CRANFIELD UNIVERSITY

IMRAN ZAWWAR

THE ROLE OF ENTREPRENEURIAL ACTIVITY IN ECONOMIC CATCH-UP

SCHOOL OF MANAGEMENT

PhD THESIS
Academic Year: 2013 - 2017

Supervisors:
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ABSTRACT

According to an estimate, in the year 1820, the difference in per capita income between the richest and the poorest country was no more than 3:1. However, with the industrial revolution, some countries experienced a significant shift in their economic growth and the gap in per capita income between the countries started to widen up. This process resulted in increasing global inequality as some countries progressed rapidly, while others remained behind and could not catch-up with the developed world. Nevertheless, with the increase in productivity given the rapid advances in technology, the developing countries have started to catch-up and most of them are growing faster than their developed counterparts. The process of catching up by the individual countries implies a reduction in the gap in productivity and per capita income with the developed world and collectively if all the countries start to catch-up it is referred to as convergence.

The phenomenon of convergence has received much attention in the literature on economic development and the potential causes of convergence have intrigued several debates. The neoclassical growth theory provides the theoretical construct to explain this process of convergence and the role of capital, labour and technology is argued to be fundamental. In this regard, the basic premise of this research is that although technology is an important determinant for economic convergence, it cannot be implemented without the entrepreneurs in the economy. The role of entrepreneurial activity is considered to be significant in economic growth, but it has not been explored in the models of economic convergence. Utilising the GEM data on total entrepreneurial activity this PhD thesis addresses this gap and building on the economic development and entrepreneurial literature it explores the role of entrepreneurial activity in economic convergence under varying business contexts. More importantly, it tries to ascertain what type of entrepreneurial activity assists the catching up countries to progress and reduce their gap in productivity and income with the developed world.

As the first step in this research, a systematic review of the literature was conducted resulting in a theoretical framework which uncovered the gaps in the

existing knowledge. This informed the respective research questions and provided the design for the empirical research that followed. The first empirical paper showed that the impact of entrepreneurial activity in catching up economies, is only significant in the presence of a feedback loop, i.e. as improved entrepreneurial activity from one year feeds into another, helping the catching up countries to grow faster and reduce the gap in productivity and income with the higher incumbent economies. The second empirical paper showed that in the presence of a feedback loop it is only the opportunity entrepreneurial activity that has a significant impact in reducing the GDP gap, while necessity entrepreneurial activity is insignificant.

In a world which is characterised by resource constraints, the biggest public policy issue is effective utilisation of resources. To this end, this research has great insights for public policymakers who are interested in formulating policies for impactful entrepreneurship which can expedite the process of economic development. It shows the importance of entrepreneurial activity in economic catch-up, provides insights into entrepreneurial motivation and at the same time emphasise the value of a feedback loop.

Keywords:

Business Context, Entrepreneurial Activity, Economic Catch-up, Convergence, Opportunity Entrepreneurship, Necessity Entrepreneurship

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PhD is usually considered as a lonely journey, but this is something that I never experienced at Cranfield School of Management. I am grateful to the Cranfield community for making this journey a memorable experience for me. I would like

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As I write this acknowledgement, the sun of 2017 is setting down and with this sunset, the beautiful journey of my PhD is also coming to an end. Although, I will miss my PhD days, the beautiful memories I have made will always remain a part of my thoughts and I look forward to the dawn of the new beginning. I would like to conclude in the words of Sir Winston Churchill, ‘Now this is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning.’

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TEA	Total Entrepreneurial Activity
GEM	Global Entrepreneurship Monitor
GDP	Gross Domestic Product
ATC	Average Total Cost
MC	Marginal Cost
PWT	Penn World Tables
CPI	Corruption Perception Index
GMM	Generalised Method of Moments
2-SLS	Two Stage Least Squares

1 INTRODUCTION

During the 18th Century, Britain experienced a significant shift in economic growth due to its early idiosyncratic industrial revolution. They tried to maintain their hegemony by containing the reason for their improved economic well-being and keeping it a secret, but this could not last forever. Within a few years, the industrial revolution spread like a fire, and economies from Central Europe and America started to catch up with Britain (Gerschenkron, 1952). The business context as a result of economic catch up was defined by the process of industrialisation which marked widespread substitution of machinery for human labour. Before manufacturing had mostly been done by individuals using improvised tools or basic machines at their homes. The industrial revolution brought mechanisation, powered solutions and factories which lead to mass scale production and efficient operations. It ensured capital accumulation and massive savings which resulted in enhanced economic growth. Although capital stock and savings played a pivotal role in the economic development, the ensuing role of skilled labour effectively utilising these advances cannot be undermined (Barro, 2001; Glaeser et al., 2004; Lucas, 1988).

The renowned economists Adam Smith, Thomas Malthus, David Ricardo and Karl Marx all support this view in what is termed as the labour theory of value (Gordon, 1959). The central premise of this theory is that only labour (i.e. people) make and create value, machines or capital stock have a usage value, but alone they cannot create more value unless utilised as a means of production and creating new opportunities. This context shaped the literature on economic development and made the basis for neoclassical economics. Following this Solow (1956) in his seminal work proposed the model of economic growth based on the Cobb-Douglas production function and defined growth as a function of capital accumulation and growth in labour with technological innovation as an add-on.

In the intervening century as the newly industrialised economies in East Asia including Japan, Korea and Taiwan have successfully caught up with the industrial leaders, and countries like China and India have embarked on the path of catching up, the growth empirics relate this economic catch up to the

exponential progress in technology (Freeman, 1989; Lee, 2013; Mankiw, Romer and Weil, 1992). According to the neo-classical growth theory, technological transformation improves labour productivity, motivates savings and increases investments, resulting in a surge in real GDP which allows the incumbent country to grow and catch up with the developed world. Although there is very little disagreement about the importance of technological growth in economic development, it is how technology gets implemented that stimulates discussion in this thesis. Hence this thesis questions technological independence.

In line with the labour theory of value the underlying argument is that technology is just an enabler which augments the potential of enterprises and individuals. It is the entrepreneurs in an economy who carry and implement the technology serving as vanguards for economic growth and subsequent economic catch-up. However, the literature on economic development explains the differences in economic growth and income inequality predominantly on the basis of technological change, capital accumulation and increase in the workforce (Jones, 2013; Lucas, 1988; Romer, 1990; Solow, 1956, 1957). The central role that entrepreneurs play in the process of economic growth remains hidden in the neoclassical economics also termed as “orthodox economic theory” (Bhidé, 2000).

Since entrepreneurship is a heterogeneous phenomenon it is difficult to define what constitutes entrepreneurship and this will be explored further in the next section. However, recently, the role that the entrepreneurs play in the evolution of growth and productivity has regained the attention of the economists and efforts are being made for analysing entrepreneurship in the light of modern economic theory. Schumpeter (1934) is amongst the first few 19th century economists to acknowledge the fundamental role that entrepreneurs play in opportunity recognition, developing new industries and implementing the improved technology. He (Schumpeter) terms their activity as creative destruction of the weakening sectors of the economy, as advanced more efficient enterprises replace the weaker and less efficient ones. It is argued that this dynamic entry and exit of the entrepreneurs in the market generate subsequent economic

growth (Burke and van Stel, 2014; Parker, 2009). Hence, entrepreneurship spurs improvement in innovation and productivity and is considered as an essential source for creating jobs and enhancing economic growth (Acs et al., 2009; Agarwal, Audretsch and Sarkar, 2010; Aghion and Howitt, 1998; Wennekers and Thurik, 1999). It is referred to as the 'seedbed' of growth and innovation, and due to its atypical features, merits special attention and a niche focus in the study of economic development.

With the recent surge in the literature on entrepreneurship, its contribution to economic growth is widely established (Acs and Storey, 2004; Galindo and Méndez, 2014; Thurik et al., 2008; Wennekers et al., 2005); but it is still not known if this contribution is significant enough to allow the developing countries to catch up with the developed world. There is a gap in the literature as research conducted so far only measures the impact of entrepreneurship from a static perspective without accounting for the feedback effect from one year of entrepreneurial growth to another. Also, the contribution of entrepreneurship to economic growth has only been analysed in the individual country context, and researchers have not questioned how this compares collectively to other economies. To this end, it is also important to distinguish if it is the improved entrepreneurial activity that impacts economic growth, or is it the enhanced economic growth that creates more opportunities which sanction increased entrepreneurial activity in the economy. Finally, all the entrepreneurs are not the same; there are significant differences between those who pursue entrepreneurship to exploit an opportunity vs others who are forced into entrepreneurship as they do not have a better choice for work. Given these differences in entrepreneurial motivation, not all entrepreneurs have the same impact on economic growth and less is known how this affects the incumbent country's effort on economic catch-up. In this context, it is important for policymakers to know which type of entrepreneurial activity will have a positive impact in supporting economic catch-up. The dynamics of entrepreneurship may vary depending on the business context (defined as catching up and non-catching up countries), and whether this favours a particular type of entrepreneurial motivation has still not been investigated. Developing economies are marked with

higher rates of unemployment and lower per capita income, but at the same time, they are more advantaged as they move above in the path of economic catch-up developing higher value-added activities (Lee, 2013). How entrepreneurial motivation shapes this context, is a question that might be of interest for the policymakers.

This chapter discusses the brief rationale for conducting this research and serves to identify the theoretical underpinnings that form the foundation of this thesis. The next section outlines the literature background, followed by the section on research aim and the section on research methodology. Finally, the structure of the thesis is presented including the research questions, theoretical contribution and the corresponding chapters.

1.1 Literature Background

1.1.1 Evolution of entrepreneurship

According to Shane and Venkataraman (2000, p.218): 'the field of entrepreneurship [is] the scholarly examination of how, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated and exploited'. This definition precisely answers the debate on what constitutes entrepreneurship, is it the process of creating and running one's own firm or is it simply related to the 'entrepreneurial individual'. In essence, entrepreneurship comprises of both the process of discovery, evaluation and exploitation of opportunities, as well as the individual who discovers, evaluates and exploits these opportunities (Hitt et al., 2011). In order to understand the multilevel antecedents of entrepreneurship including the entrepreneurship process and the individual, it is important to explore the earlier knowledge in this field and how it relates to different disciplines.

The evolution of entrepreneurship as a field of research is a recent phenomenon although the function of entrepreneurship in itself is as old as the act of trade and exchange (Landström, Harirchi and Åström, 2012). The interest in entrepreneurship developed with the emergence of economic markets during the middle ages, it prompted the early researchers to explore the role

entrepreneurship plays in economic growth and resource allocation. Hence, the traditional model of entrepreneurship is based on the concept of demand and supply, it relates to the process of discovering entrepreneurial opportunity by exploiting areas where the demand for a product/service exceeds supply (Casson, 1982; Kihlstrom and Laffont, 1979) and once discovered it explores whether the opportunity is worth pursuing by comparing it with the opportunity costs of foregone activities that will be incurred if the idea is pursued further (Venkataraman, 1997).

In this process of opportunity discovery, one aspect is to focus on the entrepreneur, their characteristics, traits and behaviour, their prior knowledge necessary to identify an opportunity and their cognitive skills necessary to evaluate and compare different opportunities. This is a body of research that focuses on the micro-perspectives involving the characteristics of an entrepreneur as an individual. This research is developed mainly on the works of behavioural scientists from disciplines such as sociology and psychology. McClelland's (1961) seminal work titled ‘The Achieving Society’ is most influential in this respect. The question central to McClelland’s research is to explore: ‘Why do certain societies develop more dynamically than others?’ According to this research, entrepreneurs play an important role in the development of a society, and it is their need for achievement that is transformed into economic growth. McClelland’s research prompted the importance of personal qualities of an entrepreneur and became the basis for future research in this field. However, to ensure clear contribution to knowledge the scholarship in this thesis is not concerned with the micro-foundations of who is an entrepreneur it is rather the contribution of entrepreneurship to economic growth that this research aims to explore.

Second approach in entrepreneurship literature is to focus on aspects related to post discovery. What happens once an entrepreneur exploits an opportunity? After discovering an opportunity an entrepreneur acts and seeks resources to establish an entity, it is this process through which new firms come into existence. A substantial body of research focuses on this process of new firm creation.

Contributing to this domain is the research by Gartner (1988) and Vesper (1982) who view entrepreneurship as a set of activities leading to the creation of new organisations. This approach is promoted through the famous compilation of Gartner's (1988, 1990, 1993) work which changed the focus in entrepreneurship research from the characteristics of the entrepreneur to viewing the process-related aspects of entrepreneurship.

The process-based view of entrepreneurship research stems from the literature on Industrial Organisations (IO). In this regard, the open-system revolution in organisation theory made a generous contribution as it resulted in evolutionary models explaining a range of different phenomena from macro to micro aspects of an organisation (Campbell, 1965). The work of Nelson and Winter (1982) is most influential in this aspect as they examined evolutionary changes in an organisation in an attempt to answer how firms and industries change over time. Similarly, Aldrich (1979) developing on the work of Nelson and Winter (1982) argued that success and failure of the firm depend on the suitability of the environment in which they operate. He further established the conceptual framework explaining why and how new ventures develop based on the evolutionary approach to the new firm formation (Aldrich, 1999). While most of this research focused on external issues pertaining to an organisation, Penrose's (1959) work titled ‘The Theory of the Growth of the Firm’ contributed to the resource-based view purporting elements of an ‘internal’ approach necessary for organisational growth. Penrose (ibid) in her work viewed the firm as an administrative control unit comprising of several valuable resources, and she considered managerial capability (both administrative and entrepreneurial) as pivotal to organisational success.

All these aspects and views on entrepreneurship are very important in understanding an entrepreneur, however, much of this literature is prescriptive in nature and hence it is limited in its approach to support an overarching economic study due to the underlying differences in epistemological stance. Secondly since this thesis deals with the macroeconomic evaluation of the concept of convergence the underlying requirement is to evaluate entrepreneurship at a

similar macroeconomic footing which can allow a cross country comparison and make the interpretation of results more meaningful. To add further clarity to this statement, if the study was aimed at institutional catch up as opposed to economic catch up, the research would have focused on institutional entrepreneurship, in other words the argument is to compare likes with likes in order to generate valid findings and results.

To be more precise and to ensure clear contribution to knowledge, this research only deals with the macroeconomic evaluation of the entrepreneurial activity. The main interest in this thesis is to understand the elements of rent contribution associated with the role of an entrepreneur. In other words scholarship in this thesis is concerned with evaluating the returns from an entrepreneurial activity. In this regard since the study utilises the data on Total Entrepreneurial Activity (TEA) extracted from the Global Entrepreneurship Monitor (GEM) the distinction between the terminologies of an entrepreneur and entrepreneurship are very blurred. For the purpose of this study it is important to specify that the unit of analysis in this paper used to measure the contribution of entrepreneurial activity is actually the percentage of entrepreneurs between the ages 18 – 64 in an economy who are either a nascent entrepreneur or owner manager of a business.

Finally, to ensure clear understanding of research it is important to classify different strands of literature that form part of the body of knowledge to which this thesis aims to contribute. The body of knowledge in this thesis is carefully selected based on the research aims and objectives; it can be classified into two main disciplines, i.e. economic development and economic entrepreneurship. However, for the purpose of clarity, it is important to note that complete literature on economic development is also not part of this study just like complete literature on entrepreneurship is not part of this study. This research only delves into few growth theories which closely represent the concept of divergence and economic catch-up, and later in *Chapter 2*, it establishes a chronological understanding of the same. Likewise, as stated above entrepreneurship has been studied using many perspectives, but this thesis is only concerned with the economic aspects of entrepreneurial activity. Further to ensure clear understanding, it is important

to declare at the very outset that this research is rooted in the study of economics and the general parameters of this research are presented in the Venn diagram given below (Figure 1-1). It is the interaction (as shown in the Figure 1-1) between the literature on economic development and the economics of entrepreneurship where this thesis is positioned to address and make a contribution.

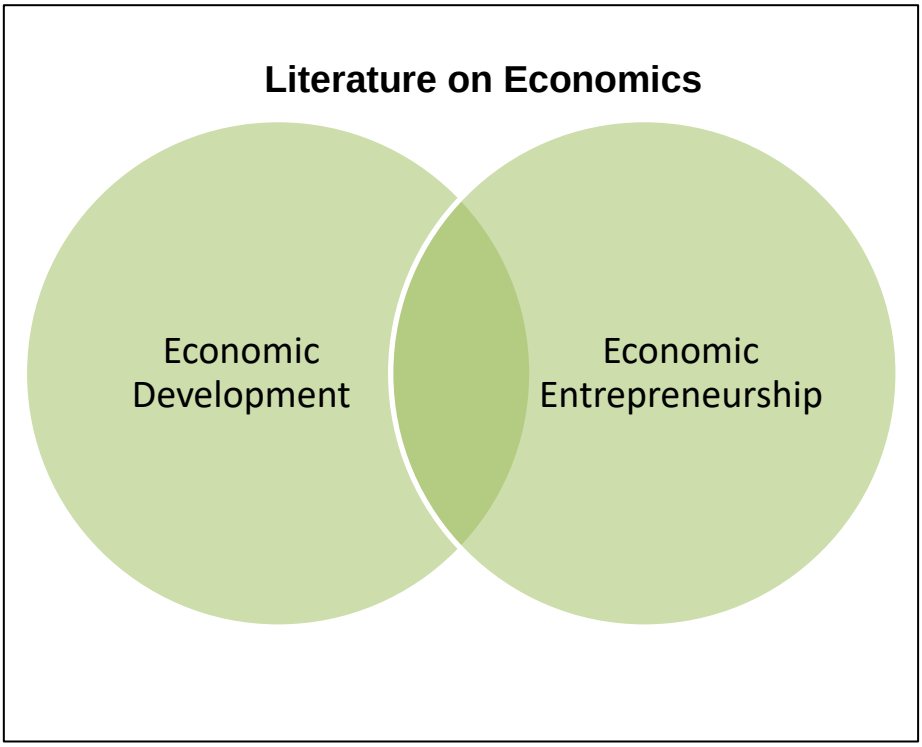

Figure 1-1 Venn diagram representing the body of knowledge

1.1.2 The emergence of entrepreneur in economic development

It builds upon the neoclassical growth theory and argues the role of entrepreneurship as a driver for economic catch-up. A question fundamental to this thesis then is to define who is an entrepreneur and why is he/she important in this development process. Who is an entrepreneur has remained at the heart of much discussion in the literature on entrepreneurship. However, difficulty in agreeing on an operational definition for an entrepreneur has rendered its role to remain absent in the literature on economic development. In this context let us first consider the question 'why do we need entrepreneurs?' This will lead us to explain who they are and why they are important in the development process.

Although recent literature holds entrepreneurship as a significant factor in economic growth, the theory of competition purports that there is no need for entrepreneurship at all (Leibenstein, 1968). To elaborate, let us assume a world of perfect competition, where quantity supplied for commodity X is in equilibrium with the quantity demanded at price P. If the price of commodity X is equal to the average total cost (ATC) and the marginal cost (MC), i.e. P = ATC = MC then there are no economic profits. In other words, if all inputs are equal to the outputs, and this information is available to everyone, there is no space for an entrepreneur in such a world, and therefore there is no entry into the markets. However, if the demand for commodity X increases, the price rises and this results in economic profits in the market. In the short-run, this increased demand is fulfilled by the existing suppliers but in the longer-run higher profits attract new entrants into the market. This creates an opening for the entrepreneur and the reason for its being (Kirzner, 1973). Hence, it implies that entrepreneurs are the agents of change who come into existence when profits in the market are above the equilibrium, and the economic historians support this view. The eighteenth-century economist Richard Cantillon (1730) defines an entrepreneur as a risk bearer, later Frank Knight (1921) developed on this concept and argued that entrepreneurial profits represent a reward for bearing this risk. According to the French economist, Jean-Baptise Say (1845) an entrepreneur owns and combines the factors of production to establish a market economy and serve as a communicator between the producers and consumers. The scholars of the neo-Austrian school like Israel Kirzner (1973) define an entrepreneur as an arbitrager, while for Joseph Schumpeter (1934) an entrepreneur is the epitome of innovation.

1.1.3 The concept of necessity and opportunity entrepreneurship

Since in the above discussion it is assumed that production function is clearly specified, markets are well established, prices are clearly defined, and all information is freely available and known to everyone, there is minimal risk or uncertainty, and therefore literature on entrepreneurship consider this type of market entry as routine entrepreneurship. Routine entrepreneurship is similar to necessity entrepreneurship where no new knowledge is created or applied, and

the sole motivation behind the necessity entrepreneurs is the reason that there is no other better choice for work. Based on the existing literature on knowledge as a conduit to economic growth (Audretsch and Kelibach, 2008), this thesis argues that routine or necessity entrepreneurs cannot be the ones to drive economic catch-up. This type of entrepreneurship only increases competition and rivalry in the market; firms compete on price and quantity while no new product is introduced (Block, J.H. et al., 2015). According to Schumpeter (1943, pg.83), 'the fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production of transportation, the new markets, the new forms of industrial organisation that capitalist enterprise creates …'. Based on this statement of Schumpeter this thesis aims to explore another type of entrepreneurship referred in this thesis as opportunity entrepreneurship. In contrast to necessity entrepreneurs, opportunity entrepreneurs are driven by an opportunity as opposed to finding no other option for work. The role of opportunity entrepreneurs in a society is not only to recognise existing opportunities but also to create new ones. They are responsible for introducing new products, bringing innovative ideas and along the lines of Schumpeterian entrepreneur disrupt the market. Since opportunity entrepreneurship entails creating new and novel approaches; they often end up exploring unchartered territories and establishing uncontested market spaces where demand and supply curve do not exist. In such cases the production function is not clearly defined, the markets do not operate or exist well, the ATC and MC curves are not known, there exists information asymmetry and prices are not established. This presents a lot of uncertainty and hence to be successful an opportunity entrepreneur must fill in market deficiencies, and ultimately this becomes the engine for economic growth.

1.1.4 The case for empirical investigation

Since entrepreneurship is argued to have a positive impact on economic growth this thesis aims to explore whether this is strong enough to support economic catch-up. It is important to realise that economic growth does not necessarily result in economic catch-up. While a country may show positive economic growth,

it does not mean that it is also on the path of economic catch-up. The phenomenon of economic catch-up implies a reduction in GDP gap vis-à-vis a developed economy (Fagerberg and Godinho, 2005). Hence, to be on the path of economic catch-up the incumbent country needs to have stronger economic growth as compared to the developed counterpart. Only when the rate of growth of GDP is higher than the leading economy, will it be able to reduce the GDP gap vis-à-vis a developed country, and it will be classified as a catching up economy. After exploring the role of entrepreneurial activity in economic catch-up, as a next step, this thesis bifurcates entrepreneurial activity into necessity and opportunity entrepreneurship. These two types of entrepreneurial motivation present divergent aspects and this thesis aims to explore how this distinction impacts economic catch-up. Overall this thesis presents an important public policy issue for those who are interested in impactful strategic entrepreneurship.

1.2 Aim and Research Objectives

1.2.1 Research aim

This thesis aims to explore the association between entrepreneurial activity and economic catch-up. In doing so it provides greater insights for policymakers and unearths the varied roles that entrepreneurship plays in economic growth deepening our understanding of this largely unexplored area of literature.

1.2.2 Research objectives

The central theme of this thesis is to present the case for entrepreneurship and to highlight its contribution to economic catch-up. In doing so, it challenges the accepted norms and contemporary research on economic growth. To achieve the above aim of research, this thesis divides it into three distinct research objectives. The first objective guides the development of the systematic review of literature. While the remaining two objectives are based on the findings from the systematic review of literature. Each of these objectives contribute to the overall research aim and are explored in a separate chapter as part of this thesis.

Objective 1: to theoretically establish the role of entrepreneurial activity in varying business contexts defined by economic catch up, divergence and non-catch up

Objective 2: to empirically test the role of entrepreneurial activity in facilitating economic catch up amongst catching up and non-catching up economies

Objective 3: to provide critical evaluation of different types of entrepreneurial motivation and how it impacts the efforts of economic catch up amongst catching up and non-catching up economies

See Figure 1-2 for a graphical summary of these objectives and how these relate to different chapters in this thesis.

1.3 Philosophical Orientation and Methodology

This research is grounded in the realms of economic growth and its interaction with entrepreneurial activity. As the study deals with measurement and causality, it holds an empirical orientation, and from a methodological standpoint, it is expected to conform to a logical positivist stance. The logic positivism as an epistemology provides rigorously constructed scientific methodology to address the research aims and objectives of this study. Although positivist analysis is a dominant aspect of economic studies (Caldwell, 1980), the juxtaposition of entrepreneurial activity in this research is more challenging to rationalise. Since entrepreneurship is a heterogeneous phenomenon, the difficulty in measuring the role of entrepreneurial activity adds to the nuances of this debate and raises questions on the methodological approach adopted in this study. This section aims to justify the epistemological position first by examining the choice of methodologies and later by defending the philosophical stance adopted in this thesis.

