these results emanate from the fact that the casual direction runs from inequality to institutions and policies, which then leads to economic development. He argues that divisions along ethnic and class lines place severe constraints on institutional and policy reforms. Therefore the strength of institutions and the implementation of growth promoting policies may be partially determined by social cohesion.

Our results seem to support this assertion as inequality has a significant impact on the association that the perceptions of corruption, banking development, human capital have with EO, even though the direct relation with EO is contingent. First, we find that high inequality increases perceptions of corruption, confirming Olken's (2005) contention that perceptions of corruption are affected by social trust. Second, the results suggest that high inequality negates the potentially positive impact of banking development on EO since distributional conflict may lead to credit being allocated inefficiently to favoured constituencies, and thus hindering innovativeness,

risk taking and proactiveness. Third, inequality seemingly reduces the returns to higher education, in low income countries as well as secondary education, in Africa. Galor and Zeira (1988, 1993) explain this finding by submitting that due to credit market imperfections, inequality may result in an under-investment in human capital, thus hindering EO. These results also confirm Persson and Tabellini's (1991) thesis that in a society with distributional conflict, growth promoting activities such as the production of knowledge are likely to be constrained.

Lastly, we assessed wealth, the lag of EO and natural resource rents as control variables. We found that wealth is not positively related to EO in middle-to-high income countries whereas it is positively associated with EO in Africa and the broader sample of low income countries. Moreover, natural resources were marginally (significant at the 10% level) positively related to EO in African countries. Finally and interestingly, although the lag of EO is positively related to EO across all levels of development, it is not always persistent in African countries. This suggests that EO and possibly growth, is highly volatile in Africa.

4.4 Conclusion

In sum, we have investigated the determinants and drivers of EO. The question we asked is: why are some countries more innovative, risk taking and proactive than others? We found that the control of corruption, banking development, inequality and human capital influence the level of EO that countries possess. However, these results suggest that this impact is non-linear with threshold effects and is contingent on the level of development and institutions, which are in turn shaped by inequality.

In this chapter, we have evaluated and confirmed the direct association between institutional and policy variables and the manifestation of entrepreneurship EO,

addressing our concerns about this oversight in literature. In the following chapter we will investigate the relation between EO and growth. In addition, we will address whether first, the determinants of EO enhance the relation between EO and growth and second, whether as we have argued, the association is between institutions, policies and EO which then leads to growth or the other way around.

Chapter 5

THE IMPACT OF EO (AND ITS' DETERMINANTS) ON ECONOMIC GROWTH

Introduction

The annual gross domestic product (GDP) is a proxy for economic well-being and a measure of prosperity. GDP growth in developed countries has improved living standards and increased life expectancy and some developing countries similarly are following suit. Rapid economic growth in China has reduced the number of people living in poverty from 53 percent to 8 percent (Ravallion and Chen 2007). Similarly, Brazil and India grew at 6.6% and 8.8% in 2010, respectively, lifting millions of people out of poverty. In contrast, the relative absence of economic growth in some poor countries, especially those in Africa, has left millions of people living in abject conditions.

But how can this process of economic growth, which leads to a higher GDP per person and increased welfare, be initiated? To answer this question, we have argued for the Schumpeterian paradigm which suggests that growth is generated by a random sequence of quality-improving innovations and embodies Schumpeter's (1942) idea of "creative destruction". The Schumpeterian paradigm is gaining increasing importance in the literature. In fact, McMillan and Woodruff (2002) suggest that the success or failure of a transition economy depends on its' entrepreneurial dynamics. Moreover, know-how associated with the generation and exploitation of knowledge has become much more critical for economic growth recently for both rich and poor countries (Fagerberg and Srholec, 2008). Gilbert et al. (2004) concur and argue that entrepreneurship policies are emerging as one of the

most essential instruments for economic growth. Just as monetary and fiscal policies were important for creating employment and growth in the post-war economy, entrepreneurship policy is likely to emerge as the most important policy instrument for a global and knowledge-based economy.

However, the empirical link between entrepreneurship and growth is tenuous. Studies grounded on GEM evidence suggest the relationship between entrepreneurial activity and a country's level of economic development is U-shaped (Wennekers et al., 2005). In addition, in developing countries, entrepreneurship and job creation are positively associated only if self-employment and informal companies are disregarded from the study (Ghani et al., 2011a and 2011c) and informal entrepreneurs are generally not seen as drivers of economic growth (Beck et al., 2003).

The entrepreneurship-growth link has also been questioned in developed countries. Koellinger (2008) finds that the majority of business start-ups in high income countries also engages in marginal, replicative economic activity or fails soon after their foundation. He contends that the potential impact of these marginal firms on the macro-economy is trivial. Likewise, Bowen and de Clercq (2008) submit that marginal entrepreneurs in developed countries are motivated by a lack of employment alternatives and thus, an upsurge in unemployment during recessions prompts growth in marginal entrepreneurship (Thurik, Carree, Van Stel and Audretsch, 2008 and Faria, Cuestas and Mourelle, 2010). Therefore, in both developed and developing economies counting the number of informal, replicative entrepreneurs does not assist us in measuring entrepreneurship or its impact on growth.

Nevertheless, entrepreneurship at the aggregate level has traditionally been measured as a stock variable. Scholars have used stock variables that largely measure replicative entrepreneurship: the self-employment ratio, total entrepreneurial activity (TEA) of the GEM, opportunity entrepreneurship and the ratio between necessity and opportunity; as indicators entrepreneurship (Koellinger and Thurik, 2012). However, Baumol et al. (2007, p. 3) note that "replicative entrepreneurship is important in most economies because it represents a route out of poverty, a means by which people with little capital, education, or experience can earn a living. But if economic growth is the object of interest, then it is the innovative entrepreneur who matters." And similarly, Banerjee and Duflo (2007, p. 162) warn that "it is important not to romanticize these penniless entrepreneurs."

The entrepreneurship-growth link is tenuous not only because of the misspecification of entrepreneurship as a stock variable but also because in empirical endogenous growth work, technological change is reduced to invention. Although both endogenous and neoclassical growth theory contend that technological upgrading, which is occasioned by entrepreneurship, is vital for economic growth, this technological change is merely defined as expenditure on R&D in empirical work. However, Minniti and Lévesque (2010) argue that literature on economic growth concentrates on R&D since historically there has been a positive association between growth and sustained research investments. However, Acs et al. (2005) note that countries, such as Sweden and Japan, which have large R&D expenditure compared to China, have experienced zero or low growth whereas China has grown significantly with minimal R&D expenditure (Hsiao and Shen, 2003).

Moreover, entrepreneurial processes are not linear, as Schumpeterian theory submits; and therefore, they may appear differently in Zambia, say, compared to Sweden. Therefore, at the country level, policies and levels of institutional development can impact the character of the EO-growth relationship (Johns, 2006). First, high corruption may increase levels of uncertainty and transactions cost for an entrepreneur (Anokhin and Schulze, 2009). Therefore, reducing corruption may increase the number of innovative opportunities that are exploited; resulting in higher productivity and investment. Moreover, in many unequal societies the existence of unproductive, parasitic elites may frustrate entrepreneurship (Baumol, Litan and Schramm, 2007); in other words, in a society with distributional conflict, growth promoting activities, such as the accumulation of capital and the production of knowledge, are likely to be constrained (Persson and Tabellini, 1991).

Furthermore, financial sector distortions can inhibit EO and consequently decrease the rate of economic growth (King and Levine, 1993). Financial institutions are important because they evaluate and finance entrepreneurs' innovation and launching of new products to market (Schumpeter, 1912) as well as ease the trading, hedging, and pooling of risk which encourages investment in projects with higher risk and superior expected returns (Devereux and Smith, 1994 and Obstfeld, 1995). Therefore, countries with poor levels of financial market development are unable to support infant industries and EO since firms are credit and equity rationed (Ayyagari, Demirgüç-Kunt, and Maksimovic, 2008). Lastly, human capital is deemed to facilitate EO by enhancing the ability of a country to imitate and learn advanced technologies that originate from within and offshore (Stokke, 2008); increasing the absorption of spill-overs from FDI (Borensztein, Gregorio and Lee, 1998); and significantly increasing entry by knowledge-based firms (Baptista and Mendonça, 2010).

In this chapter we seek to answer three questions. First, does EO have a positive impact on economic growth at the aggregate level? Second, is this impact enhanced by human capital, financial development, inequality and corruption? Third, does the impact of EO on growth vary depending on the country's level of development?

Our line of argument is, first - entrepreneurship at the macro-level encompasses innovation, proactiveness and risk taking. Thus measuring it as a stock variable is not helpful in assessing whether indeed a country is entrepreneurial or not. Further, although innovation is a critical element of EO, it is not sufficient for growth. An inventive country still needs to take risks and proactively seek opportunities in order to grow. Thus a more accurate characterisation of entrepreneurship at the macro-level is EO and in particular, it is the manifestation of this innovative activity, risk taking and proactiveness that facilitates technological change and therefore, economic growth.

Second, institutions and policies alter the ability and incentives of firms to innovate and proactively take risks; and therefore, as established in the previous chapter, the clear causal link is from institutions and policies to entrepreneurship. The quality of institutions shape economic incentives that entrepreneurial firms face, increasing or decreasing returns to private capital, and thus determining commerce and manufactures. Similarly, human capital determines entrepreneurial firms' ability to imitate and learn advanced foreign technologies; however, it is this very learning that leads to economic growth, not human capital per se. Therefore, institutions and policies are first, predictors of EO; and second, they enhance the relationship between EO and growth. Simply put, controlling for the same level of EO, for example, between China and the UK, the UK will have a higher GDP per capita than

China since it has better governance, more effective financial institutions and a higher stock of human capital.

Moreover, we take into account context by evaluating the impact of the hypothesized determinants (enablers) on the EO-growth relation whilst controlling for the distance to the technological frontier. This is important since a greater understanding of policy and institutional differences that may shape EO, and consequently growth, in both developing and developed countries, may assist firms, investors and government policy makers in spurring economic development.

5.1 Research Design

Similar to chapter 4, we use secondary, longitudinal, panel data set constructed from the CANA panel database and the World Development Indicators (WDI). The data set contains both cross-sectional and time series elements which will assist us to investigate the longitudinal association between EO and growth. The complete sample covers data on 93 countries, of which 16 are African, during the period 1980-2008.

5.1.1 Independent variables

To answer the question of whether EO is positively related to growth, EO and the determinants: financial market development, corruption, social cohesion and human capital are employed as IVs. Firstly, we evaluate EO based on Miller's (1983) characterisation as a reflective, unidimensional, second order construct. EO's first order indicators are risk taking, innovativeness and proactiveness and we assess both the level and the deviation of EO against growth. The deviation of EO is defined as the change in EO, that is (EO – EO (-5)), over a five year period. Secondly,

financial market development is measured using the private credit to gross domestic product (GDP). Thirdly, we employ the Gini coefficient, a measure of inequality, to evaluate social cohesion (Rodrik, 1999). Further, in order to measure corruption, we use the Corruption Perception Index from Transparency International Index. Lastly and analogous to Lee and Kim (2009), we operationalise the level of human capital by using both the secondary and tertiary enrolment ratio.

5.1.2 Dependent variable

In this chapter, we evaluate the EO-growth relation and therefore our dependent variable is GDP growth. We assess GDP growth over a five year period in order to minimise cyclical fluctuations in order to decipher the real long term impact of a change in EO on GDP. In addition, GDP volatility is defined as the standard deviation of this five year growth and it is assumed to be constant. This assumption is reasonable since firstly, fluctuations are evened out by calculating GDP growth as a 5 year rolling average and secondly, growth volatility is assumed to be mean reverting. Whilst we are aware that there might be structural breaks and regime switches in volatility that is not the focus of our work.

Table 25 presents the descriptive statistics for GDP, the log of GDP, GDP growth, GDP volatility as well as EO and the deviation in EO over a five year period. The data is available for all 93 countries in the sample, 16 of which are African. As Table 25 indicates, the normality assumptions are violated. The log of GDP and GDP growth are negatively skewed, whereas GDP volatility as well as EO and its deviation are positively skewed. All the variables are leptokurtic except for the log of GDP which is mesokurtic. The Bera-Jarque statistic firmly rejects normality ($p<0.01$) for all the variables.

Furthermore, we analyse the maxima and the minima to begin to decipher patterns amongst countries. Norway attained the highest GDP per capita, measured in US 2005$, at $67804.55 in the year 2007 whereas Ethiopia had the lowest reading in the sample at $111.79 in 1992. Azerbaijan achieves both the highest annual average growth rate of 91% over the five year period ending in 2008 and the maximum growth volatility of 63% whereas Georgia suffers a growth collapse with GDP contracting by -149% per year over five years and lastly, the developed country, Austria, has the lowest growth volatility at 2.6% over a five year period.

Table 25: Descriptive statistics of GDP per capita, GDP growth, EO and The deviation in EO

	GDP per capita	Log(GDP)	GDP growth	GDP volatility	EO	EOdev
Mean	10575.83	8.25	0.10	0.12	0.00	0.15
Median	3642.68	8.20	0.11	0.08	-0.08	0.13
Maximum	67804.55	11.12	0.91	0.63	3.92	1.84
Minimum	111.79	4.72	-1.46	0.03	-2.45	-1.40
Std. Dev.	13541.94	1.58	0.18	0.11	0.74	0.29
Skewness	1.46	-0.07	-2.03	2.65	0.88	0.69
Kurtosis	4.23	1.96	15.50	10.73	5.57	8.52
Jarque-Bera	1051.62	117.16	14833.00	9185.68	850.84	2191.78
Probability	0.00	0.00	0.00	0.00	0.00	0.00
Sum	26725129.00	20852.01	197.57	301.66	0.00	245.21
Sum Sq. Dev.	46300000000.00	6310.54	68.66	31.58	1137.34	135.66
Observations	2527.00	2527.00	2061.00	2512.00	2104.00	1627.00

Notes:
1. The GDP per capita is measured in US $2005.
2. GDP growth is calculated as GDP growth= log(GDP/GDP(-5))
3. The deviation in EO is also the 5 year increase or decrease in EO.