The term *methodology* is synonymous with the word methods, and it implies defining the technical procedures in a study. It often refers to the philosophical approach or more simply an investigation into the reasoning of thought, concepts and theories. In the discipline of economics:

> *"methodology is concerned with whether the claims of economists are reliable and true and how one can judge whether they are reliable and true; and is concerned with whether the practices of*

> *economics lead to conclusions that one ought to rely on or to believe"* (Hausman, 1992, p.264).

Methodology in economics can hence be understood as a theory of theories at a meta-level or as a '*philosophy of science applied to economics*' (Blaug, 1980). It is a study of theoretical constructs and its relationship with the actual outcomes. There are five prominent methodologies that have been extensively applied in economics and these include positivist economics, logical positivism, scientific realism, priorism, conversation and rhetoric (ibid). Table 1-1 below provides a basic distinction between these methodologies:

Table 1-1 Different methodologies in economics

	Philosophical Stance	Source of Knowledge	Outcome
Positive economics (Instrumentalism)	Provides theory or hypothesis about phenomena not yet observed	Deals with human introspection as a source of knowledge	Theory is a means to an end and the end is reliable predictive analysis
Logical Positivism	Entails systematic reduction of knowledge to logical and scientific foundations	Only meaningful statements (with observational evidence) acceptable source of knowledge	Rejects the use of speculation and principles of metaphysics
Scientific Realism	An inquiry into the relationship between cause and effect	Reason based on definitions and general axioms as a	True reflection of the real world independent of human thought.

		source of knowledge	Not exclusively empiricist methodology
Priorism	Economic inquiry into improving human social interaction	Reason as the primary source of knowledge, while observation as secondary	Does not support quantitative predictions; hypothesis testing is secondary. Often seen as an unscientific approach
Conversation and Rhetoric	Aim social self-understanding. Concerns with the structure of relationships and communication within the community of scholars	Writings of economists considered as the primary source of knowledge	Assume economics as a historical and not a predictive science

Given the above distinction between various methodological approaches, logical positivism seems to be the most suitable approach to support this analysis and this selection is also in accordance with the previous research on this subject. The logical positivism in this study lays an epistemic foundation where the philosophy is logical analysis, and the subject matter is empirical or positivist science (Kaplan, 1968). However, the assertion that only meaningful statements can be accorded the status of knowledge restricts the application, and hence the approach is further bifurcated into two standpoints, i.e. *falsification* or

confirmation (Caldwell, 1980; Popper, 1959). The methodological standpoint of falsification asserts that theories and hypothesis are scientific if and only if the resulting predictions are falsifiable in a manner that they restrict certain acts from occurring (Blaug, 1980). However, the neoclassical economics has moved away from the standpoint of *falsification* towards *confirmation* which ascertains that empirical evidence supports the hypotheses only to some extent and if faced with empirical rejection it does not simply abandon the theory, rather it either repairs the theory or amends its scope (Caldwell, 1982). Considering the distinction between the two standpoints of *falsification* and *confirmation,* it is more appropriate to suggest that logical positivism with the weaker form of confirmation is the main methodology adopted in this thesis.

Here it is important to clarify another dimension which is central to this thesis, and it is to distinguish between the positive and normative aspects of this study. The general assumption implicit in our methodological stance as identified above is that the aim, objectives and contribution of this study are separable from the normative dimensions of economics. It is positive economics that is the subject of this research, and it is only with this clear distinction in mind that this research can be evaluated and analysed using the prescribed tools and criteria of the philosophy of science. The policy implications of this study should not confuse the readers as the study does not claim to make any explicit contribution to policy. The improved understanding and knowledge generated as part of this research may certainly have an implicit bearing on entrepreneurial policy, but this is not the main subject of this scientific study. To conclude in the words of David Hume who in the *Treatise of Human Nature* exclaimed that '*one cannot deduce ought from is*' lays a perfect watertight demarcation between the realm of descriptive statements and the realm of ethical pronouncement, prescriptions or norms to do something (Hume, 1739).

Finally, it is important to establish a clear philosophical disposition on entrepreneurial activity and present a distinct understanding of how it is viewed in this research. The history of entrepreneurial evolution presents a clear dichotomy with respect to the diverging epistemological backgrounds with one

emphasising on the centrality of the firm and the other on the role of an entrepreneur (Storey, 1994). It has been made prominent earlier in the *Section 1.1.1* that this research is only concerned with the quantitative analysis of the rent-generating mechanism attributed to the role of an entrepreneur. In this regard, the scholarship in this thesis believes that entrepreneurs are involved in both opportunity discovery and creation. In essence, it supports (Graud and Giuliani, 2013) narrative perspective on entrepreneurship which suggests that entrepreneurial journey is a dynamic process requiring continual adjustment by the involved actors and that entrepreneurial agency is concealed in these distributed efforts of the individual actors. This distinction helps in providing a clear epistemological stance which leads to a systematic evaluation of the desired criterion.

1.4 Research Design

This thesis consists of two empirical papers preceded by a systematic review of the literature. Following the protocol provided by Denyer & Tranfield (2008), the systematic review of the literature demonstrates the historical evolution of the literature on economic catch-up/divergence and the intricate boundaries where it overlaps the literature on entrepreneurship. It synthesises available research on the topic and concludes with a research question and conceptual research framework which is empirically tested in the following two papers. The empirical work in this research is drawn from the study of cross-sectional time-series data from Global Entrepreneurship Monitor (GEM) and several other macroeconomic databases including Penn World Tables (PWT) 8.1, World Development Indicators and World Economic Outlook. The first empirical paper consists of an unbalanced panel dataset of 47 countries from 2002 – 2014, i.e. over 13 years. The empirical model in this paper is developed based on the Cobb-Douglas production function and it investigates the role of total entrepreneurial activity in economic catch-up. The second empirical paper also consists of the same unbalanced panel dataset of 47 countries, but due to the limited availability of a few variables, it only includes data from 2002 – 2012, i.e. over 11 years. The empirical model in this paper is also developed based on the Cobb-Douglas

production function and this time it includes few additional variables to explore the impact of necessity and opportunity entrepreneurial motivation on economic catch up. Both the empirical chapters involve approaches to econometric modelling and modern statistical evaluation techniques to test the hypothesis. All empirical investigations and analysis are done using STATA 12.0

1.5 Thesis Structure

This thesis is based on Cranfield's new thesis guidelines and is presented in a 'paper format' as opposed to a conventional monograph style. The next three chapters in this thesis present papers 1 to 3 as described above and are written in a journal style article. The fifth chapter presents the overall conclusion and contribution to knowledge. A brief introduction to each chapter is appended below to present the research design and summarise the thesis structure.

Chapter 2 reviews the literature and forms journal paper 1. This chapter is based on the systematic review protocol and explores the literature on economic development and entrepreneurship to provide the conceptual research framework and research question that feeds into the later part of our research and is empirically evaluated.

Chapter 3 serves as the first empirical chapter and tests the hypothesis that entrepreneurial activity supports economic catch-up. This chapter augments the basic neoclassical growth model proposed by Solow (1956) to test the role of entrepreneurial activity. In doing so, it proves the concept of conditional convergence and also calculates the half-life in which the countries will be able to cover half the distance with respect to their more developed counterpart. This chapter studies the role of entrepreneurial activity in economic convergence based on a dynamic panel data model which incorporates a feedback loop that captures the effect from one year of entrepreneurial activity to another.

Chapter 4 presents the second empirical paper and divides entrepreneurial activity presented in the previous paper based on the entrepreneurial motivation of necessity and opportunity. It explores the role of opportunity vs necessity entrepreneurship in economic catch-up with the intent to inform policymakers to

have a clear distinction between the two when making entrepreneurial policy. This paper presents the importance of differentiating between the two types of entrepreneurship and also signifies the importance of business context.

Chapter 5 presents the overall summary of findings and highlights the contribution to knowledge. It sets the agenda for future research and highlights the limitations of the present work. It concludes with a section on personal reflections on the PhD journey.

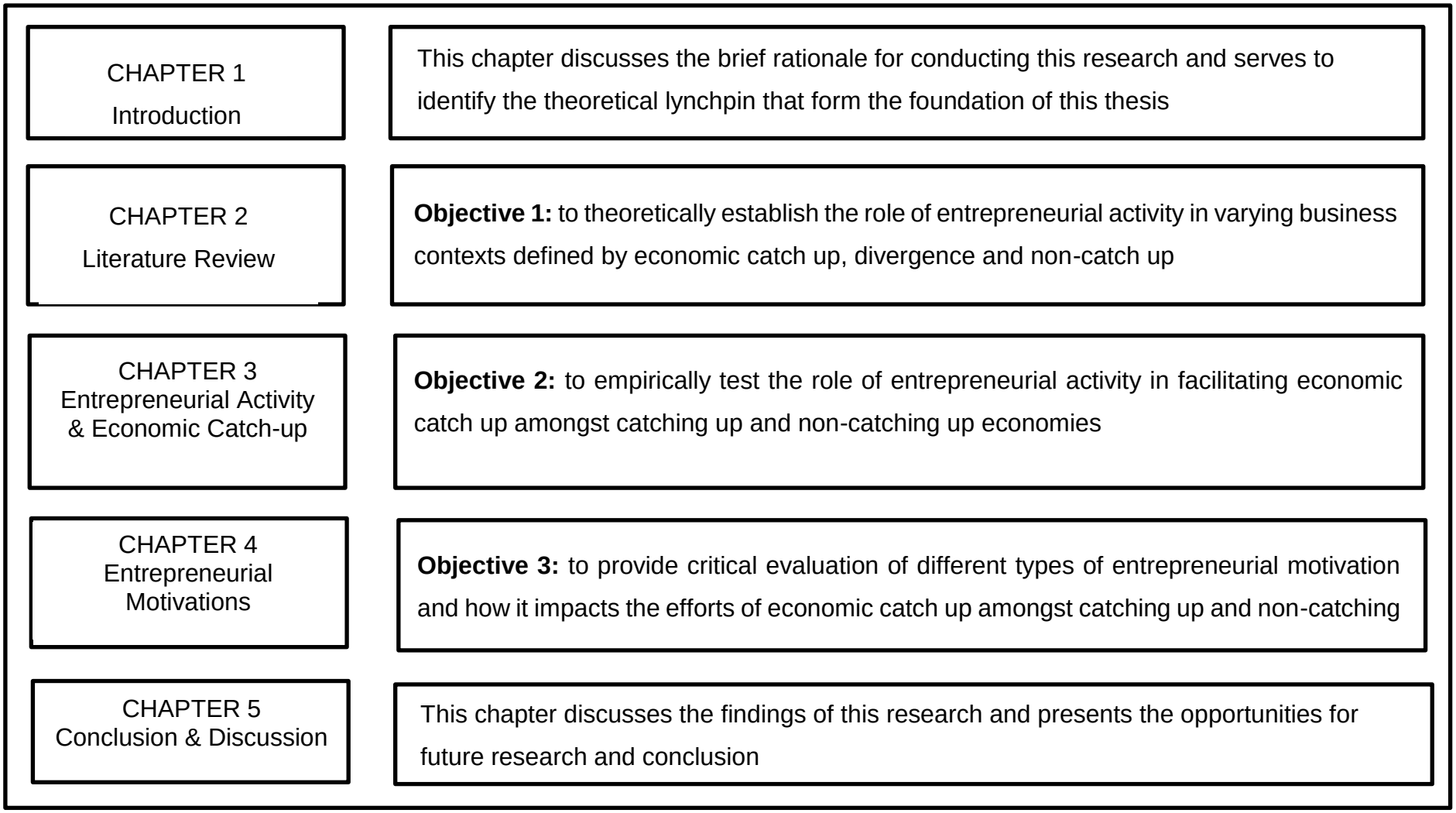

Figure 1-2 Summary of research objectives and corresponding chapters

1.6 Research Dissemination and Publication Plan

1.6.1 Working papers

Zawwar, I; Burke, A.E.; and Hussels, S
Business context and entrepreneurial performance: A Review of Literature,
Target Journal Small Business Economics

Zawwar, I; Burke, A.E; Belghitar, Y and Hussels, S
Does entrepreneurial activity generate economic catch-up?
Target Journal Small Business Economics

Zawwar, I; Burke, A.E; Belghitar, Y and Hussels, S
Economic Catch-up and the Importance of Entrepreneurial Motivation
Target Journal Strategic Entrepreneurship Journal

1.6.2 Conferences

Zawwar, I; Burke, A.E; Belghitar, Y and Hussels, S
Does entrepreneurial activity generate economic catch-up?
Accepted for XXXI RENT Conference, Lund, Sweden, November 15-17, 2017
(could not attend due to budget limitations)

Zawwar, I; Burke, A.E; Belghitar, Y and Hussels, S
Economic Catch-up and the Importance of Entrepreneurial Motivation
Target Journal Strategic Entrepreneurship Journal
Accepted for 6th REDETE Conference, Banja Luka, Republic of Srpska, Bosnia and Herzegovina, 13-15 April, 2018

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2 BUSINESS CONTEXT AND ENTREPRENEURIAL ACTIVITY: A SYSTEMATIC REVIEW OF LITERATURE

ABSTRACT

This paper attempts to explore the interrelationship between business context and entrepreneurial activity. With the recent surge in research on entrepreneurship and how it contributes to economic growth, there have only been a few attempts to synthesise entrepreneurial activity based on the catching-up or diverging economic behaviour of the countries. Defined as the business context in this paper, this diversity amongst countries regarding their divergent and convergent changes in productivity has a fundamental impact on entrepreneurial activity. In this regard, this review aims to highlight the value of considering these fields of research simultaneously and ascertaining how business context defined in terms of economic catch-up or divergence affect entrepreneurship and vice versa. This paper provides a rich understanding of this dynamic with a view to providing greater insights for policymakers, unearthing the varied roles that entrepreneurship can play in economic growth with intent to deepen our understanding of this largely unexplored area.

JEL Classification: L26; O11; O24; O32; O34; O47

Key Words: Business Context, Economic Catch-up, Divergence, Entrepreneurial Activity

2.1 Introduction

The increasing importance of dynamic industries (Audretsch, 1995) which entail a more prominent role for new and small firms (Audretsch et al., 2002) has resulted in entrepreneurship becoming increasingly significant for economic growth and employment creation (Thurik et al., 2008). It has also led to a surge in the research on entrepreneurship and there is a growing body of literature that defines the role of entrepreneurship in economic growth, job creation, innovation and market competitiveness (Acs and Storey, 2004; Thurik and Wennekers, 2004; van Stel et al., 2005; Wennekers et al., 2005; Galindo and Méndez, 2014). The impact of entrepreneurship is different under varying business contexts (Reynolds et al., 2002). This review is aimed at providing a deeper understanding of the role and contribution of entrepreneurship in the business contexts defined by catching up, non-catching up and diverging economies. Such a review requires the novelty of surveying and conducting a synthesis of two separate but related fields of research, namely entrepreneurship and economic catch-up/divergence. The benefit is to enable a better understanding of these currently discrete fields with a view to providing a framework to enable a more holistic and interdisciplinary understanding of this important area of business performance and behaviour.

Ever since the World has moved towards industrialisation, there has been a growing body of research which suggests that developing countries grow faster than their developed counterparts (Abramovitz, 1990; Denison, 1967; Wolff, 1987). It is argued that levels of income and productivity between the developing and the leading economies have converged (Abramovitz, 1986; Baumol, 1986). This trend of convergence between the developing and the developed world has been termed as catching up. However, on the contrary, research also suggests that poorer less developed economies living below the subsistence level show slower growth thus conforming to the idea of divergence (DeLong, 1988; Dowrick and Nguyen, 1989).

Previous research on entrepreneurship has not considered this type of business context as a binding constraint on entrepreneurial activity. There is an absence

of empirical or theoretical literature which specifically discusses the impact of catching up or divergence on the role of an entrepreneur. Although the contribution of entrepreneurship to economic growth or development is widely celebrated (Acs et al., 2016, Capello and Lenzi, 2016; Martinez-Fierro, Biedma-Ferrer and Ruiz-Navarro, 2016; Naude, 2010), the underlying business context of economic catch-up/divergence in which this happens is not much stressed. In this endeavour, a question yet to be fully answered is whether economic catch-up is a cause of improved entrepreneurial activity or an effect. In other words, does catch-up lead to improved entrepreneurial activity or does entrepreneurial activity lead to catch-up and vice versa regarding divergence?

By placing 'business context' centrally and highlighting the differences in entrepreneurial activity, the objective of this paper and subsequently the review question, is to ascertain the relationship between catch-up/divergence and the entrepreneurial activity. It is important because, although research on business context is not new, the specific scenarios of catch-up and divergence have not been considered before in entrepreneurship research. While catch-up and divergence are fundamental to the theories of economic growth, they also serves an important role in defining the 'business context' that may have an impact on the entrepreneurial outcomes.

This review is fundamental to policymakers who establish enterprise policies aimed at promoting entrepreneurship and economic competitiveness to understand the differential impacts of the business context. We perform this review by demonstrating the historical evolution of the literature on economic catch-up/divergence and the intricate boundaries where it overlaps the literature on entrepreneurship. The next section presents our methodological construct, followed by the section on the literature of economic development and the role of entrepreneurship, segregated into two separate sections. The section on discussion and policy implications presents the conceptual framework highlighting three different business contexts (i.e. catching up, non-catching up and divergence) and the associated entrepreneurial activity. Finally, the last section summarises the results and highlights the areas for future research.

2.2 Methodological Framework

Our review of the literature commences with the view to ascertain entrepreneurial activity in different business contexts and for the purpose of this study, we classify them as catching-up, non-catching up and diverging economies. In order to arrive at the representative sample of the literature, in the first step, a number of keywords were extracted based on the definitions, labels and the description of the review context (see Table 2-1). These keywords were carefully chosen to limit the search in identifying the literature with an explicit interest in pertinent business contexts, rather than reviewing generic entrepreneurial and economic growth literature where business context may be inherent but does not play a part in the analyses and discussion. As represented in Table 2-1, the keywords were initially divided into two main categories, allowing for the distinguished representation of the two streams of literature that feed into our review. Later, the keywords in both the categories were combined to yield 32 (i.e. 4 x 8) concrete search strings. These search strings were then investigated using popular management databases including Business Source Complete (EBSCO) and Scopus.

Table 2-1 Search terms

Category A	Category B
Entrepreneur*	Economic Develop*
Entrepreneur* Performance	Economic Catch* up
Entrepreneur* Activity	Economic Convergence
Small Firm*	Economic Diverg*
	Emerging Econom*
	Economic Growth
	Recession*
	Business Cycle*

In conducting this review of the literature, we adopted a two-stage research approach. This provides a robust framework and a bespoke protocol for our intended analysis (see Figure 2-1). In the first stage we implement a systematic textual search, using the strings presented above and after adjusting for duplicate records, this results in 7,313 unique hits. For a literature review, it is common to retrieve even a larger number of unique hits in the first round. However, the above result is not entirely surprising, given that entrepreneurial activity and the

pertinent business context we are interested in, have not so frequently been considered together and this is precisely the gap this review aims to fill. Although standalone the two categories result in an extensive literature, the overlapping literature between the two categories is comparably small. Following, Denyer and Tranfield (2008) the systematic review protocol adopted in this paper entails a clear classification of the criteria for inclusion and exclusion of papers at the outset. The shortlisting from the resultant pool and its fine tuning helps in reducing the number of articles selected for their relevance. The criteria we adopt is the following:

(i) Only research relevant to different aspects of entrepreneurial contribution or impact is included such as economic growth, institutional impact or economic impact. Other studies based on pure managerial or behavioural aspects of entrepreneurship are not considered as part of this research. (ii) Only the economic development literature that feeds directly into entrepreneurial prosperity or is related to it is selected.

Based on the results of the systematic review we further decide to supplement it with the more traditional approach to research. In this stage, we first select important references from key studies appearing in the above review (i.e. backward snowballing) and later shortlist these references based on the citations (i.e. forward snowballing)[1] . This is done because the above review of literature reveals that some of the important work which could not be ignored was left out, primarily because it either appeared as a book (e.g. Kirzner, 1973) or a book chapter (e.g. Weiss, 1976) or published before the first year considered in our database (e.g. Solow, 1956) or missed for some other unknown reasons. In all, our search generates a sample of 138 works which are subsequently reviewed and referenced in this paper. Although, there may be some potentially relevant literature that we may have missed in this process of review, largely this list of references is representative of the work on entrepreneurial activity in varying

[1] For more details on backward and forward snowballing technique see Kitchenham, B. (2004). Procedures for performing systematic reviews. *Keele University, UK and National ICT Australia Ltd.,* **ISSN:1353-7776**.

business contexts, and these form the basis on which we make recommendations in this paper

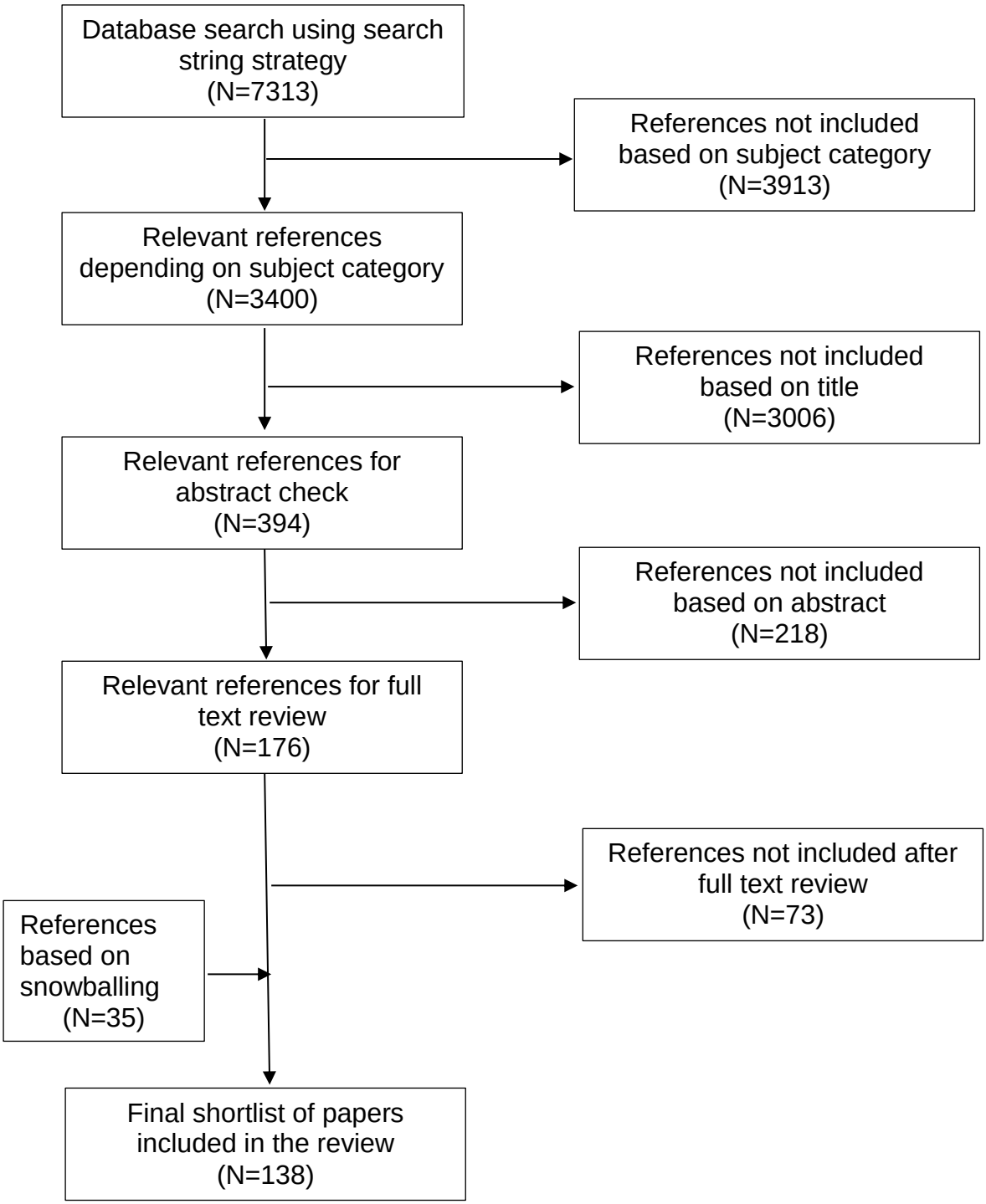

Figure 2-1 Flow diagram of research methodology

2.3 Economic Development

Understanding business context or the process of contemporary economic growth will generate incomplete results if we do not base our analysis on appropriate micro-foundations and the central forces that drive this process (Galor and Michalopoulos, 2012). We therefore begin by exploring the literature on economic development. However, the aim is to identify and explain only those models of economic growth which in subsequent sections form the basis of our discussion on entrepreneurship and the associated catching up/divergence.

A review of the literature reveals that activity in the study of economic development increased after the Second World War. The main interest was to develop the poor nations of the World, but the challenge was that mostly they were agrarian based economies lacking modern infrastructure and proper institutions. Therefore, the initial theories attribute economic growth to the growth in labour (i.e. increase in population) and capital accumulation measured in terms of savings. These initial models are based on Fel'dman's formula which attributes rate of growth in an economy to the ratio of annual savings and capital stock (Fel'dman, 1964).

The Harrod Domar growth model based on the Fel'dman's formula proposes that rate of growth in an economy is directly proportional to its investment in the previous year (Domar, 1946; Harrod, 1939). Likewise, Rostow's Stages of Growth assert that economic growth takeoff which occurs in various stages of varying lengths is the result of only 5 percent to 10 percent rise in national income (Rostow, 1960). Both these models although worked for the development of the countries from Europe (as they had proper institutions in place) but were less suited to countries from Asia, Africa and Latin America as they were either agrarian-based economies or lack developed countries' infrastructure and proper institutions. Both these theories emphasise on savings and investment which although are essential conditions for economic growth but are certainly not the only conditions for underdeveloped countries.

The realisation to transform the traditional economies with heavy subsistence on agriculture into modern industrialised economies led the economists to propose Structural Change Models. The two theories which gained enhanced recognition as representatives of the Structural Change Model are the ‘dual-sector model’ by W. Arthur Lewis and ‘patterns of development’ by Hollis B. Chenery (Chenery, 1975; Lewis, 1954). According to Lewis, the underdeveloped agrarian economies with surplus labour can be transformed into more productive industrialised economies if the labour is transitioned to the urbanised industrial sectors without affecting the productivity of agriculture. However, Chenery argues that different countries follow different trajectories and the pattern a particular country follows depends on its size, level of income, resources and comparative advantages relative to other nations. Although these models provide a structural framework, they do not address in complete totality why some countries have a different growth trajectory.

It was not until Solow (1956) presented his seminal work also known as Solow’s neoclassical growth model that reasons for differences in economic growth were comprehensively explored. In summary Solow’s model presents two important sources responsible for variation in output per worker, i.e. differences in capital per worker (this, in turn, depends on savings rate and growth of workforce) and technological progress. If we assume similar conditions for growth between the developing and the developed world, differences in capital per worker and technological progress are the two most important reasons to expect developing countries to catch-up by growing faster on average than the developed countries.

The work of Solow (1956) laid the foundation for an important concept termed as economic catch-up and gave a new direction to the literature on economic development. Although he did not emphasise the causes of technological enhancement and assumed this to be exogenously driven, linking this model with the literature on entrepreneurship creates a path where entrepreneurship can drive change in this variable and hence cause a change in economic growth.

2.3.1 Economic catch-up

Determining the process of economic growth and subsequently the process behind economic catch-up the growth models portray human capital and diffusion of technological enhancements in the forefront. These models and especially the works of Romer (1986; 1990) which will be discussed in the following section, highlight the importance of trade and economic integration for catch-up, particularly with an economy comprising high levels of human capital. The open economies are advantaged as they present a wider base of resources and access to a bigger market which helps them reduce the cost of production, fostering stronger competition-enhancing innovation and creativity. It helps the least developed countries to import capital goods, and the prevalence of trade in ideas helps them to imitate as opposed to innovating thus facilitating catch-up. This enlargement of the market either via trade or economic integration is viewed as a positive factor which accelerates economic catch-up (Burke, 1996).

The initial idea of economic catch-up can be traced back in literature to the work of Veblen (1915). However, this expression was coined by Gerschenkron (1952) as he described the postwar economic growth in Europe and how it caught up with the leading economy of the time the UK. He stressed the fact that growth for latecomers to development can be extremely rapid, they can accomplish in one generation what it took the pioneering nations to achieve in four. The idea was further developed by Abramovitz (1986) as he confirmed that being laggard in productivity represented a potential for rapid growth. Abramowitz used the famous historical compilation of time series data by Maddison (1982) describing the growth of labour productivity covering 16 leading industrialised economies during the period 1870 – 1979. Abramowitz established strong evidence showing the trends for convergence amongst the productivity levels of the industrialised economies. Baumol (1986) also studied the same data and further suggested the evidence for convergence of output per labour hour amongst the industrialised economies. However, they both excluded the poorer less developed countries which in their opinion showed no such trend.

Fagerberg and Godinho (2005) define catch-up as the ability to reduce the gap in productivity and income as compared to a leading more developed economy. Odagiri et al. (2010) define the same as a process through which latecomers to development narrow their gap in income and technology compared to a leading economy. Another closely defined terminology in literature is ‘convergence’. According to Abramovitz (1986) forces that accelerate the process of economic growth give rise to this tendency of economic convergence. Dowrick and Nguyen (1989) define it as a tendency of the poorer less developed countries to grow more rapidly than their developed and rich counterparts. Fagerberg and Godinho (2005) define it as an overall trend confirming a reduction in the gaps in productivity and income for the World as a whole, also exclaiming that convergence is a natural phenomenon if all countries below the frontier catch-up.

In essence economic catch-up represents the phenomenon of reducing the GDP gap vis-à-vis a leading economy. The GDP gap is an influential concept and is measured as a difference in per capita economic growth between the incumbent and the leading economy. The idea is to determine the level of economic growth, while the value of GDP or rate of growth of GDP alone may not offer enough information its difference with the leading economy offers a complete picture. It may be that a country has a positive rate of growth but is still classified as a diverging economy because of the increasing difference with the leading economy which grows at a higher rate. Notionally, we may define this as similar to the concept of speed and velocity in physics. While the rate of growth of GDP represents speed which is a scalar quantity, the GDP gap reflects velocity which is a vector quantity, and it determines the direction, i.e. whether a country is converging, diverging or remaining stationary.

2.3.2 Economic divergence

Given the rich consensus in the literature that productivity and per capita income in the industrialised economies have tended to converge (Abramovitz, 1986; Baumol, 1986; Dowrick and Nguyen, 1989; Gruen, 1986; Kormendi and Meguire, 1985), the outcome gets complicated if only some countries catch-up while the others fall behind and diverge. Until the dawn of the industrial revolution, there

were little differences in per capita income across countries. According to an estimate, in the year 1820 the difference in per capita income between the richest and the poorest country in the world was no more than 3:1, however, by 1998 this ratio increased to 20:1 (Maddison, 2001). These trends of divergence in per capita income and productivity imply that convergence is certainly not the only phenomenon as several developing countries failed to catch-up with the rapid rate of growth and increasingly high standards of living in the industrialised economies.

Although, according to the exogenous growth models, in the long run, all economies will ultimately converge to a steady state level, however, in the actual world the phenomenon of absolute convergence does not necessarily hold true, while some countries exhibit convergence there are others which show divergence. After his seminal work, Solow (1957) attempted to explain the growth in the US economy but rendered a large part as unexplained and attributed it to a residual. Solow defines this residual as the rate of per capita economic growth which is above the rate of per capita capital growth. This indicates that there are factors over and above the capital/labour ratio which contribute to the growth in output per capita. Although Solow's model clearly indicates labour-augmenting technology or the notion of technological innovation as the factor explaining this residual, unfortunately, this very variable that defines the potential path to economic growth is left unexplained and exogenous in the model.

Subsequent researchers attempted to explain this residual, and this led to the advent of endogenous growth theory by Romer (1986) and Lucas (1988) which also highlights the reasons for economic divergence. Romer (1986) and Lucas (1988) attribute growth to technological change, which is determined by the endogenous deliberation of agents purporting profit maximisation. Thus it defies the concept of exogenous technological change and instead purports that technological change is the result of intentional actions by the people reacting to market incentives (Romer, 1990). The model argues that technology is non-rivalrous but partially excludable, contrary to the general characteristics of public goods which are mostly non-rivalrous and non-excludable. The provision that

technology is partially excludable means that its access is not equal for all the countries and this can restrict the poorer less developed economies from catching-up; rather facilitating divergence as the developed countries utilising the advances in technology enhance their productivity by several folds.

Further, the model explicates growth and presents it as a function of four basic inputs, i.e. capital, labour, human capital and technology. It explains that growth may not be observed in the poor less developed economies, if they are continuously marred by low levels of human capital, thus setting them on the path of divergence. Romer (1990) defines human capital as a distinct measure of accumulated activities such as learning at school and skills acquired at the workplace. The model exclaims that an increase in human capital improves output, which encourages investment in physical capital and advances productivity. Thus anomalies in the levels of human capital across different countries can explain the differences in growth between them.

In addition Lucas (1990) observes that if Solow's model is assumed to be correct, then capital should flow swiftly from the rich to the poorer countries allowing them to quickly catch-up, but this does not happen in reality. He gives four important reasons which block this flow and ultimately prevents convergence and the poorer countries from catching up.

2.3.2.1 Differences in labour productivity

Taking the example of US and India as per the data on labour productivity, i.e. per person employed in 2013, workers in the US are twelve times more productive than the workers in India[2]. Given this difference, the returns on capital in India compared to the US are much smaller. This kills the incentive for the flow of investment from the rich to the poorer countries.

[2] US$ (converted to 2013 price level with updated 2005 EKS PPPs). Source: The Conference Board Total Economy Database™, January 2014, http://www.conference-board.org/data/economydatabase/

2.3.2.2 The absence of knowledge spillover

There are differences in the level of knowledge across countries and these differences result in varying levels of production technology (Audretsch and Keilbach, 2008). This impacts the ability of poorer less developed economies with lower levels of productivity to catch-up.

2.3.2.3 Political risk

Assuming that differences in the marginal product of capital lead to the flow of capital from the developed countries to the less developed ones. This would eventually lead to a phase where goods will flow in the opposite direction in the form of interest payments and return on investment. For this arrangement to be competitive, there needs to be an effective mechanism to control the risk of expropriation of profits by the governments in the less developed countries. This risk reduces the incentive for the developed economies to invest in the less developed countries. As a result, the cost of borrowing is exacerbated and poorer countries find it difficult to attract foreign investments.

2.3.2.4 Restrictions on capital inflows

The government in the less developed countries aim to restrict the capital inflows, this allows them higher returns on the limited capital available in the country and lower wages. Thus the government benefits from the monopoly position by maximising the profits, but this keeps the country underdeveloped and restricts it from catching up with the developed economies.

The foremost contribution of the endogenous growth theory is recognition of the fact that technological change is the result of endogenous deliberation by the agents purporting profit maximisation. However, this theory falls a little short in explaining that technological change has to be embodied in some kind of entrepreneurial activity before it is carried into practice and made effective. Although, the production function in the endogenous growth model presented by Romer (1986) and Lucas (1988) is the result of the aggregation of firms, however,

extreme aggregation has rendered the model to become incapable of explaining the micro-foundations that determine the role of entrepreneurs in the economic growth. For example, if we assume a world without the entrepreneurs, all the models of economic development will fail to justify economic growth.

Schmitz (1989) identified this gap and pioneered a growth model focusing on entrepreneurship. He emphasises the role of entrepreneurs as an imitator and argues that it is primarily the activities of an imitative entrepreneur that drives economic growth. His theory differs from the neoclassical and endogenous growth model based on three important aspects. First, the earlier models of economic growth as presented above are highly aggregative and ignore the institutional context in which the investment and consumption decisions are being made. In these models, the number of firms operating in an economy is of no importance (e.g. constant returns to scale) or even if they are (e.g. decreasing returns to scale) the numbers are predetermined and given. Second, the earlier models miss the importance of imitation and implementation of existing knowledge in promoting economic growth. Third, the earlier models disregard the new knowledge created as a result of production activities, i.e. learning by imitation and implementation. According to Leyden (2016) the supply of entrepreneurs is an important determinant of economic growth and increasing the number of entrepreneurs increases the level of output in an economy.

This leads us to an important premise, i.e. to determine the role of entrepreneurship in economic catch-up and divergence, the rest of the paper deals with this task. However, Aghion (2017) argues that economic growth and business development is not only an ‘economic phenomenon’ rather it is a process involving improvements on several dimensions including political and social systems, industry infrastructure, level of education and technological competence. Therefore, to conclude this section, we present an account of the factors other than entrepreneurship which stimulates economic catch-up and divergence as identified by the literature.

2.3.3 Role of technology

The more a country lags behind its technology frontier, the more it has to depend on imported technology, its imitation and foreign knowledge (Teece, 1976). This argument represents the central premise that one may derive by amalgamating the conclusions presented by Solow (1956), Romer (1986) and Schmitz (1989). As identified by these models, technology, implementation of knowledge and its imitation are important contributors to economic growth. Therefore, the phenomenon of importing technology, foreign knowledge and its imitation helps the laggards to leapfrog the earlier stages of technological growth and catch-up with the developed countries. According to Veblen (1915) changes in technology have altered the process of development. Previously it was embodied in persons and hence migration of the technical staff was a prerequisite for technological progress, today it is embodied in machines. Therefore, it is easily transmittable and has made catch-up relatively smoother. In his argument, Veblen assumes that technology transfer and its ease of availability are sufficient causes for initiating the catch-up. However, the prerequisites for catching-up in developing countries have significantly changed from the past; the manner in which they adapt the state-of-art modern technologies have severe implications on fostering growth (Radosevic, 1999). Technology although important is certainly not the only condition for economic growth; it has to be augmented by endogenous technological dynamism, superior domestic infrastructure, appropriate institutional setup and investment in education and training of the workforce (Dosi, Freeman and Fabiani, 1994). An important example can be that of India and Western Europe. Both the regions were equally placed during the 17th century in terms of growth per capita and access to technology. By the 18th century growth in Western Europe outpaced India as a result of superior infrastructure, more robust institutional setup, investments in education and training of the workforce which ultimately resulted in the industrial revolution (Maddison, 2001).

Technological progress and social capability complement each other and are not two separate alternatives for growth. Hence, catch-up is only strong when a country although lagging on the technology frontier is socially advanced

(Abramovitz, 1986). Technological opportunity is not the same for all the countries, the choice of technology depends on the level of education embodied in its nation (ibid). Abramovitz (1990) terms this phenomenon as “technological congruence” and exclaims that it depends on the scale of operations, capital intensity, market conditions, labour skills and raw materials. Therefore technological congruence limits the ability of a country from exploiting the full potential of a particular technology or its transfer.

This also explains why there are significant differences across countries that are catching-up compared to those which are diverging. It is not enough for new advanced technologies to be simply imported to have the desired effect on catch-up, the relevant factor endowments are also required to fuel their viability (Roy, 2009). According to Li and Ayres (2008), technological progress is of two types, one that consists of only improvements and upgrades to the existing products or processes, such progress has limited spillover effects, and its contribution to growth is minimal. The other is a radical innovation which is rarer but makes a greater contribution in the long run. To generate maximum progress from catch-up, it is paramount for the latecomers to have an educated, entrepreneurial workforce, with suitable infrastructure and institutional setup to target dynamic and progressive radical technologies which can add greater value to the economy.

2.3.4 Role of education, innovation, research and development

Knowledge created as a result of innovation, transfer of technology and research and development (R&D) is an important source for economic catch-up (Lucas, 1988). Investigating the catch-up process in the educationally advanced economies of Europe, Easterlin (1981) argues that reasons as to why some countries catch-up while others diverge lie in the amount of formal education attained by society. Similarly, Glaeser et al. (2004) purport that human capital is a more important source than institutions in the process of growth and economic development, and human capital accumulation further leads to institutional improvement. This argument supports why Romer (1990) accounts for human capital as one of the factors affecting growth in his endogenous model. As

described by him human capital is differentiated from labour, and it entails aspects such as formal education and on-the-job training. This is one of the reasons why growth in population does not necessarily mean growth in human capital. In essence, we cannot assume unlimited human capital accumulation and therefore it is a phenomenon characterised by limitations. The more a country is rich in its human capital, the greater is its potential to experience growth.

Similarly, as long as the determinants of the stock of knowledge and factors promoting a conducive environment for R&D are strong enough, the opportunities for innovation remain unlimited. The role of innovation (especially technological innovation) is well established in economics both in theory (Romer, 1986; Romer, 1990; Solow, 1956) and empirical research (Mansfield, 1972; Nadiri, 1993). According to Olsson (2005), there are two kinds of inherently different innovations, i.e. incremental innovation and radical innovation. Incremental innovation entails minor improvements to already existing products or services facilitating total factor productivity. While radical innovations instrumentally enhance technological opportunities and form the backbone for economic growth and development, researchers have increasingly used R&D expenditures or patent data to provide quantitative measures for innovation (Griliches, 1990; Mansfield, 1972). However, innovation is not only confined to R&D or patents. During most of the 19th Century, the UK dominated the World in the areas of economic prosperity and innovation, with a GDP per capita that was approximately fifty percent more than the average combined GDP of other leading economies. Both Germany and United States started to catch-up, and by the second half of the 19th Century, they had considerably reduced this lead of the UK. They did not accomplish this by simply imitating the technology; rather they developed innovative ways of production and distribution (Freeman and Louca, 2001; Freeman and Soete, 1997). More recently the progressively rapid catch-up by Japan is another example of organisational innovation and R&D that not only transformed the Japanese economy but also had spillover effects which contributed to productivity increases in the United States. Similarly, countries like Korea, Taiwan, and Singapore place greater importance on their system of education to facilitate innovation and technological catch-up and today form part

of the developed economies. Burke, FitzRoy and Nolan (2000) present evidence showing that education improves the performance of the entrepreneurs while negatively affecting the number that choose to become entrepreneurs but as a net impact 'less may mean more'. Thus more educated entrepreneurs become torchbearers of productivity and economic growth. These examples show that as education, innovation and R&D are not subject to diminishing returns due to depreciation; their flow from leaders to followers is the essence of catch-up (Abramovitz, 1986).

2.3.5 Role of trade and FDI

The endogenous growth theory presented by Romer (1986) and Lucas (1988) suggests that a nation's integration into World markets increases its rate of growth. Their arguments reflect an idea of the market where physical capital, human capital and technology can flow from the leading economies to the developing countries when there are no constraints or barriers. In general, the literature on the role of trade and FDI can be classified into three stages. The first stage relates to the growth models on trade and its impact. According to these theories open economies (i.e. those open to trade and foreign investment) are more likely to converge to higher levels of per capita income if there is a flow of capital from more developed rich countries to less developed low subsistence economies.

The second stage describes the effect of factor mobility, i.e. movement of capital and labour. According to Burke (1996), a country is likely to benefit more from the integration of a product market with a leading economy in comparison to the integration of a labour market or the flow of human capital as proposed by the growth models. In the case of an open economy, the negative spillovers resulting from the integration of labour markets and flow of human capital will outweigh the positive effects from the integration of product markets creating a net negative effect (ibid).

The last stage describes the concept of learning by doing, according to this argument the comparative advantage for trading should be determined by doing rather than by the predefined underlying attributes of a country. Krugman (1987)

describes that this results in knowledge spillovers and dynamic economies of scale which may benefit an economy.

Finally, Sachs and Warner (1995) also present evidence that developing countries that have been successful in catching up with the leading countries have also been economies focused on free trade. Openness to trade and foreign investment is at the heart of policies fostering growth and poverty reduction (Dollar and Kraay, 2002). The Irish 'economic miracle' and its subsequent economic catch-up is the most prominent example of the role of FDI quoted in the literature (Gray and Arrow, 1997; Harris, 2005). According to Acs, O'Gorman and Terjesen (2007), the economic miracle in Ireland is the result of attracting technology through FDI. Although in the research literature the role of trade and foreign investment remains unexplored regarding stimulating economic catch-up, Anyadike-Danes, Hart and Lenihan (2011, p.505) argue that "…the policy of attracting inward FDI from multinational enterprises impacts on indigenous entrepreneurial activity." The research on the UK by Burke, Görg and Hanley (2008), concurs finding that FDI has a negative effect on the survival of indigenous entrepreneurship in more dynamic entrepreneurial markets. However, as per our understanding researchers have not yet explored the part FDI plays in the import of foreign entrepreneurship or even entrepreneurship embedded in a business eco-system, i.e. importing the business firm level infrastructure necessary to make entrepreneurship thrive. Results from such a study may set a new direction in the literature on entrepreneurship, trade and FDI.

2.3.6 Role of government, institutions and property rights

A country's failure in catching-up with high levels of productivity is substantially corroborated with obstinate societal characteristics, inefficient political institutions and ineffective political integration on consensus favouring development (Abramovitz, 1986; Abramovitz, 1990). The term used in the literature to define these characteristics is social capability (Abramovitz, 1986; Ōkawa and Rosovsky, 1973). Countries characterised by weak social capability have inefficient human capital due to lack of education and technical skills, constraints embedded in institutional structures and cultural norms, insufficient capital

resources which are often misallocated and poor technological competence. It is these types of barriers that prompted (Baumol, 1986 p. 1080) to contend that "poorer less developed countries are still largely barred from the homogenization processes".

The economics of development recognises that there are several market imperfections in the less developed countries, such as pervasive market failures and large-scale information asymmetries, which holds them back from growth and maturity. Under these circumstances, governments have to play a greater role to facilitate market operations by market-friendly interventions which may include: improving physical and social infrastructure, fostering entrepreneurship and providing education. Historically, state (bureaucracy) has played a central role in facilitating catch-up by encouraging public/private partnerships, improving property rights, increasing the efforts in R&D, investing in the importation of technology and providing the infrastructure that facilitates entrepreneurship (Fagerberg and Godinho, 2005).

Of course, corruption can severely inflict a blow on the role of the government if officials compromise state benefits for private gains (Dutta and Sobel, 2016). Some examples may include bribery, nepotism, and misappropriation of public funds. Interestingly, evidence suggests that in poor less developed countries with weak government institutions, corruption may improve economic efficiency. As informal economic practices dominate the economic system in such countries, acts like bribery allows the entrepreneurs to avoid bureaucratic delays and translate this into massive gains (Leff, 1964). However, such gains and economic efficiency will not generate a net benefit to the country if it damages innovative practices, distorts resource allocation and promotes inequality which tends to be unfavourable for economic growth and development (Gould and Amaro-Reyes, 1983; Mauro, 1995; Murphy, Shleifer and Vishny, 1993).

Corruption is primarily a result of institutional weakness and institutions play an important part in facilitating economic catch-up. The literature on economic catch-up explicitly examines the role of institutions both in determining productivity and also the rate at which they contribute to economic growth (Acemoglu, Johnson

and Robinson, 2001; Bjornskov and Foss, 2016). According to North (1990), as institutions reduce the transaction costs and facilitate prospective gains, they enable growth and productivity. The concept of institutional catching up has been central to developing economies. As institutions grow and catch-up with developed markets, this is subsequently accompanied by growth in productivity and living standards (Fischer and Gelb, 1991). In this context, China which has adopted some healthy institutional practices (like free entry promoting competitive markets) has also disregarded others (e.g. intellectual property rights), and this has been cited as one of the few reasons why radical innovation remains absent in the country (Abrami, Kirby and McFarlan, 2014). Contrary to the conventional role of intellectual property rights, it may present a double-edged sword for entrepreneurship (see Burke and Fraser, 2012). While strong adherence to the intellectual property rights promotes innovation and generates new entrepreneurial opportunities, it limits access to innovation and technology which are seedbeds for entrepreneurial growth. However, overall it presents a net-positive impact on entrepreneurial activity (ibid). Hence, intellectual property rights play a central role in institutions, as they promote entrepreneurship and help attract investments.

In more abstract terms the literature on economics is concerned with measurement and causality, knowing that technology, human capital, property rights and governance infrastructure are important – a rather critical question is how firms and entrepreneurs interact with these institutions. It is primarily the entrepreneurs and firms that create wealth and innovation; not technology, governance infrastructure or educational system - they are just a means towards an end and not an end in themselves (Jones, 2013). However, here there is a gap in the literature on economic catch-up, as it presumptuously assumes the institutional infrastructure, technology and human capital as first order causes of economic growth (ibid). While the role of domestic enterprises and entrepreneurial ventures which serve as vanguards for fostering growth and productivity remains unexplored.

2.4 The Role of Entrepreneurship

There is no single uniformly accepted definition of entrepreneurship because it is a heterogeneous phenomenon and has been broadly interpreted in several different contexts (Audretsch et al., 2001). Fischer (2012) in his review of emerging theories in entrepreneurship divide the theoretical perspective explaining entrepreneurship behaviour in two main categories, the traditional model of entrepreneurial behaviour and the alternate theoretical perspective. The traditional model of entrepreneurial behaviour also classified as “emerging theoretical perspective” largely draws on economic theory to explain the entrepreneurial action and it is this perspective on entrepreneurship that this review is more concerned with.