Table 26 displays the mean, standard deviation and rank of the growth rate of selected countries. The mean of the deviation of EO, the initial values of both EO and GDP and their terminal values in 2008 are also presented. The initial values of both EO and GDP vary in their starting dates. For former Eastern Bloc countries, such as Slovenia, both the EO and GDP series start in the early nineties whereas we have a longer data series starting in 1980 for developed countries.

Interestingly the top 10 countries on the growth measure seem to differ in the level of development. For example, Singapore and Ireland were developed countries in 1980 whereas Poland and Estonia were middle income and on the other hand, China and Vietnam were low income countries. In addition, fast growing economies seem to share commonality in that most of them substantially increased their EO resulting in both high growth and reduced growth volatility. China's EO rose by 1.43 from a low base of -0.43 by increasing, as figure 11 illustrates, all the composite elements of EO. Similarly, as figure 12 illustrates, Singapore's EO increased from an already elevated base of 1.70 to 3.40 by improving its innovative capacity and proactively diversifying into new markets whilst maintaining a high level of risk taking. Moreover, both China and Singapore share a below sample average growth volatility of 0.07.

Table 26: Ranking f countries on the basis of GDP growth and EO

GDP Growth Rank	Country	GDP Growth	Growth Volatility	EO Dev	EO 1980/initial	EO 2008	GDP 1980/initial	GDP 2008
1	China	8.55%	0.07	0.29	-0.43	1.00	221.65	2402.78
2	Estonia	6.97%	0.04	0.44	0.31	1.02	4635.56	11796.89
3	Armenia	6.32%	0.35	0.51	-1.21	0.04	1146.30	2265.42
4	Cambodia	6.06%	0.09	0.43	-1.50	-0.32	241.78	588.00
5	Vietnam	5.03%	0.07	0.37	-1.19	0.56	262.95	819.88
6	Ireland	4.55%	0.11	0.59	0.96	2.71	16004.52	48892.70
7	Thailand	4.52%	0.15	0.18	-0.39	0.57	881.74	3014.55
8	Poland	4.37%	0.06	0.17	0.01	0.29	4726.74	9505.84
9	Singapore	4.32%	0.07	0.41	1.70	3.40	9933.61	31832.71
10	Botswana	4.12%	0.11	0.06	0.45	0.57	1842.67	6261.11
	Bottom 5							
89	Saudi Arabia	-1.00%	0.19	0.06	0.58	0.90	21432.29	15115.15
90	Kyrgyzstan	-1.37%	0.32	0.14	-1.15	-0.54	593.69	561.07
91	Ukraine	-1.73%	0.46	0.05	0.24	0.29	2677.49	2205.58
92	Georgia	-2.59%	0.62	0.36	-0.99	-0.28	2792.45	1838.74
93	Tajikistan	-4.04%	0.54	-0.18	-0.64	-1.28	774.39	395.57
	Selected Developed							
37	United States	2.14%	0.04	0.10	0.66	1.04	26085.67	44872.65
53	Germany	1.76%	0.04	0.17	0.57	1.01	22488.69	36468.96
58	Canada	1.67%	0.05	0.15	0.42	1.10	24249.35	37088.02
25	United Kingdom	2.66%	0.04	0.15	0.45	0.85	20164.59	39608.43
29	Portugal	2.45%	0.08	0.11	-0.13	0.30	10219.50	18868.13
	Selected African							
11	Mauritius	4.10%	0.06	0.10	-0.37	0.13	1855.48	5752.79
85	South Africa	0.07%	0.08	-0.03	0.29	0.20	5335.26	5757.39
84	Senegal	0.29%	0.07	0.06	-0.84	-0.40	711.88	793.10
33	Lesotho	2.31%	0.04	0.20	-2.45	-0.79	429.97	801.45
78	Ethiopia	0.63%	0.16	0.18	-1.78	-1.22	155.37	201.66
	All	1.92%	0.18	0.15	NA	NA	NA	NA

Notes:

1. The GDP per capita is measured in US $2005.
2. GDP growth is calculated as GDP growth= log(GDP/GDP(-5))
3. The deviation in EO is also the 5 year increase or decrease in EO.

In addition, in all the top 10 countries, except for Botswana (0.06), the average change in EO is higher than the sample mean of 0.15, suggesting other factors might be driving Botswana's growth. In contrast to the fast growing economies, most growth laggards such as Tajikistan either increased their EO marginally or it declined and additionally, their growth volatility is elevated. In contrast to the other low growth economies, Saudi Arabia increased its EO at a rate similar to Botswana. However unlike Botswana, Saudi Arabia suffered a growth collapse with GDP declining from

US21432.29$ in 1980 to US15115.15$ in 2008. Interestingly, both Saudi Arabia and Botswana are major natural resources exporters.

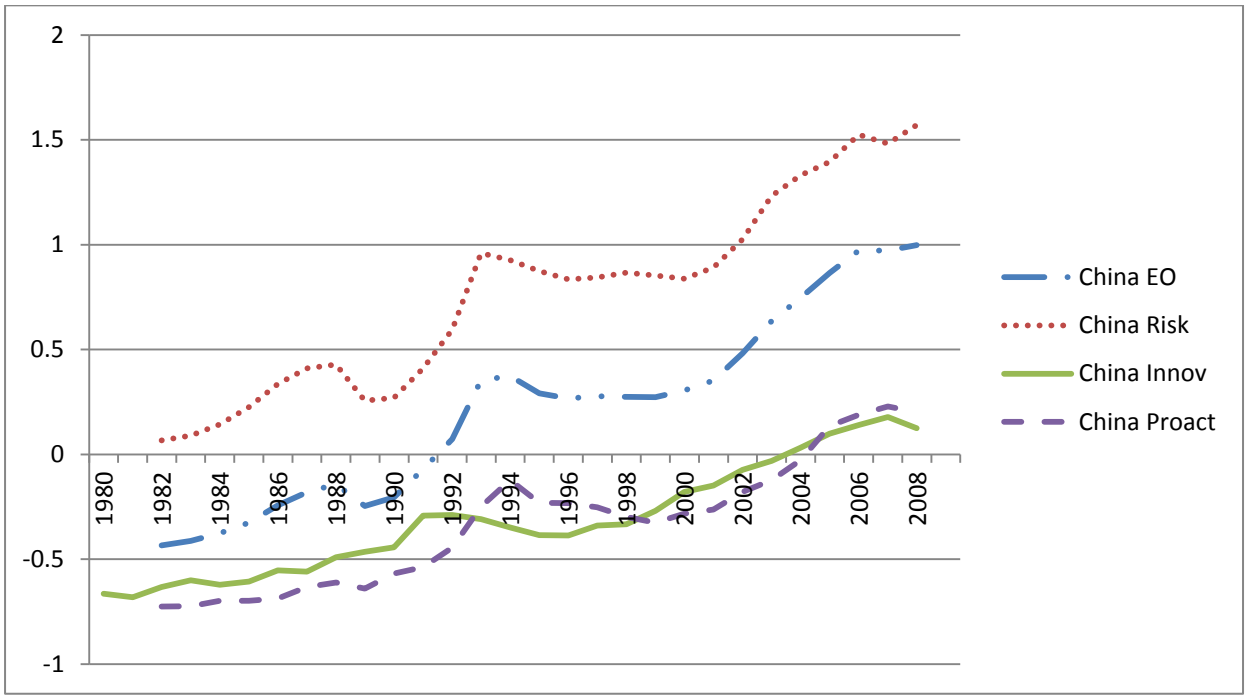

Figure 8: China EO

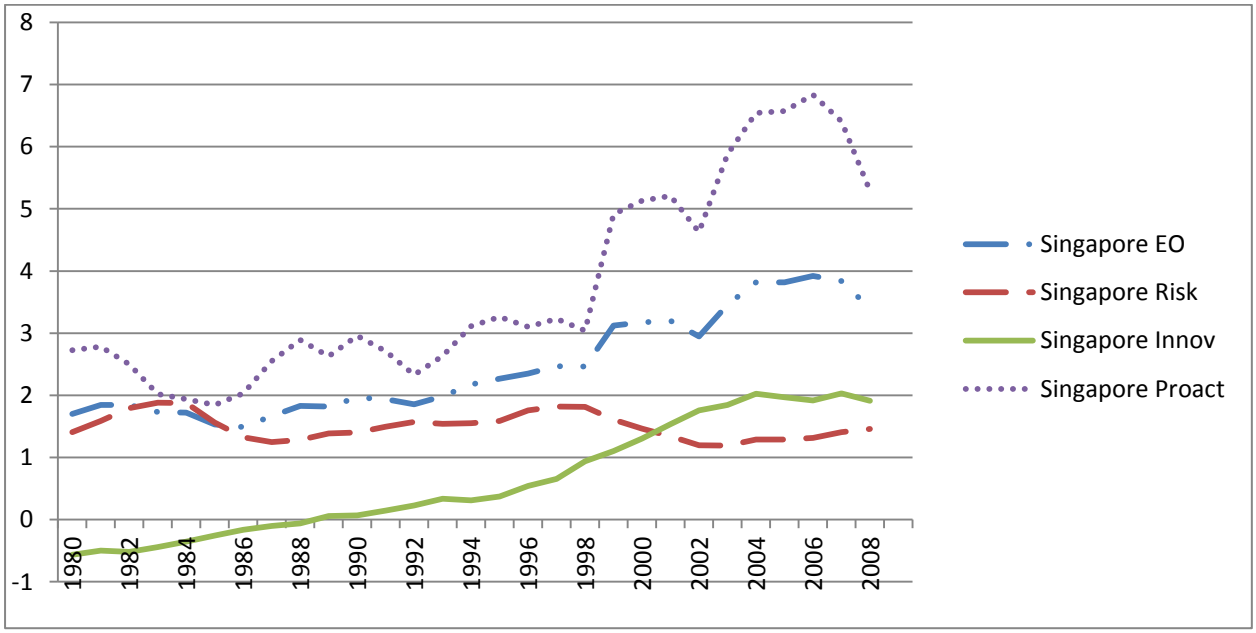

Figure 9: Singapore EO

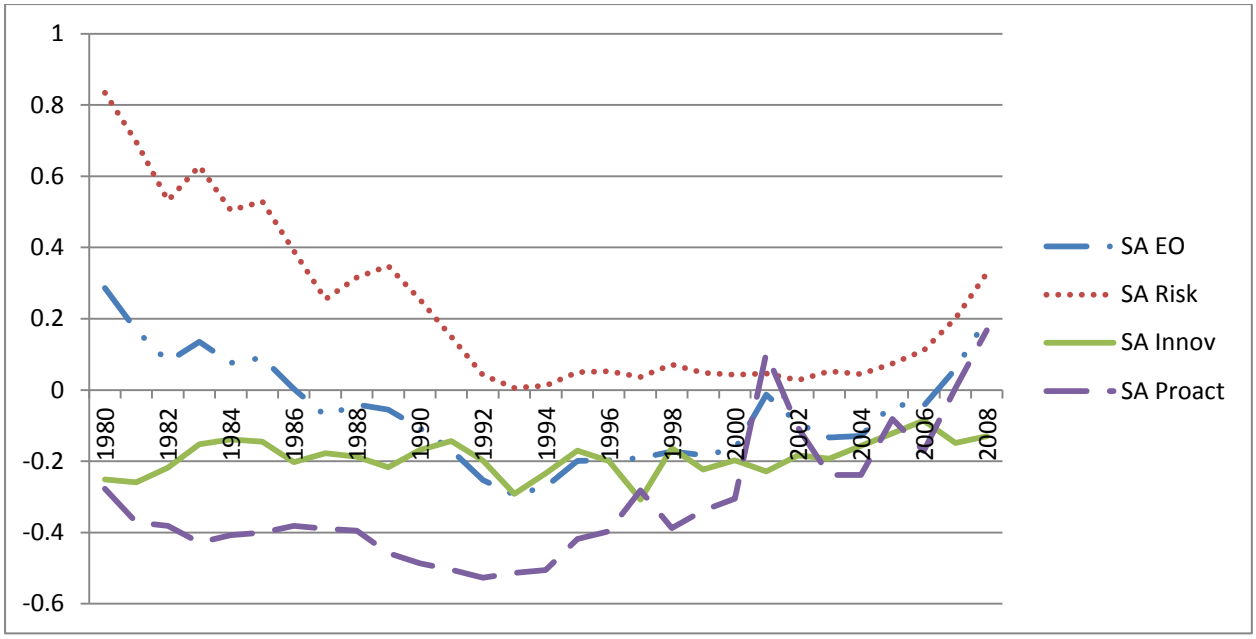

Figure 10: South Africa EO

Furthermore, developed countries raised their EO moderately and as a result they achieved average growth performance of around 2% and low growth volatility. For example, the United States increased its 5 year EO by 0.10 on average, slightly below the sample mean of 0.15, and as a result attained a growth rate of 2.14% which is almost identical to the sample mean of 1.92%. On the other hand, the performance of African countries is mixed. Diamond rich Botswana attains the highest ranking at number 10 which, as discussed, is not driven by an increase in EO. In contrast, South Africa is one of the worst performers on growth, ranking number 85 out of 93. In 1980, South Africa's GDP per capita was US $5335.29 and 29 years later it had increased at a pathetic 0.07% to US $5757.39. The country seems to have no growth drivers and unlike Botswana, it does not seem lucky enough to have found additional natural resources that could boost output. In addition, as figure 13 illustrates, South Africa does not seem to have invested and taken risks to upgrade its technological capabilities. It ranks number 90 out of 93 countries in the average increase of EO over a 29 year period that covered painful

political and institutional reforms. EO declined from an already low score of 29 to a pitiful 20. In order to address South Africa's growth challenges, policy makers may have to intervene, and address both the country's innovative capabilities. In particular, the country must address its ability to take risks and diffuse technology as evidently, political and institutional reforms have failed to get the country out of its growth trap.