Until recently entrepreneurship remained marginalised and missing from the empirical models in economic growth as identified by Bhidé (2000). Partially this has been because of the difficulty in empirically measuring the role of entrepreneurship and partly because it was the large companies that were assumed to be the driving force behind economic development (Johnson, 2007; Storey, 1994). In their review, Landström et al. (2012) present a detailed bibliographical analysis of entrepreneurial evolution and its associated literature; it explores how entrepreneurship transformed from being a topic in a few mainstream disciplines to be a promising field of research. However, for the purpose of this paper we do not aim to present a comprehensive account of entrepreneurship literature, rather our main focus is only on the role entrepreneurship plays in economic growth and subsequently economic catch-up.

Barreto (1989) classifies the role played by entrepreneurs in economic performance as fitting into four main categories of activities: dealing with uncertainty, coordination, arbitrage and innovation. Supporting this view Cantillon (1730) suggests that an entrepreneur is a person willing to buy inputs at a certain price while uncertain about the price customers would pay for the end products. This concept is further refined by Knight (1921), who argues that an entrepreneur is a person ready to take the risk, in return for the profit which represents a reward

for the unquantifiable and unmeasurable risk that they take. While, Say et al. (1845) defines an entrepreneur as a coordinator, who owns and combines the factors of production to establish a market economy and serves as a communicator between producers and consumers. For Kirzner (1973, p.16) entrepreneur is an arbitrager who finds and exploits profit opportunities: “the ‘pure’ entrepreneur observes the opportunity to sell something at a higher price than that at which he can buy it.” Schumpeter (1942) depicted entrepreneurs as innovators and recognises the key role they play in driving economic growth. In contrast, Schmitz (1989) focuses on the entrepreneur as an imitator and argues that it is imitation which drives economic growth as opposed to innovation.

In summary, the above definitions suggest different activities that entrepreneurs become part of and these all are valid in their own particular context. An entrepreneur may exploit profit opportunities or may create the opportunities; similarly, an entrepreneur may be an innovator or may act as an imitator. These heterogeneous characteristics add to the challenge of defining entrepreneurship with a single uniformly accepted definition, and this is further complicated by the fact that entrepreneurs may appear in different forms and entities (e.g. start-up, firm growth, survival, corporate venturing, freelance entrepreneurs etc.).

An alternate approach to defining entrepreneurship is to focus on the entrepreneurial process as opposed to focusing on the characteristics of the entrepreneur (Bygrave and Hofer, 1991). As a result, entrepreneurs are identified by their participation in the process and not by their heterogeneous characteristics. Adapting to this approach supports an a priori definition of entrepreneurship which is not possible if we define entrepreneurship focusing on the characteristics of an entrepreneur. Bygrave and Hofer (1991, p.14) define the entrepreneurial process as involving “all the functions, activities, and actions associated with the perceiving of opportunities and the creation of organisations to pursue them.” Hence, in simple words, entrepreneurship is about the creation of organisations and organising resources to achieve these ends. Consequently, the literature on establishing the role of entrepreneurship in the economy is divided into two main parts. The first being hugely descriptive and theoretical

because of the difficulty in measuring the role as noted above and the latter being empirical (Baumol, 1993; Lumpkin and Dess, 1996; Porter, 1990).

2.4.1 Theoretical and descriptive literature on entrepreneurship

In the spirit of this process view of entrepreneurship Kirzner (1973) and Davidsson (2003) reason that entrepreneurship is not merely a manifestation of new firms entering the market but also includes innovative entry of existing firms into new markets. Stemming from this view and based on extensive literature surveys on the relationship between entrepreneurship and economic growth the work of Wennekers and Thurik (1999) and Carree and Thurik (2003) highlights the contribution of entrepreneurship to economic growth vis-à-vis innovation, supporting change and enhancing competition in the marketplace.

An early account of the 20th Century economic history by Cipolla (1981) and Lazonick (1991) supports the central role of an entrepreneur in fostering long-term economic growth; showing that entrepreneurs can achieve this by appropriate allocation of resources, identifying new opportunities, adopting innovative production techniques, market penetration, enhancing competition and diversifying output. Indeed the role of entrepreneurship has been so important in economic development that Leff (1979) argues it has been conceptualised as a fourth factor of production. However, according to Weiss (1976), in the middle of 20th Century entrepreneurship lost its attention as economists increasingly focused on large-scale production as a source of increasing efficiency. Given theories on industrial evolution and evolutionary economics, the last two decades coupled with the revolution of knowledge and information technology has rejuvenated the link between entrepreneurship and economic growth (Jovanovic, 1982). In view of evolutionary economics, entrepreneurs are agents of change who motivate growth by generating new ideas and contending competitive firm selection (Audretsch, 1995).

In an effort to link entrepreneurship and economic growth Wennekers and Thurik (1999) attempt to synthesise wide strands of literature making a significant contribution by presenting an operational framework highlighting several roles of an entrepreneur in addition to being an innovator. They provide evidence that the

role of an entrepreneur includes not only contributing through innovation but also by initiating new start-ups and entering new markets. They show the relationship between different levels of entrepreneurial activity and its subsequent impact on economic growth. Finally, they conclude that other things remaining constant a rise in the number of entrepreneurs should increase the level of economic growth.

2.4.2 Empirical literature on entrepreneurship

This literature presents an interesting debate on the upsurge of new and small enterprises. It questions if the establishment of new and small enterprises is a misallocation of resources or if they are important contributors to economic growth and employment creation (Ferreira et al., 2017). An account of empirical research on job creation across several countries by Birch (1987), Davidsson et al. (1998) and Baldwin and Picot (1995) provides substantial evidence that small enterprises and nascent entrepreneurial ventures are a considerable source of new job creation in an economy. Reynolds et al. (1994) using the data on new firm formation in the United States establishes a clear association between the dynamics of firm birth and economic growth measured in terms of job creation. Similarly, Audretsch and Thurik (2000) study a causal relationship between the rate of change in unemployment caused by the change in business ownership and show that an increase in the number of entrepreneurs reduces the rate of unemployment. In another study, Davidsson et al. (1995) conclude that new firm formation is critical for regional economic development. These works determine that one of the most important factors by which entrepreneurship contributes to the rate of growth of GDP and economic development of the region is through facilitating job creation and reducing unemployment in the economy.

However, jobs created by nascent entrepreneurs and new ventures are often criticised as being lower in quality (Harrison, 1994). It is argued that although entrepreneurial start-ups create employment opportunities, yet because of their low rates of growth and survival their impact on reducing unemployment is limited (Fritsch and Mueller, 2004). Similarly, Foreman-Peck (1985) presents that new and small firms are ‘chaff in the wind of economic recession’ as opposed to being ‘seedbeds’ of growth and innovation. These contrasting pieces of evidence and

increasing differences between the researchers on the role of entrepreneurship and its value in creating jobs leads to further in-depth investigations.

This increased focus on the role of entrepreneurship has resulted in the concept of 'push' and 'pull' effect models of entrepreneurial activity. According to Gilad and Levine (1986), the element of 'push' represents necessity (such as caused by unemployment) because of which entrepreneurs are 'forced' to start a business, while, 'pull' represents individual's motivation for self-employment. This phenomenon is investigated by Evans and Leighton (1989a; 1990) who term 'push' as a "refugee" effect and Reynolds et al. (1994) who term it as a 'shopkeeper' effect, both studies show that unemployment leads to self-employment motivating entrepreneurial activity in an economy. Audretsch et al. (2001) further examines both 'push' and 'pull' effects and demonstrates that under the assumptions of a 'push' effect an increase in unemployment will subsequently increase the number of start-ups; conversely under the 'pull' effect any increase in the level of unemployment will have a negative impact on the number of entrepreneurial start-ups. However, the reasons for differences in entrepreneurship and its value in creating jobs is answered by van Stel and Storey (2004). They are able to show that although the 'push' effect combined with low barriers to entry may create employment opportunities, this does not contribute to economic growth and that it is the 'pull' effect which adds value to the economic growth and GDP subsequently. They further establish that "pull" effect is most likely to be found in developed countries, while 'push' effect is found in less developed low-income economies. An interesting example can be that of Canada as presented by Picot et al. (1998). They argue that it is the dominating 'pull' effect of entrepreneurship fostered by the motivation of people choosing to be self-employed that determined the success of the Canadian Labour market over the United States during the 1990's. As both markets started to diverge, income inequality and poverty became more of an issue in the US where job creation was determined by paid employment as compared to self-employment in Canada.

Acs et al. (2008) further developing on the above concept of 'push' and 'pull' classify entrepreneurial activities in two types, i.e. necessity-based entrepreneurship and opportunity entrepreneurship. According to them, necessity entrepreneurs are more prevalent in low-income countries, while opportunity entrepreneurship seems to be dominant in countries with high income. The opportunity entrepreneurs are more educated and have a significant impact on development, while the ones involved out of necessity do not have any significant effect (Acs and Varga, 2005).

Further, empirical research increasingly investigates the role of entrepreneurship in equilibrium and disequilibrium. Applying an error correction model on a data set comprising of 23 OECD countries, Carree et al. (2002) establishes an equilibrium rate of entrepreneurship for an economy as a function of the rate of economic growth. The idea of an equilibrium rate of entrepreneurship is based on the choice between entrepreneurship and wage-employment. The study confirms that any deviations from the equilibrium rate of entrepreneurship negatively affects the out per capita, i.e. GDP. Audretsch et al. (2002) also arrive at a similar result in their attempt to determine the impact of small business prevalence in an economy. Both the studies contend that there is a penalty in terms of foregone economic growth for any country deviating from the equilibrium level of entrepreneurship. Therefore, depending on the actual rate of entrepreneurial development being above or below the equilibrium level there exists a positive or negative relationship between the rate of entrepreneurial development and the rate of economic growth.

Recent attempts in empirical research developing on the works of Knight (1921), Schumpeter (1934), and Kirzner (1973) purport that firm entry and exit disrupt existing market equilibrium, and innovative entrepreneurial practices establish a new equilibrium. Burke and van Stel (2014) using the data from Dutch retail industry show that firm entry and exit is dependent on whether the markets are above (overshoot) or below (undershoot) their current carrying capacity, i.e. equilibrium number of firms that a market can sustain at a given point in time. According to them in an undershoot a lack of competition between firms

enhances market opportunities and strengthens firm survival (slower exit) thus driving the equilibrium by attracting new firms to the market. While during an overshoot competition induced by new firms cause the displacement of weak and unfit firms as an attempt to restore the equilibrium. Supporting this healthy role of competition in crowded markets, Burke and Hussels (2013) determine that more intense competition at the time of start-up eventually feeds through to an increase in the chances of long-term survival of the new ventures born in this tough environment.

Similarly, Acs et al. (2005) determine that in an endogenous growth setting entrepreneurship acts as a conduit to knowledge spillovers thereby contributing to economic growth. According to Carree et al. (2007), the total entrepreneurial activity (TEA) varies across different countries according to their output per capita and across regions within the country according to their level of economic development. These peculiar traits make entrepreneurship a strong factor in driving economic catch-up. However, despite this detailed account of theoretical and empirical literature Fritsch (2008) concludes that we still lack an accurate understanding of the ways in which entrepreneurship can contribute to economic growth, and it is this gap which this literature review attempts to address. Based on our above review Figure A 2-1 presents an integrated map and associated relationships between the different strands of literature.

2.5 Discussion and Policy Implications

It will be interesting to policymakers and researchers to confirm how higher levels of economic catch-up impact entrepreneurial activity and how over a longer time horizon the resulting entrepreneurial performance impacts the economy creating a feedback loop effect on the GDP gap. According to Lucas (1988) and Gollin (2008) for high-income economies (like the USA and Japan) as per capita income increases, the ratio of self-employed (a widely used indicator confirming entrepreneurial activity) to the salaried worker decreases. This is primarily because, in developed economies, individuals prefer to invest more time in acquiring professional skills through education rather than acquiring entrepreneurial talent (Fotopoulos, 2012). Therefore, the expectation is that

entrepreneurial opportunities remain stationary in high-income economies and entrepreneurship has no significant impact (Gollin, 2008; Kuznets, 1971).

According to Galor and Michalopoulos (2012) ‘convergence is triggered by the higher prevalence of individuals with entrepreneurial traits in lower income economies.’ This suggests that it is not only the entrepreneurial opportunity that leads to economic catch-up but also sufficient supply of entrepreneurs in the economy that ensures the process of economic growth. This is also because entrepreneurs not only exploit the available opportunities but also create them. Therefore, it is important to recognise the factors that determine the supply of entrepreneurs. Kihlstrom and Laffont (1979) present entrepreneurial ability, labour skills, risk averseness and access to capital as the most important factors influencing the choice of entrepreneurship. They particularly focus on risk aversion as a determinant distinguishing entrepreneurs from wage workers and argue that those who are less risk averse choose to become entrepreneurs while others prefer being employed.

Evans and Leighton (1989b) further develop this insight and report several key findings that encourage individuals’ to choose entrepreneurship over wage employment. According to them, entrepreneurship is independent of age or experience. However, people with low income and those unemployed are more likely to be self-employed. Contrary to this evidence is the findings of Evans and Jovanovic (1989) who show that economic wealth does not necessarily have to be negatively associated with self-employment. They show that individuals with greater assets have a higher probability of entering self-employment because in the presence of credit constraints they can use their wealth as collateral to secure loan finance for business start-ups.

However, Burke et al. (2000) argue that it is not enough to look at the number of self-employed as a measure of entrepreneurship. They contend that there is a difference between the factors that affect the quantity (numbers) of the entrepreneurs and those that determine the quality (performance). Therefore, it is essential to calculate the net effect of both these factors while measuring entrepreneurial impact, as the two may have to counter influence on each other,

e.g. unemployment or lower wage may induce an entrepreneurial push - increasing the number of self-employed, but at the same time it severely reduces the quality of the entrepreneurial pool. Similarly, higher education may reduce the number of self-employed (as higher educated workforce may prefer wage employment over risker self-employment), but it also improves the performance of those who choose to become entrepreneurs (ibid).

Schmitz's (1989) work on the role of imitation implies that a large GDP gap will create a greater pull effect into entrepreneurship as more opportunities exist for new ventures. In economies with a relatively high supply of latent well-able entrepreneurs - which we have shown above would depend on lack of finance constraints (more and better resourced new ventures) and high human capital (e.g. a highly educated workforce) and a supportive economic environment, (e.g. physical infrastructure, support industries, culture and political institutions) - one would expect a greater and more impactful entrepreneurial response to any given GDP gap. In this manner, a feedback effect occurs where a GDP gap pulls more people into entrepreneurship which in turn boosts economics performance thereby reducing the GDP gap. In short, entrepreneurship plays a key role in economic catch-up. The better resourced an economy is in terms of having a latent supply of capable entrepreneurs, the greater the speed at which one would expect economic convergence to occur for any given GDP gap. It could be argued that the greatest level of entrepreneurship of this kind is likely to exist in middle GDP per capita countries where entrepreneurial capability is likely to be good and where the GDP gap is significant. Correspondingly, the least developed poor economies whose education, wealth and infrastructural characteristics would lead to a limited supply of latent capable entrepreneurs, may be unable to respond effectively to any GDP gap opportunity and the resulting slower economic growth may push it onto a divergent economic growth path where the GDP gap widens. This slowing down of the process of economic growth has potential to create a vicious cycle of poverty which we call a divergence spiral.

There may also be a situation when a catching up economy experiences a negative shock due to the recession (limiting access to finance for entrepreneurs

and reducing the level of profit opportunities available to entrepreneurs), political unrest or natural disasters may reduce the entrepreneurial activity resulting in a negative impact leading to a divergence spiral. Similarly, the opposite may also be true as the result of a positive shock repositioning a less developed diverging economy onto the path of economic catch-up. Lee (2013) terms the former situation as a middle-income trap because of which many catching up economies fail to maintain their catch-up capacity. Drawing on this discussion, Figure 2-2 presents a conceptual framework of the relationship between economic catch-up, divergence and entrepreneurial activity.

From a policy perspective, it is important to know what factors determine economic catch-up and where the policymakers should ultimately focus their efforts in an attempt to enhance the process of economic growth. Concerning the relative significance of entrepreneurship in economic growth, it is particularly important for policymakers; especially given the scarce resources they have to choose whether the policy should be aimed at directly promoting entrepreneurship or whether it should be targeted to improve the infrastructure or economic environment where the entrepreneurs interact. As purported by Acs et al. (2005), in such circumstances policy cannot adopt a “one size fit all” approach. Each country is different as there are variations in the economic outlook, infrastructure, the competence of the local population and the regulatory environment. To improve the competitiveness of economies, the policy strategies have to be tailored according to the local context depending on the economic performance of the country and the role that entrepreneurship plays in its development.

2.6 Conclusion

We noted at the outset of the paper that the business context pertinent to economic catch-up/divergence had been ignored in the literature on entrepreneurial growth. Although, much attention is devoted to the economic outcomes and economic growth as a result of the entrepreneurial contributions. The literature has argued that entrepreneurial success is due to either the growth of GDP or reduced unemployment. This has produced mixed results at times

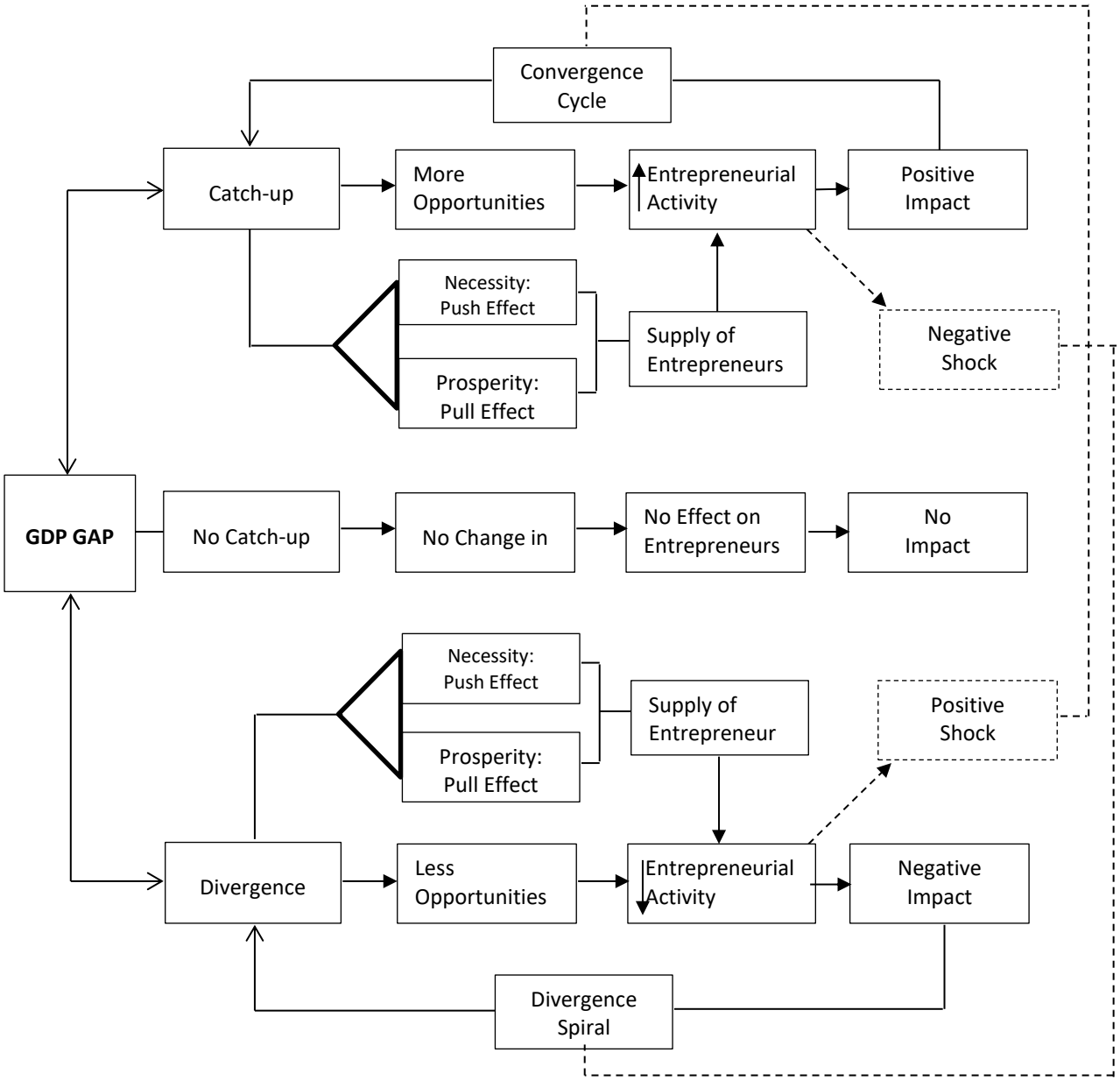

Figure 2-2 Conceptual framework of relationship between different business contexts and entrepreneurial activity

In the above framework gap in productivity amongst different countries result in varying business contexts, i.e. either it leads to economic catch-up or divergence, and if there is no (or less) GDP gap there is a condition of no-catch-up. The economic condition of catch-up creates more entrepreneurial opportunities and similarly impacts the necessity and prosperity levels of the entrepreneurs with positive impacts on the latter. The resultant 'push' and 'pull' factors determine the quality of the entrepreneurial pool, while more opportunities tend to increase entrepreneurial activity and the high quality of entrepreneurs enhance the performance. Increased entrepreneurial activity and high performance generate net positive impact, and this leads to a convergence cycle with the high performance of one cycle leading to the enhanced performance of the other. The convergence cycle increases the speed of catch-up, and this results in reducing the GDP gap. While, catch-up would normally lead to a positive impact if however, the economy observes a sudden shock or recession which increases the level of necessity based entrepreneurs it may decrease the quality of the entrepreneurial pool and reduce their performance and activity causing a negative shock. Likewise, a negative shock may lead to a divergence spiral, and the economy may fail to escape the quagmire ultimately giving vent to economic divergence and increasing the GDP gap. Conversely, the process works exactly opposite for the conditions of economic divergence.

showing entrepreneurship as an increased contributor to economic growth and reduced unemployment; while at other instances depicting entrepreneurial behaviour to be more like what Foreman-Peck (1985) describes as ‘chaff’ in the wind of economic recession and increased unemployment.

These contradictory results reflect the overlooked aspects of classifying business context into economic catch-up or divergence while studying entrepreneurial activity. This entails a far more involved process than direct relationships between the levels of GDP or the rate of growth of GDP. The GDP gap combined with ‘push’ and ‘pull’ effects control the quality and supply of entrepreneurs in the economy. As the economy catches-up, the opportunity pull effect does not necessarily have to decline monotonically, instead, increased entrepreneurial activity can boost innovation and knowledge spillovers further enhancing economic catch-up and reducing the GDP gap vis-à-vis a leading economy. By contrast, if the economies are below the subsistence level they may rather show divergence in economic growth, resulting in lower entrepreneurial capability among latent entrepreneurs and combined with a recession ‘push’ they may limit the impact of entrepreneurial activity resulting in a divergence spiral.

The idea of economic catch-up fostered by entrepreneurial activity is relatively a new concept. It is important for public policymakers who are interested in impactful entrepreneurship which can expedite the process of economic development. It also offers the option of a new field of research for scholars. The literature review and synthesis provided in this paper is intended both to highlight the merits of such research trajectory as well as to provide scholars with a survey style article which can act as both a resource and conceptual framework to facilitate their research. It presents a comprehensive and integrated review of the explicit and implicit interrelationships between business context and entrepreneurship. These implications in the existing body of knowledge have ramifications for our understanding of the economic development process and by consequence underscore the value of further research on the topic. In particular, establishing a greater knowledge of the impact of a short-run causation from economic growth and entrepreneurial activity and a long-term relationship

between entrepreneurial activity and performance with economic catch-up and divergence/convergence of GDP gaps.