The results in Table 26 also help us address the important issue of reverse causality. Reverse causality occurs when an IV that is hypothesized to cause a DV whereas it is the DV that causes the IV. For example, some may argue that it is not EO that causes growth but rather it is growth that causes EO. However, we have highlighted the case of both Saudi Arabia and Botswana exactly for this reason. Over the 29 years, as figures 15 and 17 illustrate, Saudi Arabia due to the decline in its terms of trade, experienced a massive decline in GDP while its EO increased moderately. On the other hand as figures 14 and 16 illustrate, Botswana due to the discovery of diamonds and the resultant more stable rent stream (Auty, 2001), grew very quickly whereas its EO increased only marginally. Both these cases imply that growth does not cause EO since GDP changed significantly in both countries and EO barely moved. The overall results in Table 26 seem to suggest that: firstly, an increase in EO causes growth and not the other way around, secondly, a high EO may reduce growth volatility and thirdly, natural resources may have an impact on growth that is independent of EO.

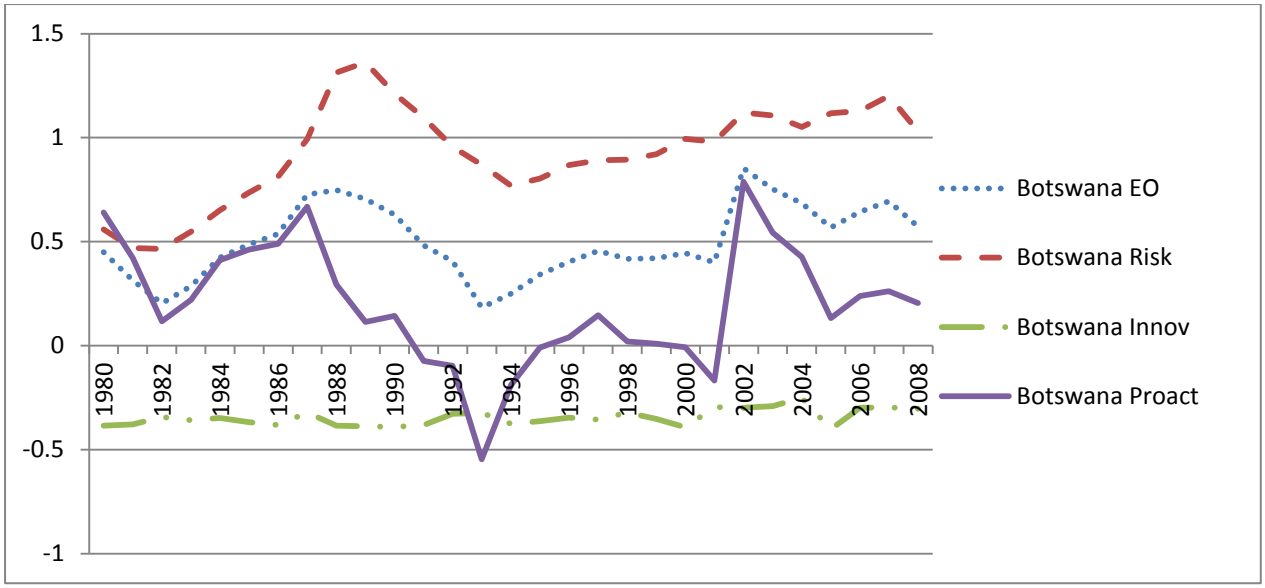

Figure 11: Botswana EO

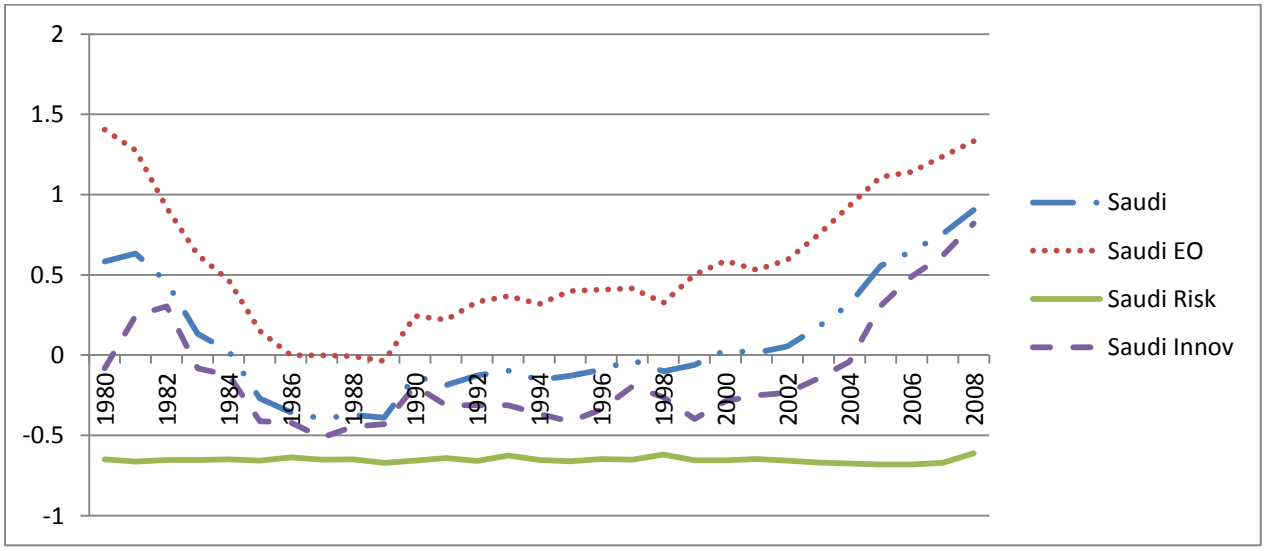

Figure 12: Saudi Arabia EO

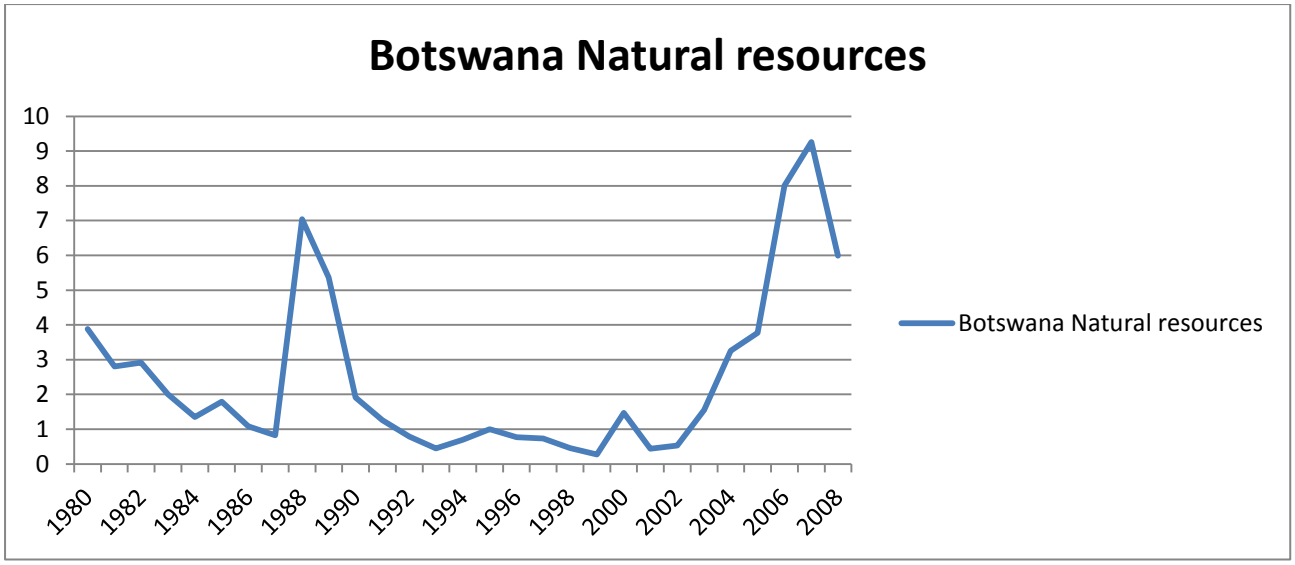

Figure 13: Botswana natural resource rents

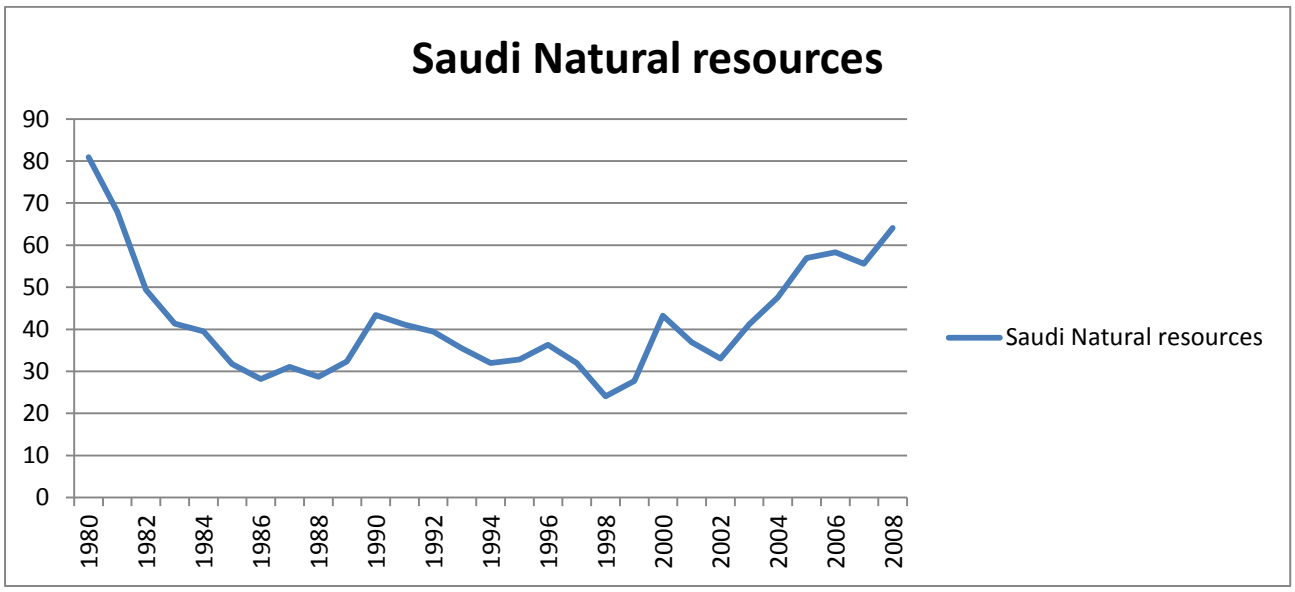

Figure 14: Saudi Arabia natural resource rents

Table 27 presents the correlations between GDP growth, growth volatility, the change in EO as well as EO and its determinants after controlling for initial GDP. As the table demonstrates, EO is significantly and positively ($p<0.00$) related to GDP growth with a correlation coefficient of 0.38. Notably, EO has a higher correlation with the determinants compared to GDP growth, suggesting that the determinants may drive growth through EO. Further, the deviation or change in EO has an even

higher correlation with growth (with a coefficient of 0.52 and this is also significant at the 1% level).

Similarly, tertiary and secondary education as well as equality is also positively correlated to GDP growth. However, their correlation coefficients are weaker compared to the association between EO, its deviation and growth. Tertiary education has the strongest association with growth with a bivariate correlation coefficient of 0.24. In contrast, the bivariate correlation between the control of corruption and growth is not significant at the 10% level. Similarly, the bivariate correlation between domestic credit and growth is also not significant at the 10% level. Notably, we also find that the R&D to GDP ratio, which is assumed in economics literature to be the key driver of economic growth, is weakly related to growth compared to both EO and its deviation, with a correlation coefficient of 0.13 ($p<0.00$). On the other hand, growth volatility seems to be enhanced by a deviation in EO, human capital and GDP growth. The bivariate association between the level of EO and growth volatility is not significant at the 10% level. On the other hand, reduced corruption, a highly developed domestic banking system and high R&D investment reduce growth volatility and this is significant at the 1% level.

Table 27: Correlations matrix of GDP per capita growth, the determinants and EO

Partial analysis controlling for: INITIALGDP

	EO	EOdev	Corruption	Gini Index	Domestic credit	Tertiary	Secondary	R&D	GDP growth	GDP vol
EO	1.00									
EO dev	0.49***	1.00								
Corruption	0.45***	0.07***	1.00							
Gini Index	-0.14***	-0.14***	-0.03	1.00						
Domestic credit	0.33***	-0.02	0.27***	0.08***	1.00					
Tertiary	0.39***	0.18***	0.40***	-0.25***	0.11***	1.00				
Secondary	0.43***	0.20***	0.41***	-0.23***	0.11***	0.74***	1.00			
R&D	0.47***	0.17***	0.43***	-0.22***	0.37***	0.42***	0.38***	1.00		
GDP growth	0.38***	0.52***	0.00	-0.24***	-0.03	0.24***	0.19***	0.13***	1.00	
GDP vol	0.03	0.15***	-0.29***	-0.02	-0.27***	0.14***	0.18***	-0.19***	0.24***	1.00

Notes:

1. The GDP per capita is measured in UDS 2005$
2. GDP growth is calculated as GDP growth= log(GDP/GDP(-5))
3. The deviation in EO is also the 5 year increase or decrease in EO.
4. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively

5.1.3 Estimation Methodology

We use the same panel data set of 93 countries to firstly evaluate the impact of EO on GDP per capita growth. Secondly, we have argued that the impact of EO on growth is shaped by institutions, banking development and human capital. Therefore we assess how the interaction between these institutional and policy variables and EO would impact growth. In order to conclude that the determinant, for example human capital, enhances the relation between EO and economic growth, we must find that sign of the coefficient estimate for the interaction term between EO and institutional and/or policy variable is positive.

In our empirical specification GDP growth is the dependent variable whereas the control of corruption, financial development, social cohesion and human capital are our independent variables. GDP growth is a highly persistent series and therefore

lagged GDP growth is also likely to be associated with current GDP growth. Because of this possible persistence, we evaluate a linear dynamic panel-data model in order to capture the effect of the lagged dependent variables on the current dependent variables.