Appendix A

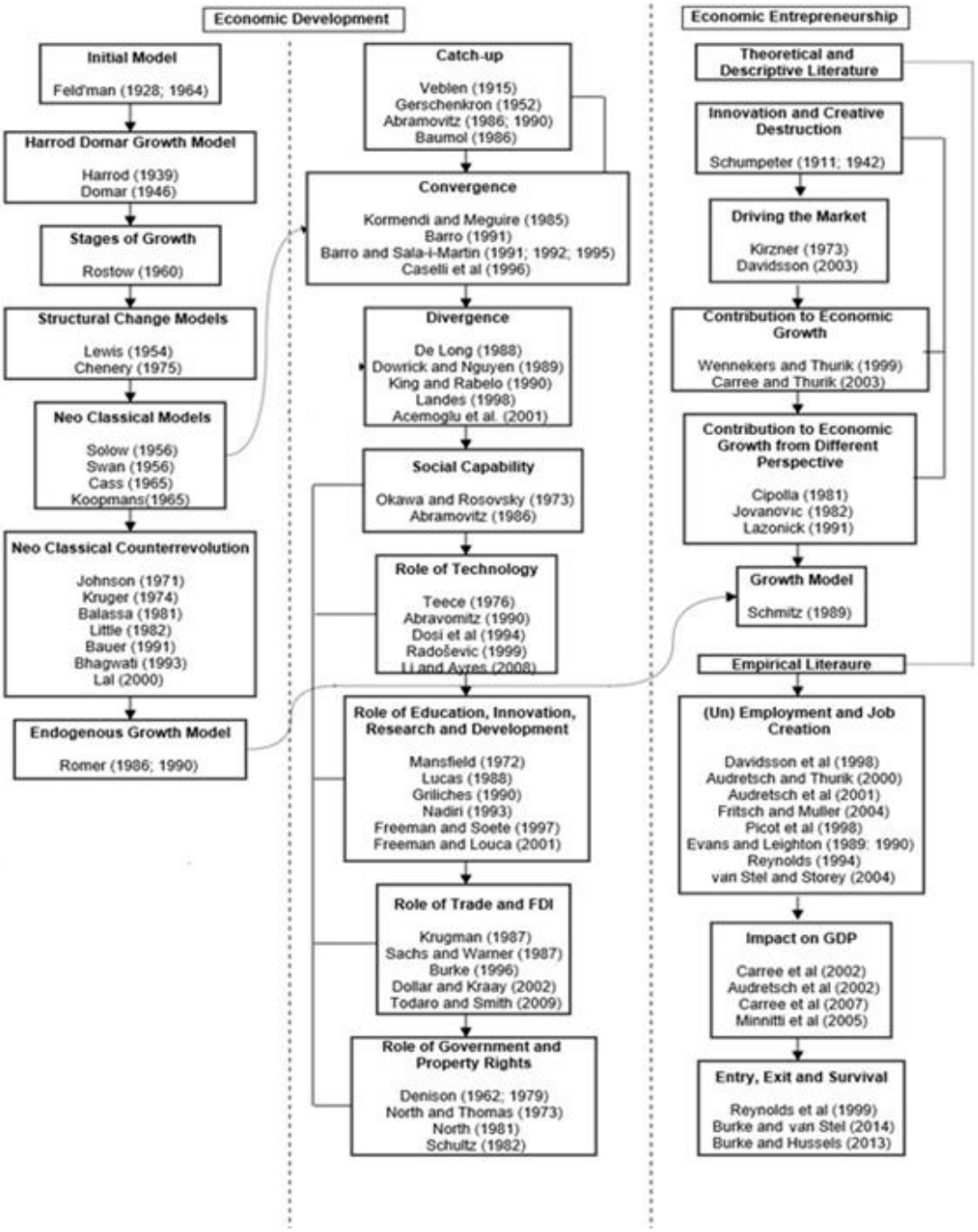

Figure A 2-1 Integrated map of literature economic development and entrepreneurship

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3 ENTREPRENEURSHIP AND ECONOMIC CONVERGENCE: EVIDENCE FROM GEM DATA

ABSTRACT

Entrepreneurship has increasingly been argued as an important factor contributing towards economic growth, however, surprisingly its role in economic convergence remains unexplored. Economic convergence is defined as the ability to reduce the gap in productivity and income as compared to a leading economy. This paper determines the unexplored association between entrepreneurship and economic convergence utilising the measure of GDP gap as opposed to the conventional measure of economic growth. Using cross-sectional time-series data from 47 countries participating in GEM 2002 – 2014, this paper ascertains that when considering the world as a whole, the contribution of entrepreneurship is only significant in the presence of a feedback loop, i.e. when resulting entrepreneurial performance from one year feeds into the next and so on. Furthermore, when considering the impact of a feedback loop, an increase in entrepreneurial activity helps to reduce GDP gap between the catching-up countries and the United States. Finally, the dataset testifies partial convergence hypothesis, and this helps us to determine the 'half-life' in which catching-up countries will cover half the distance in GDP Gap with respect to the United States.

JEL Classification: L26; O11; O24; O32; O34; O47

Key Words: Economic Development, Economic Catch-up, Entrepreneurial Performance

3.1 Introduction

During the past few decades as newly industrialised economies such as Singapore, Korea and Taiwan have started to catch-up with the developed world (Lee, 2013), there has been a surge in interest amongst the researchers as to what is causing this catch-up. This question was previously addressed in the seminal work of Solow (1956), which postulates that because of the diminishing returns on capital investments if countries are at different points relative to their balanced growth path, a lower GDP per capita economy would have higher rates of economic growth as compared to more developed economies. Inspired by this phenomenon, researchers have tried to explore if entrepreneurship has a role to play in the economic growth of a country (Acs et al., 2012; Acs, Desai and Hessels, 2008; Audretsch and Thurik, 2002; Carree et al., 2002; Wong, Ho and Autio, 2005). Although the main contribution of Solow's neoclassical growth model was the concept of economic convergence, interestingly there is no research on how entrepreneurship affects the process of convergence. While the process of economic convergence implies a reduction in the GDP gap vis-à-vis a leading economy, research in this field has increasingly focused on economic growth but not on the measure of GDP gap.

Our research question is to ascertain if entrepreneurial activity generates economic catch-up. Subsequently, the purpose of this paper is to elaborate on the idea of economic convergence using the measure of GDP gap, to introduce the phenomenon of the feedback loop and to establish the role of entrepreneurial activity in the process of economic catch-up. In doing so, it contributes to the wide literature on economic entrepreneurship with a view to providing greater insights for public policy and future research.

The second section of this paper describes the concept of economic convergence and introduces the missing link of entrepreneurial activity in this debate. The third section lays down the specifications for the empirical model on GDP gap in conjunction with the role of entrepreneurial activity and feedback loop in economic catch-up. This model is then estimated using a panel data set of 47 countries, and finally, the last section provides the conclusion. The results

indicate that entrepreneurial activity plays an important part in catching up economies by helping them reduce the GDP gap vis-à-vis a leading economy.

3.2 Economic Convergence and Entrepreneurship

3.2.1 The concept of economic convergence

The terms economic convergence and economic catch-up are often used interchangeably. While economic convergence is a collective phenomenon, economic catch-up is related to the efforts of an individual country. If all the countries below the average economic frontier start to catch-up, this overall trend of reduction in the gap between productivity and income is defined as economic convergence. While the ability of an individual country to reduce the gap in productivity and income as compared to a leading economy is defined as economic catch-up (Fagerberg and Godinho, 2006). This idea of economic catch-up can be traced back to the work of Veblen (1915). However, this expression was coined by Gerschenkron (1952) as he described postwar economic catch-up of Europe with the leading economy of the time, the UK. This idea was further conceptualised in the neo-classical growth models and the work of Solow (1956). Abramovitz (1986) and Baumol (1986) strengthened this concept as they showed using the famous compilation of time series data by Maddison (1982) that growth for latecomers to development can be extremely rapid.

To demonstrate the concept of economic catch-up and to provide our readers with the theoretical underpinnings, let us explain the work of Solow (1956) in a nutshell. Solow's model is widely popular in growth economics, particularly because of its parsimonious nature as it describes the whole economy in two simple equations. According to the first equation final output in an economy is the function of capital and subsequently growth in this output is the result of capital accumulation. The second equation shows that capital accumulation in itself depends on savings, which is a constant fraction of the final output, i.e. aggregate GDP.

Thus, an increase in savings implies an increase in investment and capital continues to grow until it reaches a steady state equilibrium after which it runs

into decreasing returns, i.e. the higher the increase in savings, the lower the marginal increase in output from increasing one unit of capital. At this point, capital depreciation equals marginal savings and the process of capital accumulation comes to a standstill, while the economy stops growing. Any subsequent growth in the economy is the result of technological progress and to generate long-term sustained economic growth technological progress is a must. Thus, Solow's model suggests that it is the rate of technological progress that has a permanent effect on the growth of output and all other changes only have a temporary *level effect*[3].

In summary Solow's model presents two important sources responsible for variation in final output, i.e. differences in capital per worker (this, in turn, depends on savings rate and growth of workforce) and technological progress. If we are to assume similar conditions for growth between the developing and the developed world, differences in capital per worker and technological progress are the two most important reasons to expect developing countries to catch-up by growing faster on average than the developed countries. To prove this concept let us assume Cobb-Douglas production function according to which $y = Ak^{\alpha}$, where y is output per worker, A represents technology which is labour augmenting and k is the available capital per worker. If all countries have access to the same technology, we can simply state $y = k^{\alpha}$ or $k = y^{\frac{1}{\alpha}}$ and therefore the marginal product of capital is as follows:

$$f'(y) = \alpha k^{\alpha-1} \quad \textbf{(3-1)}$$

Or,

$$f'(k) = \alpha y^{\frac{\alpha-1}{\alpha}} \quad \textbf{(3-2)}$$

[3] Here permanent effect refers to the shifting of growth curve, while temporal effect refers movement across the curve.

To demonstrate the impact of differences in capital per worker, let us consider two countries, i.e. US and India. As per the World Bank Development Indicators 2014, output in the US is nine times higher than the output in India[4]. Given this condition the marginal product in India is as follows:

$$[f'(k)]_{IN} = \alpha(y_{IN})^{\frac{\alpha-1}{\alpha}} \quad \textbf{(3-3)}$$

$$[f'(k)]_{IN} = \alpha(\frac{y_{US}}{9})^{\frac{\alpha-1}{\alpha}} \quad \textbf{(3-4)}$$

$$[f'(k)]_{IN} = (\frac{1}{9})^{\frac{\alpha-1}{\alpha}} \alpha(y_{US})^{\frac{\alpha-1}{\alpha}} \quad \textbf{(3-5)}$$

$$[f'(k)]_{IN} = 9^{\frac{1-\alpha}{\alpha}} [f'(k)]_{US} \quad \textbf{(3-6)}$$

In equation (3-6) if we assume $\alpha = 1/3$ the marginal productivity in India (i.e. return on investment) should be 81 times higher than in the US. This implies that the impact of an additional unit of capital on output in a developing country with lower capital-to-labour ratio should be several times higher than that in the developed country with higher capital-to-labour ratio due to the law of diminishing returns. As a result, the developing countries should attract more investments (including both domestic and foreign), and their capital is expected to grow more quickly helping them to catch-up with their developed counterparts. Similarly, the second most important reason to expect developing countries to catch-up and grow faster as presented above by Solow's model is technological progress. According to this assumption developing countries do not have to 'reinvent the wheel' to progress technology; they can benefit from technology transfers which enables them to leapfrog the stages of technological development and move them immediately to higher levels of productivity.

[4] As per the data on GDP per capita (current US$) in 2014. Source: World Bank Development Indicators http://data.worldbank.org/indicator/NY.GDP.PCAP.CD

After his seminal work Solow (1957) attempted to explain the growth in the US economy, but rendered a large part as unexplained and attributed it as a residual. He defined this residual as the rate of per capita economic growth which was above the rate of per capita capital growth. This indicated that there were factors over and above the capital/labour ratio which contributed to the growth in the output per capita. Although Solow (1956) indicated labour-augmenting technology or the notion of technological innovation as the factor explaining this residual, unfortunately, it was left unexplored as the model did not tell us where this technological innovation comes from and who drives this process.

If we assume the earlier interpretation of Solow's model, then capital must flow from the rich to the poor countries, but in reality, it does not happen (the so-called 'Lucas Paradox'). This is because workers in the US are more productive than the workers in India. According to the data on labour productivity for the Year 2013, workers in the US are twelve times more productive compared to the workers in India. Given this information output per effective worker following the above example is calculated as:

$$y_{IN} = \frac{Y_{IN}}{AL_{IN}} = \frac{1}{9}\frac{Y_{US}}{AL_{US}/12} = \frac{4}{3}y_{US} \qquad \textbf{(3-7)}$$

Correcting for differences in labour productivity in equation (3-6) by substituting the new value for output per effective worker from the above calculation, the forecasted value for return on capital in India collapses to 0.56 times the return in the US, i.e. return in India is almost half the return in the US. This adjustment kills the incentive for the flow of investment from the rich to the poor countries.

Similarly, subsequent researchers attempted to explain the concept of technological innovation, and this led to the advent of endogenous growth theory by Romer (1986) and Lucas (1988). It purports that technological change is the result of intentional actions by the people reacting to the market incentives, but none of these models identify the underlying tools that can help us to understand why some countries are able to converge with the developed world while others do not. More importantly, these models do not account for the role of firms and

entrepreneurs, while these are important drivers of growth and productivity (Acs et al., 2012; Jones, 2013). This motivated us to explore the role of entrepreneurs in economic convergence.

3.2.2 The missing role of entrepreneurship

If we assume a world without the entrepreneurs, all the models of economic development will fail to justify economic growth. Schmitz (1989) identified this gap and pioneered a growth model focusing on entrepreneurship. He emphasised the role of an entrepreneur is that of an imitator and argued that it is primarily the activities of an imitative entrepreneur that drives economic growth. His theory differs from the neoclassical and endogenous growth model based on three important aspects. First, the earlier models of economic growth are highly aggregative and ignore the institutional context in which the investment and consumption decisions are being made. In these models, the number of firms operating in an economy is of no importance (e.g. constant returns to scale) or even if they are (e.g. decreasing returns to scale) the numbers are predetermined and given. Second, the earlier models miss the importance of imitation and implementation of existing knowledge in promoting economic growth. Third, the earlier models disregard the new knowledge created as a result of production activities, i.e. learning by imitation and implementation. According to Schmitz the supply of entrepreneurs is an important determinant of economic growth and increasing the number of entrepreneurs increases the level of output in an economy.

Similarly, Audretsch and Keilbach (2008); Audretsch (2007) and Braunerhjelm et al. (2010) using the neoclassical models of economic growth show that entrepreneurship serves as the conduit for knowledge spillovers and provides the missing link between investments in new knowledge and economic growth. A number of other studies also identify the impact of entrepreneurship on economic growth through varying mechanisms. The most widely discussed mechanism in the literature of entrepreneurship is its role in job creation, in this regard the works of Davidsson, Lindmark and Olofsson (1998) and Baldwin and Picot, (1995) provide substantial evidence that entrepreneurial ventures are a considerable

source for new job creation in an economy. In a study using the case of Germany, Audretsch and Fritsch (2003) present persuasive evidence that as entrepreneurs facilitate job creation, they contribute towards economic growth. Another commonly discussed and broader mechanism is the role of entrepreneurs in creative destruction, i.e. disturbance of the existing market equilibrium. Burke and van Stel (2014) using the data on firm entry and exit present the role entrepreneurs play in helping the markets restore to their equilibrium level by adjusting to the market carrying capacity. This process of entry and exit determines the level of competition in the market which facilitates sustainable economic growth. Burke and Hussels (2013) determine that intense competition at the time of start-up enhances the chances for long-term entrepreneurial survival. Thus, entrepreneurship facilitates knowledge growth, its spillover, new job creation and healthy competition in the market space, all of which positively contributes to economic growth.

The above review highlights an important role for entrepreneurship in economic growth, yet remarkably there is no research focusing on entrepreneurship as a determinant of economic catch-up (or convergence). In more abstract terms the literature on economics is more concerned with measurement and causality, knowing that technology, human capital and economic infrastructure are important – a rather critical question is how firms and entrepreneurs interact with these institutions. Addressing this gap in the literature on entrepreneurship and economic convergence involves measurement of the difference in per capita economic growth between any incumbent and the leading economy. Notionally, this is similar to the concept of speed and velocity in physics. While the rate of growth of GDP represents speed which is a scalar quantity, the GDP gap reflects velocity which is a vector quantity which also determines the direction, i.e. whether a country is catching-up, diverging or remaining indifferent.

3.3 Data and Methodology

The typical models in the research literature utilise the concept of economic growth to analyse the impact of total entrepreneurial activity (Acs et al., 2012; Acs, Desai and Hessels, 2008; Audretsch and Thurik, 2002; Carree et al., 2002;

Wong, Ho and Autio, 2005). In this paper, we use the GDP gap (w.r.t. USA) as our choice of dependent variable. As argued above we measure economic convergence, not as a rate of economic growth, rather based on the traditional definition of economic catch-up. We purport that the GDP gap vis-à-vis a leading economy is a more appropriate measure for economic convergence (Fagerberg and Godinho, 2006). In line with the work of Lee (2013), we calculate the GDP gap in our equation as the difference in Log GDP per worker between the incumbent country and the United States. To ensure robustness of test results the data is also tested using GDP gap w.r.t G8 countries and also Scandinavian countries but the results remain the same without any major change (refer to tables in the Appendix for additional regression results).

The general specification of our first economic model is as follows:

$$GDP\ gap = \emptyset Z_{i,t} + \sigma TEA_{i,t} + \delta_i + \rho_t + \epsilon_{i,t} \quad \textbf{(3-8)}$$

where $Z_{i,t}$ is the row vector of the determinants of economic growth, $TEA_{i,t}$ is the measure of total entrepreneurial activity in country i at time t, $\emptyset$ and σ represent respective vector of coefficients, $\delta_i$is the country specific fixed effect while ρ_t is the time effect and $\epsilon_{i,t}$is an error term.

There are numerous empirical studies (as discussed above) which test the impact of the total entrepreneurial activity on economic growth, but this paper introduces the concept of GDP gap which gives a new direction to this literature. In the second stage we repeat our analysis to test the impact in the presence of a feedback loop, this captures one year's performance that feeds into another. So far the literature on entrepreneurial economics only accounts for the threshold effects and not the performance that feeds in from the previous years. In this paper, we argue that this approach results in calculating partial impact and may lead to erroneous conclusions. Introducing a feedback loop in the above equation makes our model look more like the conventional β-convergence model which has been typically used in the cross-country studies of economic growth (Barro, 1991; Mankiw, Romer and Weil, 1992). The only difference is that typical models of economic convergence utilise the concept of economic growth for analysis,

while we use GDP gap (w.r.t. USA) as determined above. The general specification for our second step dynamic panel data model is as follows:

$$GDP\ gap = \beta ln(x_{i,t-1}) + \emptyset Z_{i,t} + \sigma TEA_{i,t} + \tau(a_{cu} * dTEA_{i,t}) + a_{cu} + \rho_t + \epsilon_{i,t} \quad \textbf{(3-9)}$$

where β is the coefficient of the feedback, $x_{i,t}$ denotes GDP per worker for country i at time t, a_{cu} is the dummy of catchup countries and $a_{cu} * dTEA_{i,t}$ is the interaction variable between TEA and catchup countries where values of TEA are demeaned to avoid issues of multicollinearity (please see notes for more details). All other determinants remain the same as described above in equation (3-8). The feedback loop in the above model allows to test the convergence hypothesis and also to measure "half-life" i.e. the time required for an economy to cover half the gap between USA and its steady-state level.

3.3.1 Data and variables explained

We use a panel data of 47 countries over 13 years from GEM, to study the effects of entrepreneurial activity on economic convergence. The panel data approach is highly advocated and recommended in the studies of economic growth as it allows for differences in aggregate production function across different countries and at varying times (Islam, 1995). However, our data on TEA which is extracted from GEM database has certain limitations as the measure is only available from 2002 until 2014. Each year there are variations in the set of countries included and excluded from the GEM, this limits our choice of countries to be included in the analysis. The shortlisted 47 countries selected for analysis have a minimum of 5 years observations available for each (the list of selected countries is appended in the appendix)[5]. In addition to GEM, we have collated different macroeconomic indicators using Penn World Tables (PWT) 8.1, World Development Indicators and World Economic Outlook. Our choice of regressors

[5] We limit the choice of observations to a minimum of 5 because we use two-step System GMM analysis with a maximum lag structure of 3 years. To keep our results more accurate and meaningful we kept a limit of minimum of 5 observations as a criteria for a particular country to be included in our dataset. Out of a total of 106 countries from GEM database (over 2002 – 2014) only a select of 47 countries were able to match this selection criteria.

and determinants included in the vector $Z_{i,t}$ to measure economic growth is based on the extant survey of the literature. These variables combine traditional determinants of growth used in the analysis of conditional convergence (Mankiw, Romer and Weil, 1992; Romer, 1986; Solow, 1956). Table A 3-1 in the appendix provides a summary description of all the variables used in our model.

Initial level of income is a strong predictor explaining differences in economic growth across countries as observed by Solow (1956). In our equation, we model initial level of income using GDP per worker at $t-1$ and we expect countries with lower levels of GDP per worker to grow at higher rates closing the gap w.r.t. United States more quickly than their developed counterparts. Based on the conditional convergence hypothesis we expect $\hat{\beta}$ coefficient to be negative and significant (Barro, 1991; Solow, 1956).

Physical capital accumulation or the ratio of Investments is traditionally used both in exogenous and endogenous models and is considered as a strong determinant of economic growth (Romer, 1986; Solow, 1956). We use a measure of physical capital in our model as a ratio of gross capital formation and GDP, where gross capital formation (formerly gross domestic investment) according to the World Development Indicators consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories[6]. Based on the economic theory physical capital promotes economic growth as some investments produce growing returns. Therefore we expect the coefficient to be negative, and the measure is expected to help in reducing the GDP gap causing an economy to catch-up with the developed world.

Human capital is another strong determinant of positive economic growth (Mankiw, Romer and Weil, 1992), traditionally models of economic growth have used human capital per person, while this paper utilises the measure of human

[6] "Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and "work in progress." According to the 1993 SNA, net acquisitions of valuables are also considered capital formation. Data is in constant 2011 U.S. dollars". (World Development Indicators)

capital per worker which is consistent with our measure of GDP per worker. In a number of studies secondary school enrollment is used as a proxy for human capital (Barro and Lee, 1994; Caselli, Esquivel and Lefort, 1996), but there is a strong argument of this being a biased indicator as secondary school enrollment is not a good measure of human capital for developing countries where not many pupils reach up to a secondary level (Kalaitzidakis et al., 2001; Klenow and Rodrã-guez-clare, 1997). Keeping this in view we use the index of human capital per worker derived from Penn World Table 8.1. The Penn World Table constructs this measure of human capital using average years of schooling interpolated from Barro and Lee (2013) and country-specific estimates for returns to primary, secondary and tertiary education (Psacharopoulos and Patrinos, 2004). This measure is expected to be a better indicator for cross-country analysis, and we anticipate a negative coefficient as increases in human capital reduce the GDP gap.

Population growth is acknowledged to be an important determinant of economic performance and following the traditional growth model specifications we use $n_{i,t} + g + d$ formulation to cater the impact of population growth. Where $n_{i,t}$ is the natural yearly growth rate of population, while g represents labour-augmenting technological progress and d is the rate of depreciation of physical capital[7]. An increase in population means a decrease in economic growth, as part of the national investment is used in providing for additional workers instead of raising the ratio of capital per worker (Barro, 1998). As a consequence, we expect a positive coefficient, because an increase in population should reflect an increase in GDP gap.

Finally, based on the arguments of Barro-type extended growth regression (Barro, 1991), which supports the consideration of additional determinants of economic growth, we are interested in exploring the impact of entrepreneurial activity on economic convergence/catch-up. In the empirical literature on

[7] Following Caselli, Esquivel and Lefort (1996); Islam (1995) and Mankiw, Romer and Weil (1992) we choose 0.05 as the value for $(g + d)$.

entrepreneurship, business ownership or self-employment is often used as a proxy for entrepreneurship based on the arguments by Storey (1991). However, Wong, Ho and Autio (2005) argue that both these measures are constrained in their ability, as the data on business ownership is not readily available for the developing countries, while the data on self-employment is not a good measure for measuring start-ups - particularly in the context of the developing world. In this perspective, the availability of data from GEM potentially addresses these concerns (Reynolds, Hay and Camp, 1999) and therefore it is our preferred choice.

Based on the above discussion our additional regressors include TEA rates from the GEM database, a dummy variable categorising the differences between catch-up[8] and non-catching up economies, an interaction variable accounting for TEA[9] in catching-up countries and a dummy for time to capture time effects. Further, to normalise the measure, we use natural log (LN) transformation of TEA ratios, physical capital accumulation and human capital.

3.3.2 Methodological considerations

To examine the impact of the traditional determinants of economic growth and entrepreneurial activity on economic convergence (i.e. GDP gap) we conduct regression analyses. To control for country-specific effects, we use fixed effects estimation in the first step of our analysis. However, the fixed-effects estimator may provide biased estimations if repeated for the second set of our analysis, as the initial value of GDP per worker $(x_{i,t-1})$ included in the second set as a feedback loop is correlated with the residual term in the equation. Since it's a dynamic panel data model, Arellano and Bond (1991) advocate the use of

[8] According to the definition of economic catch-up all countries with an average growth rate of GDP per capita in 2011 constant (for the period 2002-2014) above the average growth rate of USA* are taken as catching up economies. While countries with an average growth rate equal to or below the average growth rate of USA are classified as non-catching up economies. * The 13 year (2002 – 2014) average growth rate for USA is equal to 3.6%.