Moreover, GDP growth and institutional variables may possibly be endogenous because of omitted variables and reverse causality (Li et al., 2012). For example, financial market development might be occasioned by high GDP growth resulting in increased income and thus higher savings, which then lead to increased credit availability for the private sector. Likewise, reverse causality cannot be dismissed since countries with a high GDP growth might attain a higher EO though an increase in the availability of opportunities occasioned by increased demand. Firms may respond to these opportunities by proactively investing in new capabilities to take advantage of increased demand for new products resulting in an increased EO at the aggregate level. Lastly, we follow the growth literature and control for the level of real per capita GDP and the population growth rate (Li et al. 2012).

This potential endogeneity of GDP growth can be better minimised by the Generalized Method of Moments (GMM) procedure for panel estimation. In particular, system GMM is appropriate for panels (similar to our data) with a linear functional relationship, an autoregressive dependent variable, fixed country effects, heteroskedasticity and autocorrelation. The system GMM estimator helps us correct for omitted variable bias, measurement error, unobserved country heterogeneity and endogeneity which are likely to affect GDP growth and its determinants. We therefore adopt the system GMM estimators to analyse our data. We begin by

evaluating whether EO and its deviation enhances economic growth. The equation takes the following form:

$$RGDP_{it} = \alpha_0 + RGDP_{it-1} + \alpha_1(EO_{it}) + \alpha_3(EOdev_{it}) + \alpha_6 X_{it} + \alpha_6\theta_i + \alpha_7 Z_t + \varepsilon_{it} \quad (12)$$

Where EO_{it} is entrepreneurial orientation in country *i* at time *t* and $EOdev_{it}$ evaluates the 5 year deviation of EO. Entrepreneurial orientation interacts with its drivers to impact on growth denoted by is $RGDP_{it,}$ θ_i is the measure of time-invariant country fixed effects, X_{it} is a vector of control variables and Z_t is the vector for time dummies and ε_{it} represents the random error term.

We employ the two step GMM estimator in our regression, which is asymptotically efficient and vigorous to heteroskedasticity. In addition, we employ the Sargan test of over-identifying restrictions and the autoregressive (AR) test to evaluate identification and instrument validity. If the p-values of the AR (2) test and the Sargan test are not significant (p >0.05), we do not reject the null hypotheses of over-identification and no second order auto correlation of error terms. Additionally, following Asiedu and Lien (2011), we report the ratio and where r < 1, we reduce the instrument rank by restricting the number of lags of the dependent variable that can be used as instruments in order to ensure instrument validity.

5.2 Results

Table 28 presents the results for system GMM regressions for all samples. As previously discussed, we divided countries into middle-to-high income and low income based on Lee and Kim's (2009) hypothesis that transitioning from low-to-middle income is different from transitioning from middle-to-high income status. In addition, we analyse the 16 African countries separately to assess whether there are

different growth drivers at work in Africa. Moreover, we include natural resource rents to control for growth that might not emanate from the diffusion of innovation. Similarly, population growth as well as the log of GDP per capita is also employed as a control variable in all the regression models. GDP per capita growth is the only dependent variable and EO and the deviation in EO are the predictor variables. The Sargan and AR (2) tests are satisfactory and r => 1 in all the regressions supporting identification and instrument validity. In addition, the lag of GDP growth is positively associated with GDP growth in all regressions and this is significant at the 1% level.

Table 28: GMM analysis EO and growth

Dependent variable: GDP growth												
	All countries			**Middle-to-high income**			**Low income**			**Africa**		
Model	1	2	3	4	5	6	7	8	9	10	11	12
Growth(-1)	0.80 82.41***	0.60 43.97***	0.59 46.02***	0.39 24.05***	0.31 13.75***	0.34 21.93***	0.86 181.05***	0.68 59.70***	0.66 43.50***	0.71 6.68***	0.52 15.94***	0.55 6.44***
Log(Gdp)	-0.36 -27.05***	-0.10 -9.43***	-0.01 -0.74	0.03 1.72*	0.19 10.45***	0.13 5.64***	-0.42 -28.53***	-0.17 -17.68***	0.01 0.51	0.14 0.72	0.03 0.26	0.14 0.73
Population Growth	0.03 5.07***	-0.01 -2.34***	-0.01 -5.71***	-0.02 -3.78***	-0.02 -5.02***	-0.03 -5.56***	0.05 9.12***	-0.01 -3.09***	-0.01 -3.55***	0.01 0.37	-0.05 -8.03***	-0.03 -1.44
Natural Resource Rents	0.01 15.72***	0.01 21.19***	0.01 17.83***	0.00 5.66***	0.00 1.27	0.00 0.38	0.01 20.52***	0.01 14.87***	0.01 13.36***	-0.00 -1.05	0.00 0.31	0.01 2.12**
EO	0.09 6.24***	-	-0.09 -5.95***	0.11 21.78***	-	0.05 4.71***	0.14 11.61***	-	-0.17 -7.45***	0.08 2.15***	-	-0.12 -1.46
EOdev	-	0.14 16.17***	0.19 19.58***	-	0.11 14.44***	0.094 12.04***	-	0.07 7.78***	0.15 8.65***	-	0.05 5.64***	0.13 3.60***
Observ	1611	1408	1408	858	756	756	738	642	642	336	315	315
J statistic	71.54	70.19	70.13	39.72	39.17	37.31	37.94	37.37	32.15	11.45	13.46	10.30
Prob(J-statistic)	0.19	0.22	0.22	0.27	0.29	0.32	0.38	0.41	0.61	0.41	0.26	0.41
AR(2)	0.53	0.92	0.98	0.96	0.29	0.79	0.25	0.28	0.53	0.36	0.63	0.80
No of cross sections	92	90	90	50	48	48	41	41	41	16	16	16
Instrument rank	67	67	68	40	40	40	41	41	41	16	16	16
N/I	1.37	1.34	1.32	1.25	1.20	1.20	1	1	1	1	1	1

Notes:

1. The GDP per capita is measured in UDS 2005$
2. GDP growth is calculated as GDP growth= log(GDP/GDP(-5))
3. The deviation in EO is also the 5 year increase or decrease in EO.
4. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively

In model (1), we regress the level of EO against GDP growth. We find that EO is positively associated with GDP growth for the combined sample and this is significant at the 1% level. This result is confirmed in middle-to-high and low income countries as well as Africa. Similarly, the deviation in EO enhances economic growth in all countries after controlling for wealth, natural resources and level of development. This finding is also significant at the 1% level. In Model (3) we enter both EO and the deviation into the equation to assess the relative import of both variables at different levels of development. We find that the deviation of EO suppresses the effect of the level of EO in the combined sample, low income and African countries implying that, since EO and the deviation are collinear, an increase in EO is more important for growth than the level of EO. In contrast, both the level and the deviation, as displayed in model (6), are important for growth in middle-to-high income countries. This result is significant at the 1% level.

In addition, we evaluate the impact of the control variables the log of wealth, population growth and natural resource rents on growth. First, the log of wealth in both the combined sample (models 1 to 2) and low income countries (models 7 to 8) has the expected negative sign suggesting that GDP per capita is negatively related to economic growth ($p<0.01$). However, controlling for both the deviation and the level of EO in models 3 and 9 renders the log of wealth insignificant. Similarly, the log of wealth is insignificant in African countries and this result is robust to controlling for both EO and its deviation. In contrast, in middle-to-high income countries the sign of the coefficient of log of wealth is positive ($p<0.01$). These results support convergence in the combined sample and low income countries. On the other hand, in middle-to-high income countries convergence is conditional either on a high or an increasing EO. It follows that a middle income country that has a low EO which does

not increase may fall further behind developed countries. We therefore can conclude that for middle income countries there is a threshold level of EO above which incremental increases in EO result in convergence. Otherwise failing to achieve this level of EO and the necessary incremental increases, may result in divergence.

Secondly and contrary to expectation, population growth, has a positive sign in the combined sample as well as in low income countries when we control for the level of EO (models 1 and 7, $p<0.01$). This result indicates the presence of multicollinearity between EO, population growth and GDP per capita growth below a certain level of development. Lastly, natural resources are positively associated with growth in the combined sample as well as in low income countries and these findings are robust to controlling for EO and its deviation (models 7, 8 and 9, $p<0.01$). However, this relationship is weak in African countries (models 10 and 11), conditional on a low and decreasing EO (model 12, $p<0.01$). In contrast, in middle-to-high income countries an increase in EO suppresses the effect of natural resources on growth rendering it insignificant (models 5 and 6)..

5.2.1 The determinants, EO and growth

As we have established that first, EO is positively related to institutional and policy variables and second, EO and its incremental change are positively related to economic growth in both developed and developing countries, we evaluate the question: Do institutions and policies enhance the EO-growth relation? In order to conclude that an enabler, such as human capital, enhances the relation between EO and economic growth, we must find that sign of the coefficient estimate for the interaction term between EO and human capital is positive. The equation where EO interacts with the enablers takes the form:

$$RGDP_{it} = \alpha_0 + RGDP_{it-1} + \alpha_2(EO_{it} * Corru_{it}) + \alpha_3(EO_{it} * FinDev_{it}) + \alpha_4(EO_{it} * SoCo_{it}) + \alpha_5(EO_{it} * HumanCap_{it}) + \alpha_6 X_{it} + \alpha_6 \theta_i + \alpha_7 Z_t + \varepsilon_{it} \quad (13)$$

Where EO_{it} is entrepreneurial orientation in country *I* at time *t*, $Corru_{it}$ represent our measure of corruption, $FinDev_{it}$ measures financial development, $SoCo_{it}$ calibrates social cohesion and $HumanCap_{it}$ evaluates human capital. Entrepreneurial orientation interacts with its drivers to impact on growth denoted by is $RGDP_{it}$, θ_i the measure of time-invariant country fixed effects, X_{it} the vector of control variables, Z_t is the vector for time dummies and ε_{it} represents the random error term. In the specification where the deviation interacts with the determinants, EO_{it} is replaced by $EOdev_{it}$ in equation 13 and the other terms stay the same.

We begin by evaluating whether reduced corruption facilitates the relationship between EO, its deviation and growth. To establish whether this is indeed the case, we assess how the interaction between the control of corruption, EO and its deviation would impact growth. In order to conclude that low perceptions of corruption enhance the relation between EO, its deviation and economic growth, we must find that sign of the coefficient estimate for the interaction between EO, its deviation and the control of corruption is positive. GDP per capita growth is the only dependent variable and the interaction between the control of corruption and EO and its deviation are the predictor variables. The log of wealth, natural resource rents and population growth are the control variables. The Sargan and AR (2) tests are satisfactory and r => 1 in all the regressions supporting identification and instrument validity. In addition, the lag of GDP growth is positively associated with GDP growth in all regressions and this is significant at the 1% level.

As Table 29 indicates, the sign of the coefficient estimate for the interaction between the level of EO and the control of corruption is positive for the combined sample as well as middle-to-high income countries ($p<0.01$) whereas model (5) indicates that it is not significant in low income countries. However, as model (7) illustrates, when we control for inequality, the interaction term of the level of EO and low perceptions of corruption changes sign and turns positive. This finding implies that low perceptions of corruption in relatively poor but equal countries enhance the relation between the level of EO and growth. This is significant at the 1% level. Furthermore, the effect of the interaction between the deviation of EO and the control of corruption enhances growth in the combined sample, middle-to-high income and low income countries (models 2, 4 and 6, $p<0.01$). In model 8, we evaluate the interaction in Africa and find that, counterintuitively, the control of corruption hinders the relation between EO and growth ($p<0.01$). The interaction between low perceptions of corruption and the deviation of EO (model 9) is insignificant. Both the results of model 8 and 9 may be sensitive to social cohesiveness. However, due to the small sample size of 7 African countries (when we include inequality in the regression), we cannot ascertain definitively whether this is indeed the case.

In addition, we assess the effect of the control variables: the log of wealth, natural resource rents and population growth on GDP per capita growth. First, the log of wealth indicates convergence in the combined sample, low income and African countries whereas middle-to-high income GDP per capita levels seem to diverge ($p<0.01$). Second, natural resource rents are positively associated with growth across all levels of development ($p<0.01$). Lastly, population growth, has a positive sign in the combined sample as well as in low income countries when we control for the level of EO ($p<0.01$). This result indicates the presence of multicollinearity

between EO, population growth and GDP per capita growth below a certain level of development.