[9] This variable is calculated by multiplying dummy variable for catching-up countries with TEA rates. Before taking the interaction, we demean the values of TEA by taking the difference with average TEA values to avoid multicollinearity - please see Drakos, Kouretas and Tsoumas (2014). Without demeaning, the collinearity statistics using VIF values were quite high suggesting problems of multicollinearity between independent variables.

generalized method of moments (GMM) for dynamic panel data studies, while Caselli, Esquivel and Lefort (1996) also apply this technique in their analysis of income convergence. The authors propose the use of a first-differences GMM to estimate the regression equation i.e. they use first-differences in order to eliminate the individual specific effects. In this equation the partial lagged depended variable included as a feedback loop is correlated with the error term and therefore this necessitates the need to use instrumental variables, while Arellano and Bond (1991) purports the use of lagged levels as suitable instruments. However, Blundell and Bond (1998) confirm that with continuous dependent and independent variables lagged levels may not be the suitable instruments and in case of finite sample size the first difference GMM may provide biased results.

Given the above, Blundell and Bond (1998) suggest the use of a two-step GMM, especially for samples like ours, i.e. having a small T and large N, which they prove using the Monte Carlo simulation to be asymptotically better than the first-differences estimator. However, for finite sample sizes a two-step GMM may produce downward biased results, but this can be eliminated using Windmeijer finite-sample corrections (Windmeijer, 2005). Further, as we have an unbalanced panel data with gaps in entrepreneurial observations, using forward orthogonal deviations transform can preserve our sample size, as it uses averages of future available observations instead of subtracting the previous observations from the period (Roodman, 2009).

Therefore taking the above into consideration, for the second set of our analysis we estimate our convergence equation using a two-step system GMM with forward orthogonal deviations and Windmeijer's finite-sample corrections for the variance-covariance matrix. Earlier, Bond, Hoeffler and Temple (2001) have also used system GMM in their analysis on simple and augmented forms of the Solow model. According to our knowledge this is the first paper in entrepreneurial economics which measures the impact of entrepreneurial activity on economic convergence taking into account a feedback loop using two-step system GMM technique.

3.4 Results

Before we proceed to the discussion of our regression results, Table 3-1 presents the basic descriptive statistics of the main regression variables. Over the sample period, the average GDP gap per worker w.r.t US and the rest of the world is 0.9369 in terms of natural log and if the number is transformed back to its original units it is equivalent to 2,550 USD (per worker) and it has a standard deviation of 0.97 percent approximately. Similarly, total entrepreneurial activity is characterised by a mean value of 2.0677 which if transformed back to its original units becomes 7.91 percent and it is the percentage of 18-64 year old population in a country who are either a nascent entrepreneur or owner-manager of a new business and it has a standard deviation of 0.57 percent.

Table 3-1 Descriptive statistics whole world (aggregate data)

	N	Mean	Std. Dev	Min	Max
GDP gap (w.r.t US)	611	0.9369	0.9728	- 0.3251	3.6900
Total entrepreneurial activity	482	2.0667	0.5781	0.3364	3.6973
Physical capital accumulation	622	2.7880	0.4896	1.1107	4.0026
Human capital	611	2.0387	0.1980	1.4691	2.5287
Population growth $\boldsymbol{n_{i,t} + g + d}$	624	0.0574	0.0090	- 0.0138	0.1044
TEA in catching up countries (interaction variable)	482	0.1483	0.3858	-1.1267	1.6305

Note – The table summarises descriptive statistics for the main regression variables. *Gap gap* (w.r.t US) is the difference between the US GDP per worker and the GDP per worker of the incumbent country. *Total entrepreneurial activity* is the percentage of 18-64 population in the country who are either a nascent entrepreneur or owner-manager of a new business. *Physical capital accumulation* is the measure of the ratio of Gross Capital Formation and the GDP of a country. *Human capital* is the index of human capital per worker, based on years of schooling and returns to education. *Population growth* is the yearly rate of total

population growth + 0.05 to account for the labour augmented technological progression. *TEA in catching up countries* is the interaction variable measured with the interaction of variable total entrepreneurial activity and catch-up dummy. All variables are transformed to Natural Log.

Table 3-2 reports the correlation coefficients for the set of explanatory variables and it suggests that multicollinearity is unlikely to affect the results. To ensure there is no multicollinearity VIF statistics are also presented in the appendix.

Table 3-2 Correlation matrix

	GDP Gap	Initial level of GDP	Physical Capital	Human Capital	Population Growth
Initial level of GDP	-0.9919				
Physical capital	-0.5860	0.5792			
Human capital	-0.5182	0.5315	0.0379		
Population growth	0.2429	-0.2464	0.0440	-0.3204	
Total entrepreneurial activity (TEA)	0.6858	-0.6628	-0.3659	-0.5411	0.3647

Table 3-3 presents the mean differences between catching up and non-catching economies. In the sample, there are twenty-one catching up and twenty-five non-catching up countries. The data shows that catching up countries have almost six times higher GDP gap per worker (w.r.t. USA) as compared to non-catching up countries and also marginally higher rates of population growth. While physical capital accumulation (or investment ratio) in catching up countries is almost half as compared to non-catching up countries and human capital per work is also significantly lower. Still, annual economic growth (measured as growth in GDP per worker) in catching up countries is twice as high compared to non-catching up economies. One plausible factor that may seem to explain this higher rate of economic growth for catching up countries in the given data appears to be total entrepreneurial activity. TEA rates in catching up countries are almost twice as high compared with non-catching up countries. The t-test reveals that all these differences are statistically significant at 1% significance level with the exception of difference in population growth.

Table 3-3 Basic descriptive data of the country groups and test of the significance of gaps (2002 – 2014)

	Catching up countries	Non catching up countries	Catching up vs Non catching up countries	
	Mean $(\mu 0)$	Mean $(\mu 1)$	Difference $=\mu 0 - \mu 1$	$H0: \mu 0 - \mu 1 = 0$
Log of GDP gap (per worker)	1.6747	0.2877	1.3870	0.0000***
Physical capital accumulation	13.5926	22.0615	-8.4689	0.0000***
Human capital	7.2248	8.3118	-1.0870	0.0000***
Population growth $(n + g + d)$ (%)	0.0580	0.0570	0.0010	0.1878
Economic growth (annual %)	5.1943	3.3002	1.8941	0.0000***
Total entrepreneurial activity (TEA %)	13.2403	6.8897	6.3505	0.0000***

**** significance at 1% level

Now, to examine the impact of TEA on GDP gap, we conduct our first set of regression analysis. To help us bifurcate our analysis between catching up and non-catching up economies and to ensure robustness of results, we divide our dataset into three different groups and regressions are conducted for each group separately as well as together for all the 47 countries (represented as a whole world). Contrary to our analysis on the significance of gaps between the catching up and non-catching up economies, Table 3-4 suggests that TEA has no significant impact on reducing GDP gap within the context of catching up countries. While physical capital accumulation and human capital are two statistically significant sources helping the catching up economies close their gap w.r.t. USA.

A more stark contrast is observed when we see the results for non-catching up countries, here an increase in TEA also contributes to reducing the GDP gap w.r.t. USA along with physical capital accumulation and human capital. While, as a whole when all the countries in our dataset are considered together TEA seems to have no significant impact. It is the growth in physical capital accumulation and

human capital which helps in reducing the GDP gap, while an increase in population growth further exacerbates this gap and these impacts are statistically significant.

Table 3-4 The economic convergence and entrepreneurial activity (Fixed effect panel model)

	Fixed effect panel model		
	Catching up countries	Non-catching up countries	Whole world
Total entrepreneurial activity (TEA)	0.0174	- 0.0237***	- 0.0074
	(0.69)	(-2.95)	(-0.59)
Physical capital accumulation	- 0.1746***	- 0.0649***	- 0.1915***
	(-5.46)	(-3.87)	(-9.65)
Human capital	- 0.9550***	- 0.1911***	- 0.5237***
	(-5.28)	(-2.94)	(-5.65)
Population Growth	0.8709	0.5821	1.2743*
$n_{i,t} + g + d$	(0.72)	(1.12)	(1.81)
No. of observations	184	277	461
No. of groups	21	25	46
R^2	0.4998	0.3323	0.6201
Hausman test statistic	53.55 (0.0000)	32.96 (0.0075)	97.25 (0.0000)

Dependent variable = Log of GDP gap per worker (w.r.t USA).
*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients, while for Hausman test statistics (.) indicates p values respectively. Time and country dummies are not being reported but can be provided on request.

These results may well be in line with the arguments of Burke, FitzRoy and Nolan (2000) which suggests “less may mean more” i.e. lower mean TEA rates in non-catching up countries show significant impact on reducing this gap, while higher mean TEA rates in catching up context have no significant impact. Further, in line with the arguments of Acs, Desai and Hessels (2008) it may also be the case that necessity-based entrepreneurship is more prevalent in catching up economies, while opportunity-based entrepreneurship is dominant in non-catching countries. This reflects the need to account for the quality (performance) of the entrepreneurs as opposed to just the quantity (number) of the entrepreneurs.

Finally, the results for the whole world are in line with the findings of Wong, Ho and Autio (2005) who could not find evidence for the impact of TEA on economic growth. However, the entrepreneurship literature has often produced mixed results, at times finding significant evidence for the impact of TEA on economic growth (Ferreira et al., 2017; Acs et al., 2012), while at other times finding no such evidence (Wong, Ho and Autio, 2005). This may be because there is a gap in the literature, as research on entrepreneurship has not so far accounted for the feedback loop and as discussed above it may lead to erroneous findings.

To check the impact in the presence of a feedback loop, we turn to the system GMM results in Table 3-5. In all the three group results, we can see the coefficient of the initial value of GDP per worker is negative and significant; this proves our convergence hypothesis, i.e. countries are closing their GDP gap w.r.t USA. In the presence of a feedback loop, the impact of TEA as a whole remains insignificant within catching up, non-catching up and the world as an aggregate. Although for the catching-up and non-catching up economies we can see a negative coefficient with TEA, the result remains statistically insignificant.

Table 3-5 The economic convergence and entrepreneurial activity (System-GMM Model)

	System-GMM Model		
	Catching up countries	Non-catching up countries	Whole world
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.9396***	- 1.0166***	- 0.8792***
	(-38.44)	(-41.67)	(-10.95)
Total entrepreneurial activity (TEA)	- 0.0149	- 0.0046	0.0284
	(-0.54)	(- 0.59)	(0.79)
Physical capital accumulation	- 0.0569**	- 0.0043	- 0.0798*
	(-2.32)	(-0.24)	(-1.71)
Human capital	- 0.1067	0.0059	- 0.2274*
	(-1.47)	(0.19)	(-1.71)
Population Growth $n_{i,t} + g + d$	1.3982**	0.8086*	1.7106*
	(2.37)	(2.20)	(1.74)
TEA in catching up countries			- 0.1051**
			(-1.80)
Dummy catching up countries			0.0993
			(1.15)

Implied β (annual)	0.0037	0.0038	0.0024
Half-life (years)	187	182	294
No. of observations	173	254	427
No. of groups	21	25	46
Hansen test	0.331	0.346	0.784
Arellano-Bond test for AR (1)	0.010	0.001	0.001
Arellano-Bond test for AR (2)	0.215	0.079	0.120

Dependent variable = Log of GDP gap per worker (w.r.t. USA).
*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients. For GMM type instruments we have used a lag structure up to 3 with the collapse option. Implied β i.e. rate of convergence is calculated using delta method, while Half-life is calculated using the formula: H.L = $-\ln(2)/\ln(1+\hat{\beta})$. Time and country dummies are not being reported but can be provided on request. All calculations are conducted by STATA 12.0.

Since the system GMM model uses a two-year lag, this reduces the explanatory ability of the data and once it is further divided into catching up and non-catching up countries most of the variables become insignificant in our analysis. To cater for this, we create an interaction variable in the whole world model by interacting TEA with the dummy of catching up countries, to test the impact of TEA for catching up economies in the overall context.

Here the coefficient is identified to be negative and significant at 5 percent level. This gives a new meaning to our analysis as it shows that in the presence of a feedback loop, an increase in TEA in the overall context for the catching up countries helps them in reducing their GDP gap (w.r.t. USA). This coefficient is notably stronger than the coefficient of physical capital accumulation strengthening our concept on the contribution of TEA in facilitating economic catch-up. Although, one may question the magnitude of the coefficient, i.e. 0.1051, it is not small considering that the mean value of the Log of GDP gap per worker in catching-up countries is 1.67 and 0.28 in non-catching up countries. Finally, in the aggregate model where we consider all the countries together, the results for physical capital accumulation, human capital and population growth remain consistent and in line with our previous analysis. This further strengthens our above argument that when considering catching-up and non-catching up countries separately, the bifurcation of data reduces its ability, and hence we get some statistically insignificant coefficients.

In the above set of regressions, the values for β imply the number of years required to reduce half of the gap in productivity per worker w.r.t. USA. This concept is drawn on the principles of Physics where we calculate half-life of the radioactive material to measure how long it will take the material to decay. In this context today's catching-up economies are estimated to take 187 years to reduce half the distance in productivity per worker w.r.t. USA, while the non-catching up economies usually marred with a slower growth rate will take almost 182 years to reach a similar level. The World as an aggregate is expected to reduce half the gap w.r.t. USA from its steady state in almost next 294 years. Thus under the impact of a feedback loop empirical evidence supports the view that contribution of TEA in assisting catching up economies to reduce the GDP gap (w.r.t. USA) is significant, although it may take several years to reduce this gap.

Although the selection of variables in this paper is based on the Cobb-Douglas production function following the economic convergence literature (Lucas, 1988; Romer, 1986; Solow, 1957). To ensure robustness of the above results the paper looks into the impact of adding an additional variable. In this regard Corruption perception index is added to the System GMM model using all the three points of reference i.e. US, G8 and Scandinavian countries (refer to Table A 3-6, Table A 3-7 and Table A 3-8 in the appendix). The results confirm that the impact of TEA in catching up countries still holds irrespective of adding an additional measure.

3.5 Conclusion

Economic convergence is the basic premise in the models of economic growth, while the role of entrepreneurship in this context has never been tested before. The idea of convergence may be characterised in two parts (1) the rate of growth of GDP or more appropriately reduction in the GDP gap; and (2) the process of one year's performance feeding into another, i.e. the feedback loop. While researchers have focused on the rate of growth of GDP, the concept of GDP gap has not yet been explored. This paper explores the important role entrepreneurship plays in supporting the countries in reducing their productivity gap w.r.t. USA. In doing so, it tests for the relationship between entrepreneurial

activity and the GDP gap, while it also establishes the subsequent impact that the feedback loop may have in this process.

The results indicate that in the absence of a feedback loop entrepreneurial activity does not support catching up economies in reducing their gap in productivity per worker w.r.t. USA, while for non-catching up economies the impact of TEA is significant. This means that in non-catching up countries which primarily includes high income developed economies[10], the contribution of entrepreneurial activity towards their economic growth is significant. However, in the presence of a feedback loop, the contribution of TEA towards the reduction in GDP gap becomes insignificant for both the catching up and non-catching up countries. This is primarily because of the lack of data as we induced a three year lag in our GMM model and given that we have a limited number of observations for the catching and non-catching up countries we do not have enough data to measure the desired outcome. To cater for this, we measure the interaction of TEA with catching-up countries in the whole world model. In this context, the improved economic growth reflected as a feedback loop in catching-up economies supports entrepreneurial activity, and its impact becomes significant in reducing the productivity gap per worker w.r.t. USA. This means the impact of TEA in catching-up economies, is only significant in the presence of a feedback loop, as improved entrepreneurial activity from one year feeds into another, helping the catching-up countries to grow faster and reduce the respective GDP gap with the higher incumbent economies.

This paper has greater insights for public policymakers who are interested in formulating policies for impactful entrepreneurship which can expedite the process of economic development. It shows the important role of entrepreneurial activity in economic catch-up and at the same time emphasise the value of a feedback loop. According to the above model, a one percent increase in entrepreneurial activity within catching up countries reduces their GDP gap per

[10] According to the World Bank definition a High Income Country (HIC) is one with a GDP per capita of more than USD 10,000. In our dataset all non-catching up countries are HIC, while not all HIC are non-catching up countries.

average worker w.r.t. USA by 5.3 percent. Based on these calculations the economic significance[11] of entrepreneurial activity within catching up countries in the whole World model is about 46 percent. This idea of economic catch-up fostered by entrepreneurial performance is relatively new concept and there are certainly limitations with respect to the availability of data in the above analysis. Therefore, care needs to be taken while interpreting the results. Still this paper has ramifications for our understanding of the process of entrepreneurial contribution and by consequence underscores the value of further research on the topic.

[11] The economic significance is measured as follows: (estimated regression coefficient * standard deviation of the variable)/Mean of the dependent variable

Appendix A

Table A 3-1 Summary description of variables and data sources

Variable	Definition	Sources
GDP Gap	The difference between US GDP per worker and GDP per worker of the incumbent country. The measure of GDP is in Purchasing Power Parity (PPP) constant 2011, US$	The data on GDP is from World Economic Outlook (WEO), while the data on workers is from World Development Indicators (WDI).
Initial level of GDP $ln(x_{i,t-1})$	GDP per worker of the incumbent country at $t-1$	Same as above
Physical Capital Accumulation	The measure is the ratio of Gross Capital Formation (constant 2011) and GDP (PPP, constant 2011, US$)	The data on Gross Capital Formation is from WDI, while data on GDP is from WEO
Human Capital	Index of human capital per worker, based on years of schooling and returns to education	Penn World Tables (PWT) 8.1
Population Growth $n_{i,t}+g+d$	Yearly rate of total population growth + 0.05 to account for $(g+d)$	The data on population is from WDI
Total Entrepreneurial Activity (TEA)	Percentage of 18-64 population who are either a nascent entrepreneur or owner-manager of a new business	Global Entrepreneurship Monitor (GEM)
Dummy catching up countries	Dummy variable that assumes the value of 1 if a country is classified as catching up and 0 otherwise	Own calculations
TEA in catching up countries	Interactive variable measured with the interaction of TEA and catch-up dummy	Own calculations
Dummy no. of years	Dummy variable for the years from 2002 – 2014	Own calculations

Table A 3-2 The economic convergence and entrepreneurial activity (Fixed effect panel model) – Dependent Variable Log of GDP gap per worker (w.r.t. G8 Countries)

	Fixed effect panel model		
	Catching up countries	Non-catching up countries	Whole world
Total entrepreneurial activity (TEA)	0.0174	- 0.0222***	- 0.0067
	(0.69)	(-2.82)	(-0.54)
Physical capital accumulation	-0.1746***	- 0.0604***	- 0.1897***
	(-5.46)	(-3.74)	(-9.81)
Human capital	- 0.9550***	- 0.1875***	- 0.5215***
	(-5.28)	(-2.94)	(-5.72)
Population Growth	0.8709	0.5475	1.2709*
$n_{i,t} + g + d$	(0.72)	(1.06)	(1.83)
No. of observations	184	289	473
No. of groups	21	26	47
R^2	0.5062	0.3231	0.6198
Hausman test statistic	53.55	33.94	98.79
	(0.0000)	(0.0055)	(0.0000)

Dependent variable = Log of GDP gap per worker (w.r.t **G8 countries**).
*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients, while for Hausman test statistics (.) indicates p values respectively. Time and country dummies are not being reported but can be provided on request.

Table A 3-3 The economic convergence and entrepreneurial activity (Fixed effect panel model) – Dependent Variable Log of GDP gap per worker (w.r.t. Scandinavian Countries)

	Fixed effect panel model		
	Catching up countries	Non-catching up countries	Whole world
Total entrepreneurial activity (TEA)	0.0174	- 0.0222***	- 0.0066
	(0.69)	(-2.82)	(-0.54)
Physical capital accumulation	-0.1746***	- 0.0604***	- 0.1896***
	(-5.46)	(-3.74)	(-9.81)
Human capital	- 0.9550***	- 0.1875***	- 0.5215***
	(-5.28)	(-2.94)	(-5.72)
Population Growth	0.8709	0.5475	1.2709*
$n_{i,t} + g + d$	(0.72)	(1.06)	(1.83)
No. of observations	184	289	473
No. of groups	21	26	47

R^2	0.5036	0.2888	0.6052
Hausman test statistic	53.55	33.94	98.79
	(0.0000)	(0.0055)	(0.0000)

Dependent variable = Log of GDP gap per worker (w.r.t **Scandinavian countries**).
*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients, while for Hausman test statistics (.) indicates p values respectively. Time and country dummies are not being reported but can be provided on request.

Table A 3-4 The economic convergence and entrepreneurial activity (System-GMM Model)

Dependent Variable Log of GDP gap per worker (w.r.t. G8 Countries)

	System-GMM Model		
	Catching up countries	Non-catching up countries	Whole world
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.9396***	- 1.0205***	- 0.8821***
	(-38.43)	(-40.16)	(-10.57)
Total entrepreneurial activity (TEA)	- 0.0149	- 0.0031	0.0405
	(-0.54)	(- 0.29)	(0.97)
Physical capital accumulation	- 0.0569**	- 0.0023	- 0.0779*
	(-2.32)	(-0.14)	(-1.70)
Human capital	- 0.1066	0.0098	- 0.2350*
	(-1.47)	(0.33)	(-1.82)
Population Growth $n_{i,t} + g + d$	1.3982**	0.7989**	1.6273*
	(2.37)	(2.20)	(1.68)
TEA in catching up countries			- 0.1239**
			(-2.08)
Dummy catching up countries			0.0978
			(1.07)
Implied β (annual)	0.0037	0.0036	0.0023
Half-life (years)	187	182	294
No. of observations	173	265	438
No. of groups	21	26	47
No. of instruments	20	22	23
Hansen test	0.331	0.331	0.878
Arellano-Bond test for AR (1)	0.010	0.001	0.003
Arellano-Bond test for AR (2)	0.215	0.071	0.137

Dependent variable = Log of GDP gap per worker (w.r.t. **G8 Countries**).
*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients. For GMM type instruments we have used a lag structure up to 3 with the collapse option. Implied β i.e. rate of convergence is calculated using delta method, while Half-life is calculated using the formula: H.L = $-\ln(2)/\ln(1+\hat{\beta})$. Time and country dummies are not being reported but can be provided on request. All calculations are conducted by STATA 12.0.

Table A 3-5 The economic convergence and entrepreneurial activity (System-GMM Model)

Dependent Variable Log of GDP gap per worker (w.r.t. Scandinavian Countries)

	System-GMM Model		
	Catching up countries	Non-catching up countries	Whole world
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.9396***	- 1.0205***	- 0.8821***
	(-38.43)	(-40.16)	(-10.57)
Total entrepreneurial activity (TEA)	- 0.0149	- 0.0031	0.0405
	(-0.54)	(- 0.29)	(0.97)
Physical capital accumulation	- 0.0569**	- 0.0023	- 0.0779*
	(-2.32)	(-0.14)	(-1.70)
Human capital	- 0.1066	0.0098	- 0.2350*
	(-1.47)	(0.33)	(-1.82)
Population Growth	1.3982**	0.7989**	1.6273*
$n_{i,t} + g + d$	(2.37)	(2.20)	(1.68)
TEA in catching up countries			- 0.1239**
			(-2.08)
Dummy catching up countries			0.0978
			(1.07)
Implied β (annual)	0.0037	0.0036	0.0023
Half-life (years)	187	182	294
No. of observations	173	265	438
No. of groups	21	26	47
No. of instruments	20	22	23
Hansen test	0.331	0.331	0.878
Arellano-Bond test for AR (1)	0.010	0.001	0.003
Arellano-Bond test for AR (2)	0.215	0.071	0.137

Dependent variable = Log of GDP gap per worker (w.r.t. **Scandinavian Countries**).
*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients. For GMM type instruments we have used a lag structure up to 3 with the collapse option. Implied β i.e. rate of convergence is calculated using delta method, while Half-life is calculated using the formula: H.L = $-\ln(2)/\ln(1+\hat{\beta})$. Time and country dummies are not being reported but can be provided on request. All calculations are conducted by STATA 12.0.

Table A 3-6 The economic convergence and entrepreneurial activity (System-GMM Model) with additional variable Corruption Perception Index (CPI)

Dependent Variable Log of GDP gap per worker (w.r.t. USA)

	System-GMM Model		
	Catching up countries	Non-catching up countries	Whole world
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.9664***	- 1.0167***	- 0.9160***
	(-24.06)	(-16.92)	(-7.44)
Total entrepreneurial activity (TEA)	- 0.0334	- 0.0001	0.0756
	(- 0.86)	(- 0.01)	(1.32)
Physical capital accumulation	- 0.0666	0.0049	- 0.0564
	(-1.61)	(0.24)	(-0.61)
Human capital	- 0.0855	- 0.0049	- 0.1297
	(-0.98)	(-0.03)	(-0.66)
Population growth	1.3203	0.6491	0.7662
$n_{i,t} + g + d$	(1.36)	(1.42)	(0.43)
Corruption perception index (CPI)	0.0093	- 0.0008	0.00005
	(0.57)	(-0.82)	(0.00)
TEA in catching up countries			- 0.1239*
			(-1.85)
Dummy catching up countries			0.0511
			(0.30)
Implied β (annual)	0.0045	0.0046	0.0028
Half-life (years)	154	150	248
No. of observations	152	213	365
No. of groups	21	25	46
No. of instruments	19	21	22
Hansen test	0.342	0.279	0.725
Arellano-Bond test for AR (1)	0.009	0.030	0.005
Arellano-Bond test for AR (2)	0.238	0.585	0.404

Dependent variable = Log of GDP gap per worker (w.r.t. **USA**).
*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients. For GMM type instruments we have used a lag structure up to 3 with the collapse option. Implied β i.e. rate of convergence is calculated using delta method, while Half-life is calculated using the formula: H.L = $-\ln(2)/\ln(1+\hat{\beta})$. Time and country dummies are not being reported but can be provided on request. All calculations are conducted by STATA 12.0.

Table A 3-7 The economic convergence and entrepreneurial activity (System-GMM Model) with additional variable Corruption Perception Index (CPI)

Dependent Variable Log of GDP gap per worker (w.r.t. G8 Countries)

	System-GMM Model		
	Catching up countries	Non-catching up countries	Whole world
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.9664***	- 1.0139***	- 0.9189***
	(-24.06)	(-14.05)	(-7.83)
Total entrepreneurial activity (TEA)	- 0.0334	0.0008	0.0874
	(- 0.86)	(0.05)	(1.52)
Physical capital accumulation	- 0.0666	0.0076	- 0.0525
	(-1.61)	(0.38)	(-0.56)
Human capital	- 0.0855	- 0.0039	- 0.1338
	(-0.98)	(-0.07)	(-0.71)
Population growth $n_{i,t} + g + d$	1.3204	0.6431	0.5682
	(1.36)	(1.06)	(0.32)
Corruption perception index (CPI)	0.0094	- 0.0044	- 0.0020
	(0.57)	(-0.40)	(-0.08)
TEA in catching up countries			- 0.1338*
			(-1.88)
Dummy catching up countries			0.0424
			(0.25)
Implied β (annual)	0.0045	0.0044	0.0027
Half-life (years)	154	157	256
No. of observations	152	223	375
No. of groups	21	26	47
No. of instruments	19	21	22
Hansen test	0.342	0.239	0.720
Arellano-Bond test for AR (1)	0.009	0.032	0.006
Arellano-Bond test for AR (2)	0.238	0.533	0.349

Dependent variable = Log of GDP gap per worker (w.r.t. **G8 Countries**).
*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients. For GMM type instruments we have used a lag structure up to 3 with the collapse option. Implied β i.e. rate of convergence is calculated using delta method, while Half-life is calculated using the formula: H.L = $-\ln(2)/\ln(1+\hat{\beta})$. Time and country dummies are not being reported but can be provided on request. All calculations are conducted by STATA 12.0

Table A 3-8 The economic convergence and entrepreneurial activity (System-GMM Model) with additional variable Corruption Perception Index (CPI)

Dependent Variable Log of GDP gap per worker (w.r.t. Scandinavian Countries)

	System-GMM Model		
	Catching up countries	Non-catching up countries	Whole world
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.9664***	- 1.0139***	- 0.9189***
	(-24.06)	(-14.05)	(-7.83)
Total entrepreneurial activity (TEA)	- 0.0334	0.0008	0.0874
	(- 0.86)	(0.05)	(1.52)
Physical capital accumulation	- 0.0666	0.0076	- 0.0525
	(-1.61)	(0.38)	(-0.56)
Human capital	- 0.0855	- 0.0039	- 0.1338
	(-0.98)	(-0.07)	(-0.71)
Population growth	1.3204	0.6431	0.5682
$n_{i,t} + g + d$	(1.36)	(1.06)	(0.32)
Corruption perception index (CPI)	0.0094	- 0.0044	- 0.0020
	(0.57)	(-0.40)	(-0.08)
TEA in catching up countries			- 0.1338*
			(-1.88)
Dummy catching up countries			0.0424
			(0.25)
Implied β (annual)	0.0045	0.0044	0.0027
Half-life (years)	154	157	256
No. of observations	152	223	375
No. of groups	21	26	47
No. of instruments	19	21	22
Hansen test	0.342	0.239	0.720
Arellano-Bond test for AR (1)	0.009	0.032	0.006
Arellano-Bond test for AR (2)	0.238	0.533	0.349

Dependent variable = Log of GDP gap per worker (w.r.t. **Scandinavian Countries**).
*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients. For GMM type instruments we have used a lag structure up to 3 with the collapse option. Implied β i.e. rate of convergence is calculated using delta method, while Half-life is calculated using the formula: H.L = $-\ln(2)/\ln(1+\hat{\beta})$. Time and country dummies are not being reported but can be provided on request. All calculations are conducted by STATA 12.0

Table A 3-9 Variance inflation factor (Whole World model w.r.t US)

Variable	VIF
Initial level of GDP	4.41
Physical capital	2.12
Human capital	2.00
Population growth	1.24
TEA	3.47
TEA in catching up countries	3.16
Mean VIF	2.33

Table A 3-10 List of catching up countries in our sample

Argentina	Iran	Romania
Brazil	Jamaica	South Africa
China	Korea	Taiwan
Colombia	Latvia	Thailand
Croatia	Malaysia	Turkey
Iceland	Peru	Uganda
India	Poland	Uruguay

Table A 3-11 List of non-catching up countries in our sample

Australia	Hungary	Russia
Belgium	Ireland	Singapore
Canada	Israel	Slovenia
Chile	Italy	Spain

Denmark	Mexico	Sweden
Finland	Netherlands	Switzerland
France	Norway	United Kingdom
Germany	Japan	United States
Greece	Portugal	

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4 THE IMPORTANCE OF ENTREPRENEURIAL MOTIVATION IN ECONOMIC GROWTH

ABSTRACT

The purpose of this paper is to explain why considering different types of entrepreneurial motivations in analysing economic growth is important. It utilises the data on GEM Total Entrepreneurial Activity (TEA) rates: for opportunity 'pull' and necessity 'push' entrepreneurial activity, to establish their respective impact on GDP gap which is used as a measure of economic growth. Further, for purposes of entrepreneurial policymaking, it examines the importance of considering different business contexts divided into catch-up and non-catch-up countries. In doing so, it implicitly links two disparate strands of literature, one focusing on the entrepreneurial motivation while the other on the theory of economic development. Finally, based on a unique dynamic panel data model this study answers why GDP gap in catch-up countries remain significantly higher as they struggle to close this gap, despite higher levels of economic growth and entrepreneurial activity in these countries.

JEL Classification: L26; O11; O24; O32; O34; O47

Key Words: economic growth, entrepreneurial motivation

4.1 Introduction

While the contribution of entrepreneurial activity to national economic growth has received considerable attention in the past decade (Acs et al., 2012; Audretsch, Keilbach and Lehmann, 2006; Mueller, 2007; Prieger et al., 2016; Wennekers et al., 2005; Wong, Ho and Autio, 2005), less is known about how the differences in entrepreneurial motivation impact GDP gap between the 'catch-up' and 'non-catch-up' economies. Not all entrepreneurs are the same, and therefore they do not act uniformly, nor do they all have the same impact on economic growth. Some are motivated by an opportunity while others become entrepreneurs out of necessity, literature distinguishes between these two types of entrepreneurial motivation as: 'opportunity entrepreneurship' which is driven by pursuit of an opportunity and 'necessity entrepreneurship' which is more needs based due to unemployment or lack of other suitable alternatives (Reynolds et al., 2002). Similarly, not all countries are equal, some grow more rapidly and catch-up closing their gap in GDP vis-à-vis a leading economy, while, others are slower and more advanced without a huge gap in GDP and may not require efforts to catch-up. Our analysis of the Global Entrepreneurship Monitor (GEM) data for 47 countries from 2002 – 2012 suggests that there are statistically significant differences in the levels of opportunity and necessity entrepreneurship between catching up and non-catching up countries. Given this insight, an important implication for policymakers and researchers interested in economic aspects of entrepreneurship is to distinguish between different types of entrepreneurial motivations while making policies and analysing data. Further, they might also be interested in determining how these different types of entrepreneurial motivations compare in facilitating economic catch-up, i.e. reducing the gap in GDP per capita between the catching-up and the leading economies of the world. Finally, these variations in different types of entrepreneurial motivations warrant an explanation to fill the gap in the literature.

This research explores how different measures of entrepreneurial motivation impact the GDP gap and how this facilitates the process of economic catch-up and by doing so, it uniquely contributes to the existing body of knowledge in

several ways. First, in the analysis, we make use of the GDP gap per worker as our dependent variable, contrary to the extant research which analyses GDP per capita growth (later in this paper we explain why GDP gap is a better measure). Second, we distinguish between catching-up and non-catching-up economies, while to our knowledge no analysis of the relationship between catching-up and entrepreneurial motivation has previously been explored. Third, our data on entrepreneurship extracted from GEM covering 47 countries across 2002 – 2012 represents a more recent period and also the most robust dataset ever examined by previous studies of entrepreneurship in economic growth. Fourth, we include the impact of a feedback loop in our analysis which has never been analysed before in the study of entrepreneurial economics.

This paper is organised as follows. Section 2 reviews the literature on opportunity recognition, necessity and opportunity entrepreneurship and its role in economic catch-up. Section 3 introduces the model specifications and empirical methodology to test our hypothesis. Section 4 presents results and offers a discussion, while Section 5 presents the conclusion.

4.2 Theory and Hypothesis

4.2.1 Opportunity recognition and exploitation

Casson (1982) defines entrepreneurial opportunity as an arbitrage in which goods and services are sold at prices higher than their cost of production. An interesting debate in entrepreneurial literature is to determine why only some people discover entrepreneurial opportunities while others do not. According to one school of thought, industry experience and knowledge are necessary prerequisites to recognise such opportunities (Shane, 2000). However, not all opportunities are equal, and one may need specific cognitive skills to realise their value (see Corbett, 2007; Shaver and Scott, 1991). While for an entrepreneurial birth to take place an opportunity needs to be both discovered as well as exploited, and this is a subjective process (Shane and Venkatamaran, 2000).

Although an entrepreneurial opportunity in itself may be objective in nature, both its discovery and exploitation are subjective and depend on the individual's

motivation seeking the opportunity. A rational decision-making individual will only exploit an opportunity when its expected value is higher as compared with the forgone opportunity costs of other suitable alternatives. However, an individual may have different alternatives and payoffs depending on market conditions and economic prospects. Thus, the ability to exploit such opportunities depends not only on individual capabilities (Amit, Muller and Cockburn, 1995) but also on the macroeconomic conditions breeding such opportunities (Prieger et al., 2016). Hence, catching-up economies may give rise to more entrepreneurial opportunities as there is potentially a wider GDP gap to fill, while non-catch-up economies may not offer enough opportunities but they may provide better prospects in terms of quality, i.e. less may mean more (Burke, FitzRoy and Nolan, 2000).

From the above discussion we conclude that entrepreneurial opportunities depend on the business context (i.e. catch-up and non-catch-up economies), but how entrepreneurs recognise and react to them is defined by their aspirations and motivation.

4.2.2 Necessity and opportunity entrepreneurship

As there are obvious differences in entrepreneurial motivations, it is suggested that differentiation should be made between individuals participating in entrepreneurial activity based on the voluntary pursuit of an opportunity versus those who are driven by necessity and for whom entrepreneurship is their last resort (Reynolds et al., 2002). This distinction between necessity and opportunity entrepreneurship was formally embedded in empirical research by GEM in 2001 when they introduced these terms in their database. It is important to differentiate between these motivations as they influence an entrepreneurs' behaviour pre and post start-up and helps to determine their goal and aspirations which may lead to different economic outcomes (Hessels, Van Gelderen and Thurik, 2008). Research suggests that both these groups differ in their socioeconomic characteristics including human capital endowment, the rate of entrepreneurial success and economic impact (Ács and Varga, 2005; Bergmann and Sternberg,

2007; Block and Sandner, 2009; Block et al., 2015; Kautonen and Palmroos, 2010).

According to Block et al. (2015), necessity entrepreneurs are older and therefore less agile than opportunity entrepreneurs, but they have more industry experience which may serve them greater opportunity to gather resources during their professional life. However, their long industry experience and limited entrepreneurial exposure mean their skills are more suitable for dependent employment rather than initiating a start-up. Also, those with specialised knowledge and significant human capital are able to upsell their expertise on the labour market for valuable returns and are less likely to choose self-employment for lack of suitable alternatives. It is, therefore, those with sparse human capital, lack of expert skills and valuable professional experience who are unlikely to find employment elsewhere who consequently choose to pursue self-employment for sustenance and provision to their family (Miles and Snow, 1978). This creates significant differences in observable characteristics and overall quality of entrepreneurs amongst the two groups.

Unlike the necessity entrepreneurs who are pushed into self-employment by need or lack of significant opportunities for paid employment, opportunity entrepreneurs take out enough time to carefully plan themselves based on their motivation and specialised skills set. This allows them to develop higher aspirations for future growth and it reflects in their better rate of survival and greater success in business (Wennekers et al., 2005). Because necessity entrepreneurs do not have enough choice, they are often in a less favourable position to carefully plan their initiative. As compared to opportunity entrepreneurs they are restricted in their ability given their limited knowledge, have fewer monetary resources and insufficient skills (Dencker, Gruber and Shah, 2009; Solymossy, 1997). Thus opportunity entrepreneurs have a significant impact on development, while the ones involved out of necessity do not have any significant effect (Ács and Varga, 2005).

In addition to these differences in individual characteristics between the necessity and opportunity entrepreneurs, there is also a stark divide in terms of their natural

distribution across different countries based on economic conditions and prospects for regional growth. According to Acs, Desai and Hessels (2008), necessity entrepreneurs are more prevalent in low-income countries, while opportunity entrepreneurs seem to be dominant in countries with high income. A reasonable justification for this divide is provided by the job search theory on labour market economics which suggests that the longer an individual is unemployed, the more his/her reservation wage declines which he/she is willing to accept. Because necessity entrepreneurs are mostly forced into self-employment based on lack of suitable employment opportunities, they are more likely to pursue an entrepreneurial opportunity in a low-income sector as their minimum reservation wage is comparatively lower. While Evans and Leighton (1989a) in their empirical research determine that entrepreneurs with higher opportunity cost pursue more valuable opportunities with higher potential earnings.

Thus entrepreneurial quality in the market is determined by factors like necessity and opportunity. Necessity entrepreneurs are more influenced by economic conditions, while, opportunity motived entrepreneurs are more intrinsic, driven by their desire for independence or self-realisation. This concept is similar to that presented by the ‘push’ and ‘pull’ effect models of entrepreneurial activity. According to Gilad and Levine (1986) necessity represents an entrepreneurial ‘push’ caused by an absence of other suitable alternatives like employment opportunities, while, ‘pull’ represents an individual’s motivation for self-employment which is usually driven by an opportunity prevalent in the market. Evans and Leighton (1989b, 1990) investigate the same phenomenon but name entrepreneurial ‘push’ as a “refugee” effect, while, Reynolds, Storey and Westhead (1994) term it as a “shopkeeper” effect. Audretsch, Carree and Thurik (2001) further suggest that an increase in unemployment leads to an increase in self-employment under the assumptions of a ‘push’ motivation. Conversely, an increase in unemployment has a negative impact on the number of start-ups under the assumptions of a ‘pull’ motivation. However, reasons for such differences in entrepreneurship and their value in creating jobs may be determined by the fact that a ‘push’ effect combined with low barriers to entry may

create employment opportunities, but this does not necessarily contribute to economic growth. It is the 'pull' effect which adds value to the economic growth and subsequently to the GDP (van Stel and Storey, 2004). The above review of literature leads us to the following hypothesis:

Hypothesis 1: Opportunity driven entrepreneurial activity is significantly different from necessity driven entrepreneurial activity

Hypothesis 2: Overall necessity entrepreneurial activity does not have a significant impact in reducing GDP gap

Hypothesis 3: Overall opportunity entrepreneurial activity has a significant impact on reducing GDP gap

4.2.3 Entrepreneurial motivation and economic catch-up

Ever since its inclusion in entrepreneurship research the distinction in entrepreneurial motivations is becoming increasingly relevant aimed at policymaking. However, the focus of academic debate from economic aspects has been on the impact of these groups on economic growth or job creation (Wennekers et al., 2005; Wong, Ho and Autio, 2005). Little is known about how these two groups are distinctive in their impact on GDP gap between catch-up and non-catch-up economies. Our research addresses this gap by providing a detailed account of literature and supporting this with investigating the empirical relationship between GDP gap and entrepreneurial motivations including the interaction effect of catch-up and non-catch-up economies.

The idea behind economic catch-up is to reduce the gap in GDP vis-à-vis a leading economy. Fagerberg and Godinho (2006) define catch-up as the ability to reduce the gap in productivity and income as compared to a leading more developed economy. Odagiri, H. et al. (2010) defines the same as a process through which latecomers to development narrow their gap in income and technology compared to a leading economy. A closely related concept predominantly used in literature is economic growth which measures an increase in productivity, i.e. growth in GDPPC for the incumbent country (see Carree et al., 2002; van Stel, Carree and Thurik, 2005), but we argue that it provides a

monotonic one way measurement and it is not a superior control to correct for catching up effects between countries. In contrast economic catch-up measured in terms of GDP gap provides a difference in per capita economic growth between the incumbent and the leading economy which is a more comprehensive measure as it accounts for the two way threshold effects and is a better indicator for comparing growth or economic convergence.

According to Gries and Naude (2008) entrepreneurs in factor-driven less developed economies are equally motivated by necessity and opportunity motives. While, in developed economies opportunity driven motives take a natural lead as necessity gradually falls and subsides as a motivator (Wennekers et al., 2005). It is because the total entrepreneurial activity is negatively correlated with GDP per capita, therefore as per capita income increases typically in more advanced economies, the ratio of self-employed (a widely used indicator confirming entrepreneurial activity) to the salaried worker decreases and in such conditions people naturally give preference to wage employment. However, those intrinsically motivated by opportunities and their desire for independence would still choose to become entrepreneurs and are mostly better planned with higher rates of survival and greater success in business. Consequently, these opportunity-driven entrepreneurs have a greater impact on economic growth although they may not be in abundance as compared to those driven by necessity (Liñán, Fernández-Serrano and Romero, 2013). This discussion leads us to conclude our second set of hypotheses as follows:

Hypothesis 4: Necessity entrepreneurial activity in catching up countries do not have a significant impact in reducing the GDP gap

Hypothesis 5: Opportunity entrepreneurial activity in catching up countries have a significant impact in reducing the GDP gap

The rationale behind our hypotheses is to provide a clear distinction between the necessity and opportunity entrepreneurs and how they impact economic catch-up reducing GDP gap between the developed and less developed countries. Further, we seek to understand how the impact of necessity and opportunity entrepreneurship varies in different economic contexts, i.e. in catch-up and non-

catch-up economies. While, a similar analysis may have been carried out before to analyse the impact on economic growth measured in terms of GDP per capita (Wong, Ho and Autio, 2005), we argue that using the measure of GDP gap provides a clearer picture of this dynamic.

4.3 Data, Model and Methodology

4.3.1 Empirical model

In this section, we present our foundation and rationale for developing an empirical model to test the above hypothesis. Our empirical motivation is based on the neo-classical models of economic growth and takes into account fundamental works of Solow (1956), Romer (1986), Lucas (1988) and other established researchers in this domain. According to Solow goods in an economy are produced using Cobb-Douglas production function which includes capital, labour and technology. However, growth in his opinion is the function of capital and labour which is determined exogenously by technological change. In simpler terms it means a country with higher levels of capital and labour would more rapidly adjust to a steady state equilibrium and an associated technological enhancement would further augment labour productivity making an upward shift in the production function leading to enhanced growth. This measure of enhanced growth and productivity helps the country to ultimately catch-up with the more developed economies of the world. This work laid the foundations for an important concept termed as economic catch-up and gave a new direction to the literature on economic growth. Nevertheless Solow in his study could not explain the causes for sudden technological enhancement and defined it as an exogenous change. This gap was filled by the endogenous growth theory presented by Romer (1986, 1990) and Lucas (1988) as they determined growth to be the result of technological change caused by the endogenous deliberation of agents purporting profit maximisation. Thus endogenous growth theory came very close in determining the role entrepreneurs play in economic growth but unfortunately extreme aggregation of firms rendered the model to remain incapable of discovering the micro-foundations associated with the role of entrepreneurs. This rationale leads us to develop our empirical model to examine the role of

entrepreneurial activity in economic catch-up, i.e. reducing of GDP gap. The general specifications of our economic model are as follows:

$$GDP\ gap = \beta ln(x_{i,t-1}) + \sigma TEA_{i,t} + \emptyset Z_{i,t} + \delta_i + \rho_t + \epsilon_{i,t} \quad \textbf{(4-1)}$$

where the subscripts i and t refer to countries and years in our dataset respectively. The dependent variable is GDP gap, while the variables explaining GDP gap include $x_{i,t-1}$ which is lagged GDP per worker and represents feedback loop in the equation, $TEA_{i,t}$ is the measure of total entrepreneurial activity measured in terms of necessity and opportunity motivations respectively, $Z_{i,t}$ is the row vector of other control variables used to explain economic growth, δ_i is the country specific fixed effect, while ρ_t is the time effect and $\epsilon_{i,t}$ is an error term.

Our equation is unique as compared to other models of economic growth in entrepreneurship research which use GDP per capita to define economic growth. We as described above use the GDP gap as our choice of dependent variable which in our opinion is a better measure. In addition, our equation encompasses the feedback loop making our model dynamic and look like conventional β-convergence model which is typically used in economic studies to measure cross-country economic growth (Barro, 1991; Mankiw, Romer and Weil, 1992). The concept of a feedback loop has never been employed in entrepreneurship research before this paper. Finally, the inclusion of the feedback loop in this model also allows us to confirm the convergence hypothesis.

4.3.2 Data and variables

We use GEM dataset for extracting data on entrepreneurship in our study. GEM is the most comprehensive study of entrepreneurship with an annual data collection cycle encompassing entrepreneurial behaviours, attitudes and national context. For the purpose of this study, we utilise GEM's Adult Population survey which collects data targeting a minimum of 2000 randomly selected representative sample of adults per country, across a range of countries from all income groups. To allow data to be comparable across countries and time, the survey is administered at the same time each year, and appropriate sample weights are allocated at the national level according to each country's population

grouped by gender and age. Thus our analysis is based on the resulting aggregate national level GEM data set from 2002 – 2012 across 47 countries, which is the maximum number of countries with a minimum of 4 years observation recorded for each country[12], as data is not available for all the years across every country. In addition to GEM, we collated different macroeconomic indicators using PWT 8.1, World Development Indicators and World Economic Outlook. Our choice of regressors and determinants included in $X_{i,t}$ to explain economic growth is based on the extant survey of the literature. These variables combine traditional determinants of growth used in the analysis of conditional convergence (Mankiw, Romer and Weil, 1992; Romer, 1986; Solow, 1956). Table A.1 in the appendix provides a summary description of all the variables used in our model.

GDP gap is our dependent variable and as argued above we measure economic convergence not as a rate of economic growth, rather based on the traditional definition of economic catch-up we purport GDP gap vis-à-vis a leading economy to be a more appropriate measure for economic convergence (Fagerberg and Godinho, 2006). In line with the work of Lee (2013), we benchmark GDP[13] gap in our time-series cross section of 47 countries over 11 years w.r.t United States, i.e. we calculate the differences in Log GDP per worker[14] between the incumbent country and the United States as a measure of GDP gap in our equation. However, to ensure robustness of test results the data is also tested using GDP gap w.r.t G8 countries and also Scandinavian countries but the results remain the same without any major change (refer to tables in the Appendix for additional regression results).

[12] We limit the choice of observations to a minimum of 4 because we use two-step least squares regression with a maximum lag structure of 1 year. To keep our results accurate and meaningful we kept a limit of minimum of 4 observations as a criteria for a particular country to be included in our dataset. Out of a total of 106 countries from GEM database (over 2002 – 2012) only a select of 47 countries were able to match this selection criteria.

[13] The measure of GDP used in our analysis is in PPP at constant prices of 2011 in USD, having data in PPP ensures comparison across the countries while holding it constant at 2011 prices ensures comparability across time (please see Feenstra, Inklaar and Timmer (2015).