Table 29: GMM analysis EO*Corruption

Dependent variable: GDP growth									
	All Countries		**Middle-to-High**		**Low income**			**Africa**	
Model	1	2	3	4	5	6	7	8	9
Growth(-1)	0.80 658.21***	0.64 49.13***	0.41 30.46***	0.34 21.90***	0.87 26.72***	0.48 6.73***	0.73 14.48***	0.38 3.75***	0.40 2.79**
Log(GDP)	-0.25 -76.01***	-0.14 -11.56***	0.07 2.61***	0.17 12.03***	-0.25 -6.51***	-0.21 -3.50***	-0.14 -1.17	-0.15 -1.21	-0.32 -2.23**
Natural Resource Rents	0.01 92.32***	0.01 28.65***	0.00 7.44***	0.00 2.28***	0.01 3.49***	0.02 7.49***	0.01 4.37***	0.01 2.22**	0.02 3.02***
Population Growth	0.02 14.40***	-0.01 -2.68***	-0.017 -4.05***	-0.02 -5.38	0.04 1.37	-0.03 -2.77***	0.02 1.61	-0.11 -3.48***	-0.16 -5.20***
EO*Corruption	0.00 2.85***	-	0.01 12.27***	-	-0.02 -1.36	-	0.02 3.61***	-0.06 -5.09***	-
EOdev*Corruption	-	0.02 13.08***	-	0.02 18.82***	-	0.03 3.84***	-	-	-0.02 -1.59
Gini Index	-	-	-	-	-	-	-0.00 -0.93	-	-
Observ	1611	1408	858	756	738	642	410	336	315
J statistic	88.31	71.30	38.89	41.14	25.86	26.81	15.51	9.42	14.26
Prob(J-statistic)	0.30	0.22	0.34	0.26	0.26	0.22	0.56	0.58	0.22
AR(2)	0.20	0.8533	0.52	0.91	0.74	0.39	0.12	0.73	0.20
No of cross sections	92	90	50	48	41	41	23	16	16
Instrument rank	87	68	41	41	27	27	23	16	16
N/I									

Notes:

1. The GDP per capita is measured in UDS 2005$
2. GDP growth is calculated as GDP growth= log(GDP/GDP(-5))
3. The deviation in EO is also the 5 year increase or decrease in EO.
4. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively

Secondly, we evaluate whether banking development enhances the relation between EO, its deviation and economic growth. We must find that sign of the coefficient estimate for the interaction between EO, its deviation and domestic credit is positive in order to conclude that banking development enhances the relation between EO

and economic growth. GDP per capita growth is the only dependent variable and the interaction between domestic credit and both EO and its deviation are the predictor variables. The log of wealth, natural resource rents and population growth are the control variables. As table 30 illustrates, the Sargan and AR (2) tests are satisfactory and r => 1 in all the regressions supporting identification and instrument validity. Additionally, the lag of GDP growth is positively associated with GDP growth in all regressions and this is significant at the 1% level,

The results suggest that banking development enhances the relation between the increase in EO and economic growth. A well-developed banking sector augments the positive impact of the deviation of EO on growth in the combined sample as well both middle-to-high and low income (models 2, 4 and 6,$p<0.01$). On the other hand, the interaction between banking development and the level of EO is insignificant in middle-to-high income countries (model 3) whereas it lubricates the relation between the level EO and growth in low income countries that are socially cohesive and moderately corrupt (model 7). On the other hand, the impact of banking development on the relation between both the level and the deviation of EO and growth is insignificant in Africa (models 8 and 9).

In addition, we gauge the association between the control variables, the log of wealth, natural resource rents and population growth, and economic growth. The log of wealth indicates convergence in the combined sample and low income countries whereas middle-to-high income GDP per capita levels seem to diverge whereas the results in Africa are inconclusive. Furthermore, natural resource rents are also positively associated with growth across all levels of development and lastly and as expected, population growth is negatively related to growth across all levels of development.

Table 30: GMM analysis EO*Domestic credit

Dependent variable: GDP growth	IV domestic credit								
	All Countries		Middle-to-High		Low income			Africa	
Model	1	2	3	4	5	6	7	8	9
Growth(-1)	0.49 56.63***	0.65 52.46***	0.29 11.10***	0.48 123.38***	0.89 21.51***	0.46 7.18***	0.91 34.32***	0.60 9.73***	0.65 8.88***
Log(Gdp)	0.01 1.75*	-0.17 -17.32***	0.27 9.32***	0.07 8.71***	-0.11 -2.65***	-0.21 -3.60***	-0.35 -10.70***	0.21 2.59***	-0.15 -4.55***
Natural Resource Rents	0.00 13.25***	0.01 27.48***	0.00 4.19***	0.00 21.57***	0.01 2.09**	0.02 7.46***	0.00 0.52	-0.00 -1.35	0.01 2.91***
Population Growth	-0.013 -17.58***	-0.01 -7.95***	-0.04 -5.12***	-0.02 -16.48***	0.05 1.64	-0.03 -4.22***	-0.01 -0.77	-0.00 -0.07	-0.05 -4.25***
EO*Dcredit	0.00 11.71***	-	0.00 0.34	-	-0.00 -3.73***	-	0.01 7.78***	0.00 1.28	
EOdev*Dcredit	-	0.00 8.01***	-	0.00 15.44***	-	0.00 4.71***	-	-	0.00 0.62
Gini index	-	-	-	-	-	-	-0.00 -0.72	-	-
Corruption	-	-	-	-	-	-	-0.06 -3.05***	-	-
Observ	1613	1410	858	756	738	642	410	336	315
J statistic	83.87	72.97	36.65	43.80	27.94109	26.44	17.12	14.57	11.59
Prob(J-statistic)	0.30	0.18	0.13	0.35	0.177642	0.23	0.38	0.20	0.40
AR(2)	0.70	0.35	0.62	0.64	0.30	0.57	0.81	0.65	0.27
No of cross sections	92	90	50	48	41	41	23	16	16
Instrument rank	83	68	33	46	27	27	23	16	16
N/I	1.11	1.32	1.52	1.04	1.52	1.52	1	1	1

Notes:

1. The GDP per capita is measured in UDS 2005$
2. GDP growth is calculated as GDP growth= log(GDP/GDP(-5))
3. The deviation in EO is also the 5 year increase or decrease in EO.
4. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively

Thirdly, we analyse the impact of the human capital variables on the relation between EO, its deviation and growth. We have found, in chapter 4, that a higher stock of human capital is positively related to EO. However, does human capital augment the EO-growth relationship? We include natural resource rents, to control

for growth that might not emanate from the diffusion of innovation, population growth as well as the log of GDP per capita as control variables in all the regression models. GDP per capita growth is the only dependent variable and EO and the deviation in EO are the predictor variables. As table 31 illustrates, the Sargan and AR (2) tests are satisfactory and r =>1 in all the regressions supporting identification and instrument validity. Further, the lag of GDP growth is positively associated with GDP growth in all regressions and this is significant at the 1% level.

The interaction between tertiary education and deviation of EO is positive and significant across both middle-to-high income countries as well as Africa. Similarly, tertiary education also augments the association between the level of EO and growth across all levels of development. Moreover, we also assess the control variables the log of wealth, natural resource rents and population growth. Similar to when we account for reduced corruption, the log of wealth indicates convergence in low income and African countries whereas middle-to-high income GDP per capita levels seem to diverge. Natural resource rents are also positively associated with growth whereas population growth is negatively related to growth across all levels of development.

Table 31: GMM analysis EO*tertiary

Dependent variable: GDP growth	All countries		Middle-to-high income		Low income		Africa	
Model	1	2	3	4	5	6	7	8
Growth(-1)	0.82 66.42***	0.64 46.25***	0.79 112.08***	0.44 120.62***	0.74 21.20***	0.47 6.41***	0.62 15.14***	0.48 10.66***
Log(GDP)	-0.44 -20.16***	-0.18 -15.24***	-0.55 -34.01***	-0.22 -61.15***	-0.40 -7.76***	-0.23 -4.88***	-0.23 -2.50***	-0.21 -1.27
Natural Resource Rents	0.01 10.76***	0.01 26.30***	0.01 11.80***	0.01 29.15	0.01 2.25***	0.02 7.58***	0.00 2.35***	0.01 2.48***
Population Growth	0.03 4.87***	-0.01 -3.14***	0.08 20.05***	0.02 13.90***	0.06 1.89*	-0.01 -1.30	-0.07 -9.07***	-0.05 -2.47***
EO*tertiary	0.00 7.89***		0.00 34.11***		0.01 7.55***	-	0.01 2.42***	-
EOdev*tertiary	-	0.00 13.31***	-	0.00 32.80***	-	0.01 3.96***	-	0.02 2.30***
Gini index	-	-	-	-	-	-	-	-
Corruption	-	-	-	-	-	-	-	-
Observ	1611	1408	858	756	738	642	336	315
J statistic	75.39	71.65	47.84	41.20	24.04	26.08	12.69	12.38
Prob(J-statistic)	0.14	0.21	0.28	0.55	0.29	0.25	0.31	0.34
AR(2)	0.84	0.55	0.11	0.15	0.15	0.34	0.44	0.16
No of cross sections	92	90	50	48	41	41	16	16
Instrument rank	68	68	48	46	26	27	16	16
N/I	1.35	1.32	1.04	1.04	1.58	1.52	1	1

Notes:

1. The GDP per capita is measured in UDS 2005$
2. GDP growth is calculated as GDP growth= log(GDP/GDP(-5))
3. The deviation in EO is also the 5 year increase or decrease in EO.
4. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively

Table 32 presents the results of the interaction between EO, its deviation and secondary education. The Sargan and AR (2) tests are satisfactory and r => 1 in all the regressions supporting identification and instrument validity. Further, the lag of GDP growth is positively associated with GDP growth in all regressions and this is significant at the 1% level. Similar to tertiary education, secondary education

enhances the relationship between both the level and the deviation of EO and economic growth. This result is significant at the 1% level and robust to controlling for wealth, natural resource rents and population growth. In addition, similar to when we account for tertiary education as a moderator; the log of wealth indicates convergence in low income and African countries whereas in middle-to-high income countries GDP per capita levels seem to diverge. Natural resource rents are also positively associated with growth across all levels of development and lastly, population growth is collinear with the level EO and GDP per capita growth below a certain level of development.

Table 32: GMM analysis EO*secondary

Dependent variable: GDP growth								
DV Growth	IV Secondary enrolment							
	All Countries		Middle-to-High		Low income		Africa	
Model	1	2	3	4	5	6	7	8
Growth(-1)	0.80 71.48***	0.63 13.52***	0.53 86.28***	0.43 80.02***	0.93 36.80***	0.52 7.45***	0.70 9.72***	0.61 7.93***
Log(GDP)	-0.35 -22.73***	-0.15 -12.15***	-0.04 -2.74***	0.11 10.41***	-0.48 -12.15***	-0.21 -4.45***	-0.08 -0.76	-0.08 -0.71
Natural Resource Rents	0.01 14.49***	0.01 28.29***	0.00 10.80***	0.00 4.87***	-0.00 -1.24	0.02 9.32***	0.00 3.25***	0.01 2.00**
Population Growth	0.02 4.63***	-0.01 -3.292***	-0.01 -8.12***	-0.01 -16.67***	0.05 1.84***	-0.02 -2.91***	-0.05 -5.71***	-0.09 -9.38***
EO*Secondary	0.00 4.69***	-	0.00 18.82***	-	0.01 8.57***	-	0.00 2.09**	-
EOdev*Secondary	-	0.00 47.95***	-	0.00 17.26***	-	0.00 2.59***	-	0.00 3.17***
Gini index	-	-	-	-	-	-	-	-
Corruption	-	-	-	-	-	-	-	-
Observ	1611	1408	858	756	738	642	336	315
J statistic	75.42	69.67	47.97	42.87	27.80	28.21	11.36	14.25
Prob(J-statistic)	0.14	0.26	0.28	0.39	0.18	0.17	0.41	0.22
AR(2)	0.44	0.69	0.23	0.32	0.42	0.52	0.48	0.18
No of cross sections	92	90	50	48	41	41	16	16
Instrument rank	68	68	48	46	27	27	16	16
N/I	1.35	1.32	1.04	1.04	1.52	1.52	1	1

Notes:

1. The GDP per capita is measured in UDS 2005$
2. GDP growth is calculated as GDP growth= log(GDP/GDP(-5))
3. The deviation in EO is also the 5 year increase or decrease in EO.
4. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively

Lastly, in table 33, we evaluate whether social cohesion, operationalised as inequality, augments the relationship between both EO and its deviation, and economic growth. The Sargan and AR (2) tests are satisfactory and r => 1 in all the regressions supporting identification and instrument validity. In addition, the lag of GDP growth is positively associated with GDP growth in the sample as a whole, middle-to-high income countries as well as low income countries. However, in Africa,

GDP growth is not persistent. In fact the results indicate lag of GDP may even be negatively correlated to current GDP growth ($p<0.10$).

The coefficient of interaction between inequality and both the level and the change in EO is positive and significant at the 1% level in both the combined sample and middle-to-high income countries whereas it is not significant in low income countries. This implies that inequality in middle-to-high income countries enhances the relation between EO and economic growth whereas in low income countries its impact is not significant. In models 7 and 8, we evaluate the impact of inequality in African countries. The interaction with the level of EO in model (7) is insignificant whereas the impact of inequality on the relation between the deviation in EO and economic growth is negative and this is significant at the 5% level. This result suggests that inequality hinders the impact of an increase in EO on economic growth in African countries. In addition, the lag of GDP loses its significance in model (7) and when we interact inequality with the deviation, the lag of GDP becomes negatively correlated to current GDP growth (model 8, $p<0.10$). These results are similar to our findings in Chapter 4 that when we control for inequality EO loses its persistence in Africa.

We also evaluate the control variables the log of wealth, natural resource rents and population growth. The log of wealth indicates divergence in high-to-middle income and African countries whereas in low income countries the log of GDP per capita is insignificant. Natural resource rents are also positively associated with growth in middle-to-high income countries and the combined sample. In contrast, natural resources are either not significant or negatively associated with growth in low income and African countries. Lastly, in the presence of inequality, the relation between population growth and GDP per capita growth remains non-linear with threshold effects depending on the level of EO.

Table 33: GMM analysis EO*inequality

Dependent variable: GDP growth	All countries		Middle-to-high income		Low income countries		Africa	
Model	1	2	3	4	5	6	7	8
Growth(-1)	0.80 48.95***	0.58 51.17***	0.54 52.72***	0.45 99.52***	0.44 3.40***	0.45 4.61***	0.19 0.81	-0.25 -1.76*
Log(Gdp)	-0.31 -24.11***	-0.13 -8.18***	-0.06 -4.90***	0.08 6.30***	0.14 1.18	-0.013 -0.12	0.81 2.19**	2.03 2.90***
Natural Resource Rents	0.01 5.27***	0.01 17.39***	0.00 7.51***	0.00 2.00**	-0.01 -3.46***	0.00 0.25	0.01 0.94	0.00 0.29
Population Growth	0.02 2.52***	-0.01 -3.94***	-0.02 -22.99***	-0.02 -17.39***	-0.04 -3.77**	-0.03 -2.74***	-0.07 -0.19	0.02 0.04
EO*Gini Index	0.00 11.82***	-	0.00 25.92***	-	0.00 0.73		-0.00 -0.94	
EOdev*Gini Index	-	0.00 19.74***	-	0.00 33.66***	-	0.00 0.76	-	-0.01 -2.06**
Gini index	-	-	-	-	-	-	-	-
Corruption	-	-	-	-	-	-	-	-
Observ	1181	1022	756	664	410	348	140	126
J statistic	50.73	43.53	36.59	36.72	11.99	8.45	4.12	0.68
Prob(J-statistic)	0.20	0.45	0.54	0.44	0.29	0.59	0.13	0.71
AR(2)	0.24	0.27	0.81	0.23	0.73	0.98	0.91	0.25
No of cross sections	68	66	44	42	23	23	7	7
Instrument rank	48	48	43	41	20	15	7	7
N/I	1.42	1.38	1.02	1.02	1.15	1.53	1	1

Notes:

1. The GDP per capita is measured in UDS 2005$
2. GDP growth is calculated as GDP growth= Log (GDP/GDP (-5)).
3. The deviation in EO is also the 5 year increase or decrease in EO.
4. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively.

5.2.2 Is Africa different?

The last result amongst others, begs the question, is Africa different? Some results are peculiar to Africa, and imply it may very well be different. First, we find that the control of corruption hinders the relation between the level of EO and growth. Second, the impact of banking development on the relation between both the level

and the deviation of EO and growth is insignificant in Africa. Third, inequality renders the association between the lag of GDP growth and GDP growth insignificant or negative ($p<0.1$). Lastly and most importantly, we find that inequality hinders the relation between an increase in EO and economic growth in Africa. Similarly, Barro (1991) finds that there is a negative "Africa dummy" that hinders growth. Easterly and Levine (1997) argue that this dummy could be due to ethnic heterogeneity that is particularly prevalent in Africa. Sachs and Warner (1997) suggest low growth in Africa is partly attributable to limited access to the sea, a tropical climate and natural resource abundance. Nevertheless, they contend that although natural factors may have a role in Africa's disappointing growth outcomes, economic policies such as government saving, openness to international trade and good institutions are more important for economic growth in Africa than natural factors.

Similar to Sachs and Warner (1997), our results suggest that the level of EO positively predicts GDP per capita and the deviation of EO enhances economic growth in Africa after controlling for wealth, natural resources and the level of development. Table 34, clearly demonstrates that the level of GDP per capita is closely related to the level of EO and Table 36 confirms this with an indicated correlation coefficient of 0.72. In addition, although GDP growth is highly volatile in Africa, correlations confirm the findings of regression analysis that the deviation in EO is positively related to GDP growth. Additionally, as we found in regression analysis, and contrary to expectations, the relationship between natural resource rents and growth is weak and contingent on institutions, banking development and human capital.

Table 34: EO rankings in Africa

EO Rank	Country	Mean	Std. Dev.	GDP
1	Botswana	0.50	0.18	3942.12
2	Algeria	0.14	0.27	2636.36
3	Mauritius	-0.02	0.20	3591.76
4	South Africa	-0.06	0.15	4938.75
5	Tunisia	-0.10	0.17	2426.16
6	Morocco	-0.30	0.21	1575.56
7	Egypt	-0.39	0.15	982.24
8	Zambia	-0.59	0.23	658.28
9	Senegal	-0.64	0.17	707.63
10	Madagascar	-0.94	0.34	304.35
11	Sudan	-1.02	0.36	534.20
12	Mozambique	-1.03	0.44	220.18
13	Burkina Faso	-1.07	0.17	315.53
14	Lesotho	-1.09	0.63	569.20
15	Uganda	-1.13	0.40	245.04
16	Ethiopia	-1.20	0.27	143.83
	All	-0.53	0.59	1495.25

Notes:
1. The GDP per capita is measured in UDS 2005$.
2. The average EO score is measured over the 29 years between 1980 and 2008.

Having established that the deviation in EO is positively related to growth and bearing in mind that that inequality hinders this relation, we delve deeper into inequality in Africa. Table 35 displays the descriptive statistics of inequality for Africa, low and middle-to-high income countries as well as the whole sample. The table shows that Africa has both the highest mean and median of the Gini Index. The average inequality is a full standard deviation greater than that of the whole sample which includes African countries. Excluding African countries would lead to an even greater gap in inequality between Africa and the rest of the world.

These descriptive statistics combined with the correlations as well as the regression findings in both chapters 4 and 5, suggest that in Africa inequality and social conflict, that is prevalent amongst ethnically diverse populations, may very well be the binding constraint on GDP growth.

Table 35: The descriptive statistics of inequality in Africa

	Africa	Low income	Middle-to-high	All
Mean	48.65	42.35	35.17	37.56
Median	46.18	40.53	32.79	35.29
Maximum	77.60	77.60	64.00	77.60
Minimum	29.49	12.10	18.10	12.10
Std. Dev.	10.40	10.42	10.22	10.81
Skewness	0.53	0.27	0.78	0.56
Kurtosis	2.41	3.17	2.74	2.67
Jarque-Bera	12.44	8.65	124.81	112.58
Probability	0.00	0.01	0.00	0.00
Sum	9874.90	28249.84	41782.73	74058.90
Sum Sq. Dev.	21842.79	72328.84	123868.40	230285.00
Observations	203	667	1188	1972

Notes:

1. Inequality is measured using the Gini Index
2. The low income, middle-to-high and combined samples include African countries. Excluding them would further reduce their average inequality.

The impact of inequality can be insidious. It may negatively affect growth promoting institutions and policies, resulting in poor growth outcomes. Our findings suggest that inequality in Africa increases perceptions of corruption, negates the potentially positive impact of banking development and reduces the returns to human capital, thereby negatively affecting EO. As a consequence, African countries attain very low scores on EO and its determinants with Lesotho and Ethiopia ranking last and second last, respectively.

Persson and Tabellini (1991) also confirm that in a society with distributional conflict, growth promoting activities such as the production of knowledge are likely to be constrained with the resultant negative impact on technological upgrading and growth. Sachs and Warner (1997) concur and assert that the lack of social cohesion that emanates from colonial rule may hinder the adoption of growth oriented policies. Therefore, inequality occasioned by arbitrary discrimination against ethnic minorities in African countries, results in poor human capital formation, high perceptions of

corruption and a lack of banking development which inhibit EO and consequently lead to reduced growth and increased growth volatility.

Table 36: Correlation matrix of the determinants, EO and growth (African sample)

Partial Covariance Analysis: Ordinary

	EO	EOdev	Corruption	Domestic credit	Gini Index	Tertiary	Secondary	Natural res	GDP	GDP growth	GDP volatility
EO	1.00										
EOdev	0.17***	1.00									
Corruption	0.23***	-0.27***	1.00								
Domestic credit	0.32***	-0.27***	0.64***	1.00							
Gini Index	-0.14*	-0.17**	0.30***	0.31***	1.00						
Tertiary	0.78***	0.08	0.33***	0.45***	-0.02	1.00					
Secondary	0.86***	0.07	0.25***	0.43***	-0.02	0.94***	1.00				
Natural res	-0.48***	0.16**	-0.53***	-0.42***	0.02	-0.52***	-0.53***	1.00			
GDP	0.72***	-0.14*	0.57***	0.59***	0.17**	0.81***	0.83***	-0.66***	1.00		
GDP growth	-0.09	0.33***	-0.30***	-0.28***	-0.35***	0.05	0.02	0.11	-0.17	1.00	
GDP vol	-0.36***	0.19**	-0.73***	-0.56***	-0.20**	-0.50***	-0.47***	0.74***	-0.79***	0.05	1.00

Notes:

1. The GDP per capita is measured in UDS 2005$
2. GDP growth is calculated as GDP growth= log(GDP/GDP(-5)) and GDP vol represents 5 year GDP growth volatility
3. The deviation in EO is also the 5 year increase or decrease in EO.
4. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively

So is Africa different? The answer may be yes and no. Similar to other countries, we find that the level of EO and the deviation in EO are the key drivers of economic growth and determinants such as human capital enhance the association between EO and growth. However, Africa seems to have heightened inequality which we argue is occasioned by arbitrary discrimination since it does not emanate from the growth process or from adopting a variance enhancing strategy such as EO. Instead it is an outcome of unjust political processes such as racial/ethnic discrimination and therefore it lacks social legitimacy. It is this type of inequality that results in high corruption, poor human capital formation and a lack of banking development and consequently a low and static EO which leads to poor GDP growth.

Despite the harmful impact that inequality has on EO, we find that an increase in EO is the only variable that is positively related to economic growth in Africa and natural resource rents are not. Therefore, increasing African countries' innovativeness, proactiveness and risk taking may facilitate economic growth which in turn may bring about the necessary institutional legitimacy that governments need in order to undertake reforms that would address arbitrary discrimination and create inclusive societies that engender economic progress. Our assertions integrate both Easterly and Levine's (1997) and Sachs and Warner's (1997) views that while relative equality and social cohesion is important, economic policies that would increase innovativeness, proactiveness and risk taking are even more important for growth in Africa.

5.2.3 Robustness Tests

To evaluate the robustness of our results, firstly, we test whether the control of corruption, human capital, banking development and inequality have an impact on GDP per capita across all levels of development growth after controlling for an increase in EO. We have argued that what we, in literature, commonly refer to as the determinants of growth, are actually the determinants of EO. As Table 37 indicates, with identification supported and second order autocorrelation rejected, the control of corruption, tertiary education, domestic credit to the private sector and inequality are either insignificant or negatively related to growth across all levels of development. However as model (3) shows, secondary education retains a relatively small residual impact in low income countries even after we control for a deviation in EO. These results largely support our assertion that for a country to grow, simply improving its institutions and education is necessary but not sufficient for growth. Policy makers

will still have to initiate a process of technological upgrading that encompasses taking risks to diversify into new sectors, improving innovative capabilities and proactively seeking both new markets and advanced technology

Table 37: Robustness: GMM analysis the determinants, EO and growth

DV: GDP per capita growth

	All countries	Middle-to-high income	Low income countries
Model	1	2	3
Growth(-1)	0.50 3.21***	0.39 0.97	0.03 0.20
Log(GDP)	0.32 3.47***	0.14 2.76***	0.65 6.78***
Natural Resource Rents	-0.00 -2.36**	-0.01 -3.70***	-0.00 -1.61
Population Growth	-0.01 -1.69*	-0.10 -2.78***	-0.01 -1.30
EOdev	0.20 3.76***	0.13 4.54***	0.20 5.14***
Corruption	0.00 0.02	0.05 1.63	0.01 0.52
Domestic credit	-0.00 -3.46***	-0.00 -1.10	-0.00 -4.51***
Tertiary	0.00 1.56	-0.00 -0.39	-0.01 -2.19**
Secondary	-0.00 -0.01	0.00 0.00	0.01 2.87***
Gini Index	-0.00 -1.22	0.00 0.50	0.00 0.72
Observ	1024	664	348
J statistic	7.84	9.30	10.35
Prob(J-statistic)	0.55	0.41	0.32
AR(2)	0.20	0.18	0.42
Number of cross sections	66	42	23
Instrument rank	19	19	19
N/I	3.47	2.21	1.21

Notes:

1. GDP per capita is measured in US 2005$
2. GDP growth is calculated as GDP growth= log(GDP/GDP(-5)) and GDP vol represents 5 year GDP growth volatility
3. The deviation in EO is also the 5 year increase or decrease in EO.
4. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively

Secondly, we assess whether a stock variable, the number of new limited liability corporations registered in the calendar year is positively related to growth whilst controlling for size of the economy, population growth and a deviation in EO. We use the number new limited liability corporations registered because they represent

formal and possibly better resourced entities operating within formal institutions. Due to the sample size, we use panel least squares to estimate the regression and thus, the results should be treated with caution since we could not control for reverse causality and omitted variable bias. As Table 38 indicates, we find that new business registrations are not significantly, positively related to growth and this holds across all levels of development whereas the deviation in EO positively predicts GDP growth across all levels of development.

These results support our assertion that it is the content of entrepreneurship and not the entry mode that is positively related to growth. Nevertheless, it is important to clarify that we do not imply entry and exit are not positively related to growth or that somehow they inhibit it. However, the point we make is that the entry mode does not define entrepreneurship nor is it necessary or sufficient for growth. We argue and the results seem to support that, it is the content of entrepreneurship, EO, that defines whether a country is entrepreneurial or not.

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Table 38: GMM analysis Robustness New Business and EOdev

DV: GDP per capita growth

	Panel Least Squares		
	All countries	Middle-to-high income	Low income countries
Model	1	2	3
Growth(-1)	0.88 54.39***	0.84 36.52***	0.93 41.18***
Log(GDP)	-0.01 -6.99***	-0.02 -8.21***	-0.01 -2.77***
Natural Resource Rents	0.00 0.69	0.00 0.03	0.00 0.74
Population Growth	-0.01 -4.39***	-0.01 -3.18***	-0.01 -1.22
EOdev	0.03 4.79***	0.04 4.57***	0.03 2.91***
New Businesses	-0.00 -0.46	-0.00 -0.98	-0.00 -0.76
Observ	349	213	132
R2	0.94	0.92	0.95
F-statistic	813.30	401.18	407.20
Prob(F-statistic)	0.00	0.00	0.00

Notes:

1. GDP per capita is measured in US 2005$
2. GDP growth is calculated as GDP growth= log(GDP/GDP(-5)) and GDP vol represents 5 year GDP growth volatility
3. The deviation in EO is also the 5 year increase or decrease in EO.
4. ***, **, and * in the table indicate the levels of significance of the t-value at 1%, 5% and 10%, respectively

5.3 Discussion

In this chapter we sought to answer three questions, the first one being whether EO and its deviation have a positive impact on economic growth at the aggregate level. To put it differently, the essential question we asked was: can one nation state devote more resources to innovative activity, take risks and invest more in longer term, uncertain outcomes whilst being more pro-active in growing and diversifying its economic base than others?

The answer is, yes it can. EO and its deviation are positively associated with GDP growth in both middle-to-high and low income countries as well as Africa. This

supports our contention that taking risks, innovating and proactively sourcing technology and markets leads to knowledge diffusion, technological progress and economic growth. And contrary to Lee and Kim's (2009) assertion, this result holds across all levels of development. For example, China in 1980 was a poor country. It achieved its miraculous growth by dramatically improving its technological capabilities, investing and diversifying its industrial base and proactively seeking markets for its products. Its EO score improved dramatically from -0.43 to 1 and as a result it achieved an average GDP per capita growth of 8.55% per year between 1980 and 2008. In contrast, although South Africa, which was a middle income country in 1980, undertook painful political and institutional reforms, it hardly invested in new industries nor did it acquire any new technological capabilities. Its EO declined marginally from 0. 29 to 0.20 and as a result South Africa achieved a poor growth rate of 0.07%.

Therefore, we could not find support for Lee and Kim's (2009) hypothesis that transitioning from low to middle income is different from transitioning from middle to high income status. Similarly, van Stel et al. (2005), Wong et al. (2005) and Larroulet and Couyoumdjian's (2009) assertion that the link between entrepreneurship and growth is low in developing countries is not supported. Although, we find that new business registrations are not significantly, positively related to growth across all levels of development, the deviation in EO positively predicts GDP growth. Entrepreneurship, correctly defined as EO, facilitates technological upgrading and growth across all levels of development. These results confirm that it is the content of entrepreneurship and not the entry mode that is positively related to growth, and it follows that merely counting the number of new firms and/or the number of self-employed will tell us very little about innovation, risk taking and pro-activeness and

consequently, nothing about entrepreneurship and growth. Therefore, our assertion that the studies assessing the entrepreneurship-growth nexus have shown conflicting results precisely because they have not been studying what they are purporting to study, is confirmed.

Likewise, we have addressed Acs et al.'s (2005) concern that a country such as China can grow significantly with low levels of R&D expenditure (Hsiao and Shen, 2003), by showing that first, growth is a joint function of innovativeness, risk taking and proactiveness not merely R&D and second, that it's not only the level of EO but also the incremental increase of EO that drives growth. Therefore, any increase in EO from China's low level will enhance GDP growth. Similarly, we have addressed (Minniti and Lévesque, 2010) concern that the exact nature has not been of association between entrepreneurship and economic growth although often assumed, has not been explicated. We have found that entrepreneurial countries have to innovative, assume risks, invest and proactively attack international and domestic markets in diffusing the technologies in order to grow. The evidence suggests a more accurate characterisation of entrepreneurship at the macro-level is EO. Further, it is the manifestation of this EO (i.e., innovative activity, risk taking and proactiveness) is the critical variable that drives growth.

Furthermore, we have made the argument that quality institutions, that reduce levels of corruption and arbitrary discrimination, would support EO since risk bearing and innovating require, at a minimum, the assurance the rewards will accrue to the risk taker. Moreover, we posited that financial institutions are important because they evaluate and finance entrepreneurs' innovation and launching of new products to market (Schumpeter, 1912) and thus their relative absence would inhibit EO (King

and Levine, 1993). Similarly, we argued that high stocks of human capital enhance entrepreneurship by enabling knowledge acquisition and better quality innovation (Larroulet and Couyoumdjian, 2009). We find support for these assertions as the control of corruption; banking development and human capital enhance the relationship between an increase in EO and growth. This finding is robust and significant across all levels of development.

These results find additional support in literature. Firstly, human capital enhances the EO-growth relation by significantly facilitating and increasing entry by knowledge-based firms (Baptista and Mendonça, 2010). In particular, high stocks of human capital augment the relationship between entrepreneurship and economic growth by enabling entrepreneurs to pursue better quality opportunities (Larroulet and Couyoumdjian, 2009). In addition, human capital enhances the EO-growth relation by improving a country's ability to imitate and learn advanced foreign technologies (Nelson and Phelps, 1966; Stokke, 2008). Secondly, reducing corruption facilitates growth by promoting productive entrepreneurship (Baumol, 1990). Likewise, reducing corruption may lower levels of uncertainty and transactions cost, and consequently increase the number of positive net present value opportunities that can be exploited by entrepreneurial firms, thus leading to growth (Anokhin and Schulze, 2009).

Thirdly, financial institutions are important for growth because they evaluate and finance entrepreneurs' innovation and launching of new products to market (Schumpeter, 1912) and thus their absence would inhibit EO and consequently decrease the rate of economic growth. Furthermore, countries with high levels of financial market development are better able to support the growth of capital

intensive industries (Rajan and Zingales, 1998 and Beck et al., 2008). Financial institutions and markets ease the trading, hedging, and pooling of risk, thus impacting economic growth by varying resource distribution and savings rates, and this encourages investment in projects with higher risk and superior expected returns (Devereux and Smith, 1994; Obstfeld, 1994 and Rajan and Zingales, 1998). Therefore, financial sector distortions can inhibit EO and consequently decrease the rate of economic growth (King and Levine, 1993).

In essence, institutions and policies alter the ability and incentives of firms to innovate and proactively take risks and we made the point that the clear association theoretically is from institutions to growth. We evaluated this contention and we found that the control of corruption, tertiary education, domestic credit to the private sector and inequality are either insignificant or negatively related to growth across all levels of development when we control for an increase in EO. These results largely support our assertion that first, institutions and policies are correctly the determinants of EO and second, for a country to grow, simply improving its institutions and education is necessary but not sufficient. Policy makers will still have to initiate a process of technological upgrading that encompasses taking risks to diversify into new sectors, improving innovative capabilities and proactively seeking both new markets and advanced technology.

Furthermore, we hypothesized that the proactive actions necessary to attack new markets require purposeful, cohesive action that is more likely in relatively equal societies with agreed on long-term objectives than other scenarios. Consequently, we gauged whether indeed unequal societies hinder the impact of risk taking, innovativeness and proactiveness on growth. However, this assertion was only

supported in Africa. Instead we found that in the combined sample as well as middle-to-high income countries inequality enhances the EO-growth relation whereas in low income countries its impact is insignificant. This finding partially confirms Barro's (2000) contention that association between inequality and growth depends on the level of economic development as higher inequality lowers growth in poor countries whereas it promotes growth in developed countries. Shin (2012) explains Barro's (2000) findings by suggesting that in developed countries the rich save more than the poor, thus enabling the capital accumulation necessary for growth. Therefore, any income redistribution would reduce the savings needed for investment and growth. In contrast, the poor are under credit constraint in developing countries. As a result they do not participate in investing or production activity.

As a conjecture, we would suggest another possible reason for this finding is that EO is a variance enhancing strategy and thus a possible outcome of its implementation may be a greater variance in incomes, resulting in a higher Gini Index. This may be positive for growth provided that the resulting inequality is below a particular threshold and institutions in that particular country are strong and legitimate enough to mediate any distributional conflict that may arise. However, in volatile and poor countries, extreme levels of income inequality may lead to political and social instability that causes economic growth to decline due to a lack of growth persistence (Berg and Ostry, 2011).

Lastly, we assessed wealth and natural resource rents as control variables. The results seem to suggest that the middle income trap might be due to a low EO. Although convergence was confirmed in low income countries, with the log of GDP entering the growth regression with a negative sign, in middle-to-high income

countries the sign is positive when EO and its incremental change are controlled for. This result suggests that, for middle income countries, the necessary growth needed to attain developed status is not automatic. It is conditional on a high and increasing EO. Therefore, a middle income country with a low EO which it does not increase, such as South Africa, may fall further behind developed countries. This finding receives support from Pritchett (1997) and Bairoch's (1993) contention that wealthy countries are getting richer at a faster rate than poor countries. Similarly, Easterly and Levine (2001) suggest that empirically over the past 200–300 years the story has been massive divergence in GDP per capita between the rich and the poor and not convergence, as neoclassical theory would suggest.

Moreover, we find that natural resources are positively associated with growth in the combined sample as well as in low income countries (contingent on inequality) and these findings are robust to controlling for EO and its deviation. In contrast, in middle-to-high income countries an increase in EO suppresses the effect of natural resources on growth rendering it insignificant. Similarly, this relationship is weak in African countries, conditional on a low and decreasing EO and in the presence of inequality; natural resources are either not significant or negatively associated with growth in African and low income countries, respectively.

These results suggest that the impact of natural resources on growth in low income countries may be first, independent of EO and second contingent on institutions. Acemoglu and Robinson (2006) suggest this may be because natural resource increase incentives for corruption and hinder better institutions. Van der Ploeg (2011) submits that natural resources may have harmful effects on the quality of the legal system and thus on property rights. Vicente (2010) documents an increase in corruption of 10% after the announcements of the oil discovery in São Tomé.

5.4 Conclusion

In the review of literature, we noted the anomaly that although corporate entrepreneurship literature has converged on EO as the appropriate description of entrepreneurial behaviour, literature at the aggregate level, which purports to aggregate firm level behaviour, still measures entrepreneurship as a stock variable and considers only one of the composite elements, innovation, as reflective of entrepreneurial behaviour. Risk taking and proactiveness are ignored. In our view, we have addressed this anomaly and, similar to Schumpeter, put entrepreneurship at the heart of economic progress.

Entrepreneurship defined at the aggregate level as a joint function of risk taking, innovativeness and proactiveness, and sustained behaviour by entrepreneurial states positively predicts growth. In contrast, entrepreneurship measured as a stock variable, that is, counting the number of "entrepreneurs" or viewed as invention, as Schumpeter (1911) warned, might be "downright misleading" and dangerous, leading to the muddle we have seen in literature and as an unintended consequence, poverty and destitution for millions of people.

In addition, we have made the point that the clear association theoretically is from institutions and policies to growth, as institutions and policies by themselves do not increase output. Entrepreneurial firms and entrepreneurs do. Therefore, institutions and policies are the determinants of risk taking, proactiveness and innovativeness and not economic growth. We evaluated this contention and we found that first, institutions and policies are, correctly, enablers of EO and second, for a country to grow, simply improving its institutions and education is necessary but not sufficient for growth. Policy makers will still have to initiate a process of technological

upgrading that encompasses taking risks to diversify into new sectors, improving innovative capabilities and proactively seeking both new markets and advanced technology.

In summary, the results suggest that firstly, entrepreneurship, correctly defined as EO, is the critical variable that determines whether a country grows or does not. Secondly, institutions and policies are antecedents of EO, not growth. They affect and shape the relationship between EO and growth; however, they do not determine it. Lastly, the positive impact of an increase in EO on growth does not vary according to the country's level of development. It is significant for both developed and developing countries, including Africa.

Chapter 6

SUMMARY OF FINDINGS AND CONCLUSION

This study sought to address the inconsistent link in theoretical and empirical literature between entrepreneurship and economic growth. We argued that part of the reason for these contradictory findings could be that entrepreneurship has been mispecified in the literature as entry density or R&D. Therefore, we proposed that a more accurate characterisation of entrepreneurship at the macro-level is entrepreneurial orientation (EO) and argued that it is the manifestation of this EO that is the critical individual variable which defines whether a country is entrepreneurial or not and, as a consequence, whether it will improve its productive capabilities or not.

A rigorous review of literature suggested the appropriate research questions should be:

1. Does entrepreneurship manifest at the aggregate level as EO?
2. Does EO have a positive impact on economic growth?
3. Is this economic growth impact context dependent? That is, does it vary depending on the country's level of development?
4. Further, what are the institutional drivers of EO at the aggregate level?
5. Lastly, do these institutional enablers enhance the EO-growth relation?

This study has made several contributions to the literature. First, we made a theoretical contribution by defining entrepreneurship at the aggregate level as EO, in contrast to its' current characterisation in the literature as entry density and/or R&D,

and additionally, linking this EO to economic growth. Second, we made a significant methodological contribution by devising aggregate level, objective secondary measures of EO and its' sub-constructs (risk taking, innovativeness and proactiveness). Lastly, empirically, and as hypothesized, the EO-growth relation was confirmed. Furthermore, banking development, human capital, social cohesion and the control of corruption were confirmed as policies and institutions that are predictors of EO, as well as enablers of the EO-growth relation.

6.1 Defining and measuring EO (and its sub-constructs)

In chapter 3, we sought to address the anomaly that although corporate entrepreneurship literature has converged on EO as the appropriate description of entrepreneurial behaviour, literature at the aggregate level, which purports to aggregate firm level behaviour, still measures entrepreneurship as a stock variable and considers only one of its composite elements, innovation, as reflective of entrepreneurial behaviour. To address this concern, we cogently operationalised aggregate level indicators of risk taking, innovativeness and proactiveness, using objective measures and, through factor analysis, confirmed the validity and dimensionality of EO. The significant findings were:

- First, innovativeness was validated as a composite measure of innovative input, scientific output and technological output. Thus, addressing concerns in literature about the individual indicators.
- Second, proactiveness was established as a construct that best reflects the activities of search and discovery at the international level, empirically confirming the contention that some countries may be heavy producers of new knowledge although they are sluggish in applying it. On the other hand,

other countries may quickly appropriate and apply technology developed elsewhere.

- Third, we empirically validated risk taking as capital accumulation in highly uncertain sectors. Our contention that adjusted agricultural value-added reflects the propensity to diversify and invest in risky sectors, the domestic savings rate reflects the ability to do so over time and gross investment is an imperfect measure of the magnitude of investment, was corroborated.
- Lastly, with the sub-constructs of EO defined and validated, we proceeded to confirm our conceptualisation of EO, at the aggregate level, as a reflective, unidimensional, second-order construct with three indicators: risk taking, innovativeness and proactiveness. Moreover, the results showed that the indicators of EO covary, implying that they are complementary and not substitutes.

6.2 The determinants of EO

In chapter 4 we investigated the determinants and drivers of EO and evaluated the question: why are some countries more innovative, risk taking and proactive than others? To answer this question, we assessed whether financial market development, social cohesion (operationalised as inequality), human capital and the control of corruption have a positive association with EO and whether this impact varies with the level of development. We selected these four measures (institutions and policies) as potential enablers of EO because they alter the ability and incentives of firms to be entrepreneurial and made a number of significant findings:

- First, we confirmed that in the overall (combined) sample and middle-to-high income countries, low levels of corruption are positively associated with EO.

However, the finding that low perceptions of corruption are positively associated with EO does not seem to apply in low income countries, including those in Africa. In these countries, we find a persistent and significant negative relationship between low corruption and EO, supporting the notion that corruption ameliorates bureaucratic inefficiency and the assertion that perceptions of corruption are influenced by social trust in low income countries.

- Secondly, a positive association of domestic credit extension to the private sector with EO was also supported in middle-to-high income countries. However, the banking development-EO relation seems to be contingent on the level of development. In low income countries and Africa, we found that banking development may hinder EO due to corrupt political systems and weak institutions.
- Thirdly, across the different samples, we found that after accounting for collinearity with other variables, the human capital indicators, secondary and tertiary education, are positively and significantly related to EO. In addition, the results suggest that the human capital variables are more important than the institutional variables in influencing EO in low income countries. Furthermore, after controlling for low corruption, banking development, inequality and wealth, we found that secondary education was still positively associated with EO whereas tertiary education was not. Therefore, the results suggest it is a misnomer to suggest that a country can have a strong tertiary education system without having a strong secondary system.
- Fourthly, we evaluated the association between EO and inequality. We found that inequality is highly collinear with reduced corruption, human capital and

banking development. Inequality had a significant impact on the association that the perceptions of corruption, banking development, human capital have with EO, even though the direct relation with EO is inconclusive. We suggested that a possible reason for these seemingly inconclusive findings could be that inequality partially shapes the relation between institutions and policies, and EO. This contention was supported by our results as we found that high inequality increases perceptions of corruption and negates the potentially positive impact of banking development on EO. Moreover, inequality reduces the returns to higher education in low income countries as well as returns to secondary education in Africa.

- Lastly, we assessed wealth, the lag of EO and natural resource rents as control variables. We found that wealth is not positively related to EO in middle-to-high income countries whereas it is positively associated with EO in Africa and the broader sample of low income countries. Moreover, natural resources were marginally (significant at the 10% level) positively related to EO in African countries. Finally, the results suggest that the lag of EO is not always persistent in African countries implying that EO and possibly growth, is highly volatile in Africa.

6.3 The impact of EO (and its' determinants) on economic growth

In chapter 5 we sought to answer three questions, the first being whether EO and its deviation have a positive impact on economic growth at the aggregate level. Second, we assessed whether this growth impact is contingent on the level of development, and third, we evaluated whether the determinants enhance this EO-economic growth relation. The significant findings were:

- EO and its deviation are positively associated with GDP growth in both middle-to-high and low income countries including African countries. Therefore, we could not find support for the hypothesis that transitioning from low-to-middle income is different from transitioning from middle-to-high income status. Similarly, the assertion that the link between entrepreneurship and growth is low in developing countries is not supported.
- New business registrations are not significantly positively related to growth across all levels of development, whereas the deviation in EO positively predicts GDP growth. These results confirm that it is the content of entrepreneurship and not the entry mode that is positively related to growth.
- Growth is a joint function of innovativeness, risk taking and proactiveness not merely R&D and further, that it is not only the level of EO but also the incremental increase of EO that drives growth.
- The control of corruption, banking development and human capital enhance the relationship between an increase in EO and growth. This finding is robust and significant across all levels of development.
- Institutions and policies are correctly enablers of EO, and thus indirectly, of growth. The control of corruption, tertiary education, domestic credit to the private sector and inequality are either insignificant or negatively related to growth across all levels of development when we control for an increase in EO. In contrast, the deviation in EO was significantly, positively related to growth in all specifications across all levels of development.
- A lack of social cohesion (proxied by inequality) hinders the impact of risk taking, innovativeness and proactiveness on growth only in Africa. Otherwise, in the combined sample as well as middle-to-high income countries, inequality

enhances the EO-growth relation whereas in low income countries its impact is insignificant. We argued that a possible reason for this finding is that EO is a variance enhancing strategy and thus a possible outcome of its implementation may be a greater variance in incomes, resulting in a higher Gini Index.

- Moreover, we assessed wealth and natural resource rents as control variables. Convergence was confirmed in low income countries, with the log of GDP entering the growth regression with a negative sign. However, in middle-to-high income countries the sign is positive when EO and its incremental change are controlled for. This result implied that, for middle income countries, the necessary growth needed to attain developed status is not automatic. It may be conditional on a high and increasing EO.
- Lastly, we established that natural resources are positively associated with growth in the combined sample as well as in low income countries (contingent on inequality. These findings are robust to controlling for EO and its deviation. In contrast, in middle-to-high income countries an increase in EO swamps the effect of natural resources on growth, rendering it insignificant.

6.4 Conclusion

In summary, we have defined and developed measures of EO and its sub-constructs at the aggregate level. Our conceptualisation of EO addresses the concern that we cannot measure entrepreneurship and technological progress by merely counting the number of entrepreneurs in a country. Although entrepreneurship is a complex, multi-faceted phenomenon that varies according to culture, geography, policies and institutions, we have developed a single aggregated theory-based indicator that

helps capture this complexity. Secondly, we have investigated the determinants and drivers of EO and found that the control of corruption, banking development, inequality and human capital influence the level of EO that countries possess. However, these results indicate that this impact is non-linear with threshold effects and is contingent on the level of development and institutions, which are in turn shaped by inequality. Thirdly, we have established that entrepreneurship defined at the aggregate level, as EO, and sustained behaviour by entrepreneurial states, positively predicts growth and that this association is enhanced by policies and institutions. Furthermore, our results suggest that institutions and policies are the determinants of EO and not necessarily of economic growth. Policies and institutions by themselves do not increase output, entrepreneurial firms and entrepreneurs do.

Appendix A1

List of countries

Sample:	1980 2008			
Included observations:	2726			
Number of categories	94			
			Cumulative	Cumulative
Value	Count	Percent	Count	Percent
Algeria	29	1.06	29	1.06
Argentina	29	1.06	58	2.13
Armenia	29	1.06	87	3.19
Australia	29	1.06	116	4.26
Austria	29	1.06	145	5.32
Azerbaijan	29	1.06	174	6.38
Belgium	29	1.06	203	7.45
Bolivia	29	1.06	232	8.51
Botswana	29	1.06	261	9.57
Brazil	29	1.06	290	10.64
Bulgaria	29	1.06	319	11.7
Burkina Faso	29	1.06	348	12.77
Cambodia	29	1.06	377	13.83
Canada	29	1.06	406	14.89
Chile	29	1.06	435	15.96
China	29	1.06	464	17.02
Colombia	29	1.06	493	18.09
Costa Rica	29	1.06	522	19.15
Croatia	29	1.06	551	20.21
Czech Republic	29	1.06	580	21.28
Denmark	29	1.06	609	22.34
Ecuador	29	1.06	638	23.4
Egypt	29	1.06	667	24.47
El Salvador	29	1.06	696	25.53
Estonia	29	1.06	725	26.6
Ethiopia	29	1.06	754	27.66
Finland	29	1.06	783	28.72
France	29	1.06	812	29.79
Georgia	29	1.06	841	30.85
Germany	29	1.06	870	31.91
Greece	29	1.06	899	32.98
Guatemala	29	1.06	928	34.04
Honduras	29	1.06	957	35.11
Hungary	29	1.06	986	36.17
Iceland	29	1.06	1015	37.23
India	29	1.06	1044	38.3
Indonesia	29	1.06	1073	39.36
Iran	29	1.06	1102	40.43
Ireland	29	1.06	1131	41.49

Israel	29	1.06	1160	42.55
Italy	29	1.06	1189	43.62
Jamaica	29	1.06	1218	44.68
Japan	29	1.06	1247	45.74
Jordan	29	1.06	1276	46.81
Kazakhstan	29	1.06	1305	47.87
Kuwait	29	1.06	1334	48.94
Kyrgyzstan	29	1.06	1363	50
Lao PDR	29	1.06	1392	51.06
Latvia	29	1.06	1421	52.13
Lesotho	29	1.06	1450	53.19
Lithuania	29	1.06	1479	54.26
Madagascar	29	1.06	1508	55.32
Malaysia	29	1.06	1537	56.38
Mauritius	29	1.06	1566	57.45
Mexico	29	1.06	1595	58.51
Mongolia	29	1.06	1624	59.57
Morocco	29	1.06	1653	60.64
Mozambique	29	1.06	1682	61.7
Netherlands	29	1.06	1711	62.77
New Zealand	29	1.06	1740	63.83
Nicaragua	29	1.06	1769	64.89
Norway	29	1.06	1798	65.96
Pakistan	29	1.06	1827	67.02
Panama	29	1.06	1856	68.09
Paraguay	29	1.06	1885	69.15
Peru	29	1.06	1914	70.21
Philippines	29	1.06	1943	71.28
Poland	29	1.06	1972	72.34
Portugal	29	1.06	2001	73.4
Romania	29	1.06	2030	74.47
Russia	29	1.06	2059	75.53
Saudi Arabia	29	1.06	2088	76.6
Senegal	29	1.06	2117	77.66
Singapore	29	1.06	2146	78.72
Slovakia	29	1.06	2175	79.79
Slovenia	29	1.06	2204	80.85
South Africa	29	1.06	2233	81.91
Spain	29	1.06	2262	82.98
Sri Lanka	29	1.06	2291	84.04
Sudan	29	1.06	2320	85.11
Sweden	29	1.06	2349	86.17
Switzerland	29	1.06	2378	87.23
Tajikistan	29	1.06	2407	88.3
Thailand	29	1.06	2436	89.36
Trinidad	29	1.06	2465	90.43

Tunisia	29	1.06	2494	91.49
Turkey	29	1.06	2523	92.55
Uganda	29	1.06	2552	93.62
Ukraine	29	1.06	2581	94.68
United Kingdom	29	1.06	2610	95.74
United States	29	1.06	2639	96.81
Uruguay	29	1.06	2668	97.87
Vietnam	29	1.06	2697	98.94
Zambia	29	1.06	2726	100
Total	2726	100	2726	100

Appendix A2

Descriptive Statistics for EO

	Included observations: 2104		
COUNTRY	Mean	Std. Dev.	Obs.
Algeria	0.135596	0.265095	26
Argentina	-0.288736	0.144867	29
Armenia	-0.782242	0.530441	17
Australia	0.515418	0.261271	29
Austria	0.581031	0.406352	29
Azerbaijan	0.555941	0.783486	14
Belgium	1.385220	0.322022	7
Bolivia	-0.546777	0.172898	29
Botswana	0.499491	0.176951	29
Brazil	-0.228594	0.111439	29
Bulgaria	-0.039478	0.429515	19
Burkina Faso	-1.068832	0.126717	29
Cambodia	-0.823717	0.415277	16
Canada	0.642743	0.307192	29
Chile	0.038376	0.280050	29
China	0.217769	0.448892	27
Colombia	-0.447046	0.156813	29
Costa Rica	-0.222616	0.212063	26
Croatia	0.116885	0.318999	17
Czech Republic	0.672005	0.222416	16
Denmark	0.847821	0.377614	19
Ecuador	-0.445752	0.153160	29
Egypt	-0.393287	0.153284	29
El Salvador	-0.705425	0.104346	19
Estonia	0.778638	0.380050	14
Ethiopia	-1.195017	0.266893	17
Finland	0.801849	0.500840	29
France	0.369015	0.163627	29
Georgia	-0.341992	0.289590	12
Germany	0.733587	0.216220	18
Greece	-0.004823	0.079739	4
Guatemala	-0.608521	0.039498	8
Honduras	-0.363536	0.262040	29
Hungary	0.517664	0.585536	19
Iceland	0.911716	0.492789	12
India	-0.488853	0.300525	29
Indonesia	-0.183038	0.120354	28
Iran	-0.154240	0.359301	26
Ireland	2.260473	0.637415	14
Italy	0.172887	0.118892	19
Jamaica	0.055483	0.049258	12
Japan	1.033376	0.156542	15
Jordan	-0.220878	0.252053	29
Kazakhstan	0.139101	0.373210	17
Kuwait	-0.009053	0.348591	24
Kyrgyzstan	-0.895551	0.190586	16
Lao PDR	-0.767669	0.387663	9
Latvia	0.113633	0.277287	17
Lesotho	-1.091281	0.625161	24
Lithuania	0.043892	0.257015	16
Madagascar	-0.942977	0.335098	28
Malaysia	0.616733	0.415238	29
Mauritius	-0.023733	0.203019	29
Mongolia	-0.172632	0.423319	19
Morocco	-0.298779	0.207597	29

Mozambique	-1.026571	0.439233	29
Netherlands	0.918651	0.302818	29
New Zealand	0.362130	0.210891	29
Nicaragua	-0.527505	0.164643	15
Norway	0.682855	0.260035	29
Pakistan	-0.833988	0.143632	29
Panama	0.258240	0.305027	29
Paraguay	-0.233887	0.059324	18
Peru	-0.335064	0.215979	23
Philippines	-0.407949	0.140133	29
Poland	-0.023373	0.205934	19
Portugal	0.129687	0.129530	14
Romania	-0.260652	0.238368	19
Russia	0.190631	0.185548	17
Saudi Arabia	0.082151	0.368392	29
Senegal	-0.643175	0.164668	29
Singapore	2.460334	0.806848	29
Slovakia	0.521963	0.170390	15
Slovenia	0.564983	0.289088	17
South Africa	-0.059576	0.148311	29
Spain	0.381475	0.233719	14
Sri Lanka	-0.498184	0.155048	29
Sudan	-1.016779	0.359839	29
Sweden	1.039952	0.456176	29
Switzerland	1.356382	0.271049	19
Tajikistan	-0.733471	0.265241	17
Thailand	0.192612	0.324743	29
Trinidad and Tobago	0.263573	0.354735	25
Tunisia	-0.097703	0.165411	29
Turkey	-0.435310	0.255043	29
Uganda	-1.127459	0.401596	23
Ukraine	0.164700	0.122166	17
United Kingdom	0.527313	0.182256	19
United States	0.787453	0.207759	29
Uruguay	-0.444616	0.184504	26
Vietnam	0.044960	0.431899	16
Zambia	-0.590315	0.226897	29
All	6.75E-18	0.735403	2104

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