[14] While GDP per capita is the most commonly used variable in studies of economic growth, we have used GDP per worker in line with the arguments of Wong, Ho and Autio (2005) which determines that two component for GDP Per Capita (GDP/N) are GDP per worker (GDP/L) which captures productivity gains and labour participation rates (L/N). In our model convergence is better defined by productivity gains as we control for differences in labour participation (L/N) rates across different countries.

Initial level of income is a strong predictor explaining differences in economic growth across countries as observed by Solow (1956). In our equation, we model the initial level of income using GDP per worker at $t-1$ and we expect countries with lower levels of GDP per worker to grow at higher rates closing the gap w.r.t United States more quickly than their developed counterparts. Based on the conditional convergence hypothesis we expect $\hat{\beta}$ coefficient to be negative and significant (Barro, 1991; Solow, 1956).

Physical capital accumulation or the ratio of Investments is traditionally used both in exogenous and endogenous models and is considered as a strong determinant of economic growth (Romer, 1986; Solow, 1956). We use a measure of physical capital in our model as a ratio of gross capital formation and GDP, where gross capital formation (formerly gross domestic investment) according to the World Development Indicators consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories[15]. Based on the economic theory physical capital promotes economic growth as some investments produce growing returns. Therefore we expect the coefficient to be negative, and the measure is expected to help in reducing the GDP gap causing an economy to catch-up with the developed world.

Human capital is another strong determinant of positive economic growth (Mankiw, Romer and Weil, 1992). Traditionally models of economic growth have used human capital per person, while this paper utilises the measure of human capital per worker which is consistent with our measure of GDP per worker. In a number of studies secondary school enrolment is used as a proxy for human capital (Barro and Lee, 1994; Caselli, Esquivel and Lefort, 1996), but there is a strong argument to this being a biased indicator as secondary school enrolment is not a good measure of human capital for developing countries (Kalaitzidakis et al., 2001; Klenow and Rodrã-guez-clare, 1997). Keeping this in view we use the

[15] "Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and "work in progress." According to the 1993 SNA, net acquisitions of valuables are also considered capital formation. Data is in constant 2011 U.S. dollars". (World Development Indicators)

index of human capital per worker derived from Penn World Table 8.1. The Penn World Table constructs this measure of human capital using average years of schooling interpolated from Barro and Lee (2013) and country-specific estimates for returns to primary, secondary and tertiary education (Psacharopoulos and Patrinos, 2004). This measure is expected to be a better indicator for cross-country analysis, and we anticipate a negative coefficient as increases in human capital reduce the GDP gap.

Population growth is acknowledged to be an important determinant of economic performance and following the traditional growth model specifications we use $n_{i,t} + g + d$ formulation to cater the impact of population growth. Where $n_{i,t}$ is the natural yearly growth rate of population, while g represents labour-augmenting technological progress and d is the rate of depreciation of physical capital[16]. An increase in population means a decrease in economic growth, as part of the national investment is used in providing for additional workers instead of raising the ratio of capital per worker (Barro, 1998). As a consequence we expect a positive coefficient, because an increase in population should reflect an increase in the GDP gap.

Finally, based on the arguments of Barro-type extended growth regression (Barro, 1991), which supports the consideration of additional determinants of economic growth, we are interested in exploring the impact of opportunity and necessity total entrepreneurial activity (TEA) on economic catch-up, i.e. reduction in GDP gap. Our additional regressors include opportunity and necessity TEA rates from the GEM database, a dummy variable categorising the differences between catch-up[17] and non-catching up economies, an interaction variable accounting for the opportunity and necessity TEA[18] in catching-up countries and

[16] Following Caselli, Esquivel and Lefort (1996); Islam (1995) and Mankiw, Romer and Weil (1992) we choose 0.05 as the value for $(g + d)$.

[17] According to the definition of economic catch-up all countries with an average growth rate of GDP per capita in 2011 constant (for the period 2002-2012) above the average growth rate of USA* are taken as catching up economies. While countries with an average growth rate equal to or below the average growth rate of USA are classified as non-catching up economies. * The 11 year (2002 – 2012) average growth rate for USA is equal to 3.6%

[18] This variable is calculated by multiplying dummy variable for catching-up countries with opportunity and necessity TEA rates. Before taking the interaction, we demean the values of opportunity and necessity TEA

a dummy for time to capture time effects. Further, to normalise the measure, we use natural log transformations.

4.4 Methodological Considerations

The specification in equation (4-1) is expected to have a simultaneity bias as entrepreneurial activity has often been found to have an inverse causal relationship with economic growth (Mills and Schumann, 1985; Storey, 2003). Thus, there is a hypothesised recursive linkage between entrepreneurial activity and the measure of economic growth, i.e. our dependent variable. To control for possible endogeneity given the existing simultaneous relationship between economic growth and entrepreneurial activity, a two-stage least squares estimation is considered to be an appropriate estimator. Therefore, in its general form the first stage of our equation consists of:

$$TEA_{i,t} = ln(x_{i,t-1}) + \sigma_1 UNEMP_{i,t} + \sigma_2 ExPt_{i,t} + \emptyset_0 Z_{i,t} + \delta_i + \rho_t + \epsilon_{i,t} \qquad \textbf{(4-2)}$$

where entrepreneurial activity is instrumented with unemployment $UNEMP_{i,t}$ and market expansion potential $ExPt_{i,t}$, while other variables are defined as above. Unemployment has frequently been linked with entrepreneurship, the first time this relationship was examined dates back at least to Oxenfeldt (1943), when he showed that those unemployed or with low prospects for wage employment consider self-employment as a viable alternative. Also, more recently Acs et al. (2012) considered unemployment as an instrument for entrepreneurship in their study on economic growth. While market expansion potential as defined by GEM is the impact in terms of market expansion by those involved in entrepreneurial activity. Therefore, to instrument opportunity entrepreneurial activity we use the measure of significant expansion potential which represents an impact of 4 on a four point index [4 being the highest]. And to instrument necessity entrepreneurial activity we use the measure of no expansion potential which represents an impact of 1 on a similar four point index [1 being the lowest].

by taking the difference with average opportunity and necessity TEA values to avoid multicollinearity - please see Drakos, Kouretas and Tsoumas (2014). Without demeaning, the collinearity statistics using VIF values were quite high suggesting problems of multicollinearity between independent variables.

As discussed the above equation is estimated alternating two different TEA indices, i.e. opportunity and necessity as the measures for entrepreneurial activity. Thus, the estimated values for respective TEA from Eq. (4-2) are then inserted into Eq. (4-1) separately for each occasion. Further, the error term in our model violates the i.i.d. assumption as we expect both heteroscedasticity and autocorrelation. It is reasonable to expect heteroscedasticity as we use country-level data. Similarly, autocorrelation is induced as we use lagged partial dependent variable on the right-hand side of the equation as an independent variable representing feedback loop. Therefore, we report our results using HAC corrected standard errors and also provide the F value for our estimation, the under identification test, the weak identification test and the Hansen J statistics confirming the validity of our instruments. The under identification test confirms if the equation is identified and the excluded instruments are 'relevant', i.e. correlated with the endogenous regressors. However, if the instruments are weakly correlated with the endogenous regressors the estimators may perform poorly and therefore weak identification test determines the instruments strength which should be greater than the critical value. Finally, the Hansen J statistics confirm the validity of all the instruments used i.e. instruments are uncorrelated with the error term and are correctly excluded from the estimated equation.

4.5 Results

Before we proceed to the discussion of our regression results, Table 4-1 presents the basic descriptive statistics of the main regression variables. Over the sample period, the average GDP gap per worker w.r.t US and the rest of the world is 0.9406 in terms of natural log and if the number is transformed back to its original units it is equivalent to 2,560 USD (per worker) and it has a standard deviation of 0.98 percent approximately. The necessity total entrepreneurial activity is characterised by a mean value of 0.3737 which if transformed back to its original units becomes 1.45 percent and it is the percentage of 18-64 year old population in a country who are involved in entrepreneurship because they have no better choice for work. Similarly, opportunity total entrepreneurial activity is characterised by a mean value of 1.6898 which if transformed back to its original

units becomes 5.41 percent and it is the percentage of 18-64 year old population in a country who claim to be driven by opportunity as opposed to finding no other option for work.

Table 4-1 Descriptive statistics (aggregate data)

	N	Mean	Std. Dev	Min	Max
GDP gap (w.r.t US)	517	0.9406	0.9811	- 0.3251	3.6900
Necessity total entrepreneurial activity	396	0.3737	0.9785	- 2.4079	2.8003
Opportunity total entrepreneurial activity	396	1.6898	0.5508	- 0.2107	3.3867
Physical capital accumulation	528	2.7818	0.5038	1.1107	4.0026
Human capital	517	1.0480	0.1394	0.5771	1.2890
Population growth $\boldsymbol{n_{i,t} + g + d}$	528	0.0577	0.0087	0.0220	0.1044
Necessity TEA in catching up countries (interaction variable)	396	0.3045	0.6300	- 1.0669	2.4265
Opportunity TEA in catching up countries (interaction variable)	396	0.1020	0.3825	- 1.1360	1.6968

Note – The table summarises descriptive statistics for the main regression variables. *Gap gap* (w.r.t US) is the difference between the US GDP per worker and the GDP per worker of the incumbent country. *Necessity Total entrepreneurial activity* is the percentage of 18-64 population in the country who are involved in entrepreneurship because they have no better choice for work. *Opportunity Total entrepreneurial activity* is the percentage of 18-64 population in the country who claim to be driven by opportunity as opposed to finding no other option for work. *Physical capital accumulation* is the measure of the ratio of Gross Capital Formation and the GDP of a country. *Human capital* is the index of human capital per worker, based on years of schooling and returns to education. *Population growth* is the yearly rate of total population growth + 0.05 to account for the labour augmented technological progression. Unemployment *Necessity TEA in*

catching up countries is the interaction variable measured with the interaction of variable necessity total entrepreneurial activity and catch-up dummy. *Opportunity TEA in catching up countries* is the interaction variable measured with the interaction of variable opportunity total entrepreneurial activity and catch-up dummy. All variables are transformed to Natural Log.

Table 4-2 reports the correlation coefficients for the set of explanatory variables and it suggests that multicollinearity is unlikely to affect the results. To ensure there is no multicollinearity VIF statistics are also presented in the appendix.

Table 4-2 Correlation matrix

Variable	GDP Gap	Initial level of GDP	Physical Capital	Human Capital	Population Growth
Initial level of GDP	-0.9937				
Physical Capital	-0.6021	0.6017			
Human Capital	-0.7128	0.7221	0.5115		
Population Growth	0.2416	-0.2421	0.0138	-0.3175	
Necessity TEA	0.7890	-0.7762	-0.5740	-0.5820	0.2744
Opportunity TEA	0.5481	-0.5346	-0.2620	-0.4045	0.4029

Based on the descriptive statistics Table 4-3 (a) present the mean differences between catching up and non-catching up countries. In the sample, there are twenty-one catching up and twenty-five non-catching up countries. The data table shows that there are significant differences between catching up and non-catching up economies. The GDP gap per worker (w.r.t. USA) is almost eight times higher in catching up countries, although they are lagging behind in the race of economic development, the rate at which these countries are growing each year is significantly higher compared to the rate of growth amongst the non-catching up economies. Given these differences, the policymakers cannot adopt a ‘one size fit all’ approach in defining an entrepreneurial public policy for their respective regions (Ács and Varga, 2005). Therefore, while it is important to analyse the role entrepreneurs play in strengthening economic growth, due recognition should also be given to the business context breeding the entrepreneurial ecosystem, i.e. differences between catching up and non-catching up economies.

Table 4-3 Basic descriptive data and test of the significance of gaps (2002–2012)

(a)

	Catching up countries	Non catching up countries	Catching up vs Non catching up countries	
	Mean ($\mu 0$)	Mean ($\mu 1$)	Difference $=\mu 0 - \mu 1$	$H0: \mu 0 - \mu 1 = 0$
Log of GDP gap (per worker)	1.6868	0.2839	1.4029	0.0000***

(b)

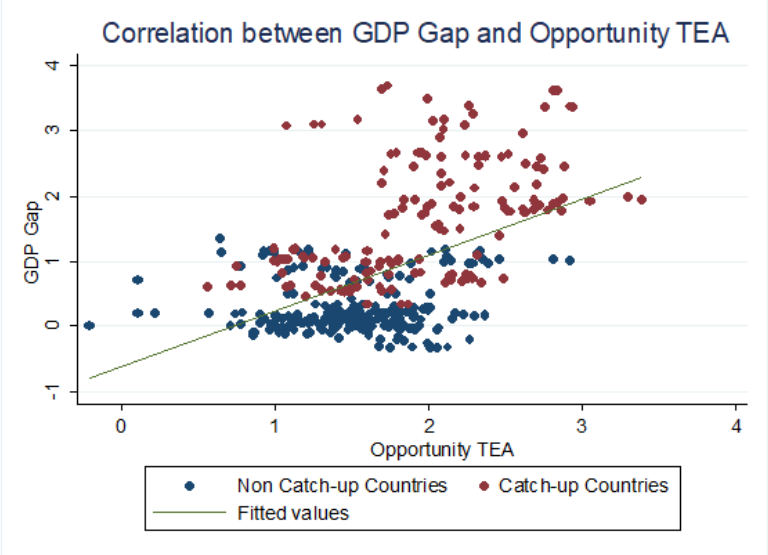
	Opportunity TEA	Necessity TEA	Opportunity TEA vs Necessity TEA	
	Mean ($\mu 0$)	Mean ($\mu 1$)	Difference $=\mu 0 - \mu 1$	$H0: \mu 0 - \mu 1 = 0$
Whole World	6.3332	2.3382	3.9950	0.0000***
Catching up countries	3.2110	1.6395	1.5715	0.0000***
Non catching up countries	3.1222	0.6986	2.4236	0.0000***

**** significance at 1% level

Similarly, Table 4-3 (b) presents the mean differences between opportunity and necessity total entrepreneurial activity analysed for all the 47 countries in our database grouped as a whole world and also separately for catch-up and non-catch-up countries. There are significant mean differences between opportunity and necessity entrepreneurial activity for all the three groups and the level of opportunity entrepreneurial activity comparatively remains higher in all of them. While on average opportunity entrepreneurial activity on its own is almost the same in catch-up and non-catch-up countries. On the contrary, necessity entrepreneurship is comparatively more than twice as high in catch-up countries. Further, both opportunity and necessity entrepreneurial activity tends to be positively related to the GDP gap (Figure 4-1). For non-catch-up countries, although entrepreneurial activity remains low as a whole, it is more strongly knitted together and has lower levels of variance across different countries. While, in the context of catch-up countries where GDP gap is significantly higher, entrepreneurial activity remains more widely dispersed and the respective level of variance amongst different countries remains higher. Finally, this analysis allows us to accept our first hypothesis according to which there is significant

mean difference between necessity and opportunity entrepreneurial activity. It further intrigues the need to investigate the impact these two kinds of entrepreneurial activity have on GDP gap and how this compares in the catch-up and non-catch-up context.

(a)



(b)

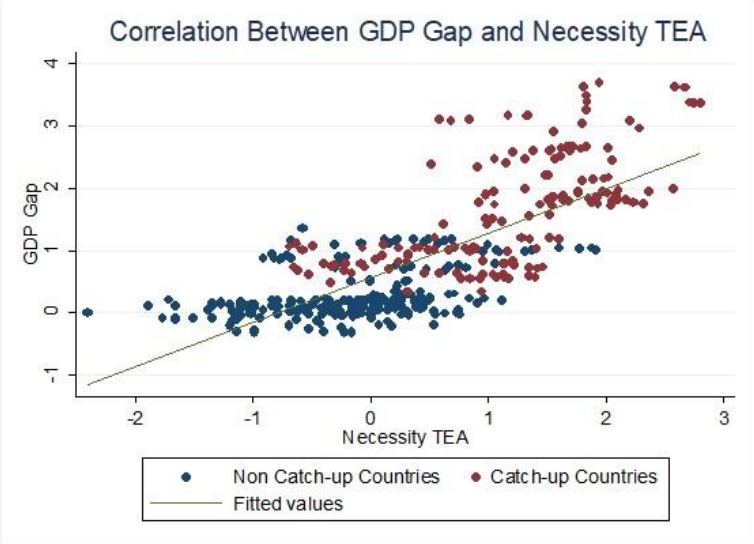


Figure 4-1 Correlation between GDP gap and opportunity/necessity TEA

Source: Author

As discussed above in the section on methodology, a unidirectional model would lead to biased results given interdependencies between entrepreneurship and

economic growth. Therefore, we develop a model which simultaneously considers the two-way relationship between entrepreneurship and economic growth. This approach not only resolves the statistical bias but also provides interesting hindsight for policymakers on what drives entrepreneurial activity. Table 4-4, therefore, presents the result of both the first and the second stage of the two-stage regression analysis. The two columns represent the two types of entrepreneurial activity considered in our model, and we also provide an interaction variable which determines how the respective entrepreneurial activity compares in catch-up and non-catch-up economies.

4.5.1 Impact of economic growth on entrepreneurial activity

The regression results from the first-stage based on equation (4-2) estimate how different factors impact opportunity and necessity entrepreneurial activity. The impact of unemployment is found to be positive and significant for driving necessity entrepreneurial activity, while, it is insignificant for opportunity entrepreneurship. This result is in line with the 'push' and 'pull' theory as Audretsch and Thurik (2002) determines that an increase in the level of unemployment under the 'push' effect will have a positive impact on the number of entrepreneurial start-ups; and conversely under the assumptions of a 'pull' effect an increase in unemployment will have no effect on the number of start-ups. An alternate factor that defines the supply of entrepreneurs is the market expansion potential, and it seems to have a stronger impact in determining entrepreneurial activity compared to unemployment. For opportunity entrepreneurship, the variable market expansion potential represents significant market expansion, while for necessity entrepreneurship it encapsulates no or minimum expansion potential. Therefore, an increase in entrepreneurs' expansion potential significantly increases both opportunity and necessity motivated entrepreneurial activity. Similarly, an increase in the lagged values of entrepreneurial activity (i.e. lower entrepreneurial deaths or exit) has a positive impact on opportunity and necessity entrepreneurship. While it is interesting to note that an increase in physical capital accumulation in a country has no impact on opportunity motivated entrepreneurial activity, it significantly reduces the

necessity based entrepreneurship. Also, an increase in factors like technology augmented growth in population has a huge impact on opportunity motivated entrepreneurship while it has no impact on necessity entrepreneurial activity. Since, catching up countries have significantly higher levels of population growth (Lee, 2013) this is presumably one of the reasons that opportunity motivated entrepreneurial activity is greater in these countries on average compared with the level of necessity based entrepreneurial practice.

4.5.2 Impact of entrepreneurial activity on economic growth

The regression results, from the second-stage based on equation (4-1), estimate the impact of entrepreneurial activity on economic growth in the presence of a feedback loop. The coefficient of the initial value of GDP per worker is negative and significant in both the columns; this confirms our convergence hypothesis, i.e. countries are closing their GDP gap w.r.t USA while the model with opportunity TEA closes this gap at a higher rate compared with necessity TEA. Further, opportunity motivated activity reduces the GDP gap, but the impact appears after a one year lag. This suggests that in the base year while the market is going through an adjustment process as a result of the entrepreneurial disruption, the real impact is established from the next year when a subsequent increase in opportunity entrepreneurial activity results in facilitating economic catch-up by reducing the GDP gap vis-à-vis a leading economy. This is in line with the earlier observation by Fritsch (2011) who suggest that new firm formation can have both a positive and a negative impact depending upon the period in which the analysis is undertaken. However, the lagged values are also only significant for opportunity motivated entrepreneurial activity, while, although the necessity based entrepreneurial activity also has a negative impact this is not statistically significant. This allows us to accept our second and third hypothesis according to which the impact of necessity entrepreneurial activity is insignificant in reducing this gap, while opportunity entrepreneurial activity has a significant impact in reducing the GDP gap. Finally, for catching up economies, the above results suggest that only opportunity entrepreneurial activity significantly helps to reduce the GDP gap. This result aligns with earlier studies, such as the one

carried out by (Aparicio, Urbano and Audretsch, 2016; Ferreira et al., 2017) which shows a positive relationship between opportunity TEA and economic growth. This allows us to accept our fourth and fifth hypothesis confirming the statistical significance of opportunity entrepreneurial activity while necessity entrepreneurship has no significant impact on reducing the GDP gap.

Table 4-4 The economic convergence and entrepreneurial activity (2-SLS)

Second-Stage	Type of TEA Measure	
Dependent Variable: Log of GDP gap per worker (w.r.t USA)	Opportunity TEA	Necessity TEA
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.9799***	- 0.9693***
	(-63.27)	(-78.89)
Entrepreneurship (TEA)	0.3005***	0.0537
	(3.63)	(1.61)
L1. Entrepreneurship (TEA)	- 0.1571***	- 0.0147
	(-2.96)	(-0.65)
Physical capital accumulation	0.0077	0.0266
	(0.30)	(1.36)
Human capital	-0.0122	0.0236
	(-0.14)	(0.36)
Population Growth $n_{i,t} + g + d$	- 1.4279	0.2396
	(-1.42)	(0.41)
TEA in catching up countries	- 0.1204***	-0.0064
	(-2.69)	(-0.36)
Dummy catching up countries	-0.0046	0.0093
	(-0.23)	(0.59)
p > F	0.00	0.00
Under identification test	0.00	0.00
Weak identification test (Ct. Value at 10% = 19.93)	27.43	23.976
Valid Instruments (Hansen J Statistics)	0.1118	0.7948
Number of Observations	293	295
First-Stage	Type of TEA Measure	
Dependent Variable: Entrepreneurship (TEA)	Opportunity TEA	Necessity TEA
Initial level of GDP per worker $ln(x_{i,t-1})$	-0.0055	0.0012
	(-0.19)	(0.03)
Unemployment	- 0.0385	0.1515***
	(-1.42)	(3.57)
Market Expansion Potential	0.1787***	0.4081***
	(5.03)	(6.41)

L1. Entrepreneurship (TEA)	0.4143***	0.5145***
	(6.86)	(10.99)
Physical capital accumulation	- 0.0113	- 0.2473***
	(-0.23)	(-3.81)
Human capital	0.0622	0.2462
	(0.31)	(0.99)
Population Growth	4.5069**	-1.1631
$n_{i,t} + g + d$	(2.33)	(-0.43)
TEA in catching up countries	0.3956***	0.2429***
	(6.48)	(3.95)
Dummy catching up countries	0.0432	0.0537
	(1.11)	(0.85)

*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients. Estimates for time dummies are not presented but can be provided upon request. All calculations are conducted by STATA 12.0.

Although the selection of variables in this paper is based on the Cobb-Douglas production function following the economic convergence literature (Lucas, 1988; Romer, 1986; Solow, 1957). To ensure robustness of the above results the paper looks into the impact of adding an additional variable. In this regard Corruption perception index is added to the System GMM model using all the three points of reference i.e. US, G8 and Scandinavian countries (refer to Table A 4-5 The economic convergence and entrepreneurial activity (2-SLS) with additional variable Corruption Perception Index (CPI) Table A 4-6 The economic convergence and entrepreneurial activity (2-SLS) with additional variable Corruption Perception Index (CPI)in the appendix). The results confirm that the impact of opportunity TEA in catching up countries still holds irrespective of adding an additional measure. Similarly, it further confirms that necessity entrepreneurship makes no contribution to economic catch-up.

4.6 Conclusion

In this paper, we have analysed the impact that opportunity and necessity entrepreneurial activity has in reducing the GDP gap and facilitating economic catch-up. Our analysis reveals that it is only the opportunity entrepreneurial activity that has a significant impact, while necessity entrepreneurship is insignificant in reducing the GDP gap. Although, initially opportunity

entrepreneurship exacerbates the GDP gap as it disrupts the industry, after the 1st year it starts helping in reducing the GDP gap. As for catching up economies opportunity entrepreneurship significantly helps in facilitating economic catch-up by reducing the GDP gap.

On the contrary, while catching up economies have higher levels of entrepreneurial activity, on average this difference is mainly driven by higher values of necessity entrepreneurship which is more than double for catching up economies. Since necessity entrepreneurship has no significant impact in reducing the GDP gap, therefore, GDP gap (per worker) in catching up countries remain significantly higher. And despite the higher levels of entrepreneurial activity, these countries continue to strive to close the gap in income and productivity, thus remaining behind in the race of economic development.

Our research shows that an increase in market expansion potential subsequently increases entrepreneurial activity. Therefore, from a policy perspective, an increase in the market expansion potential would be more sustainable as it would increase opportunities in the economy. In other words, we may term this as an organic increase in the entrepreneurial activity which would strengthen economic growth and ultimately reduce the GDP gap. However, what drives and impacts market expansion potential is a topic suitable for future research.

Finally, policymakers need to carefully choose to strengthen the right type of entrepreneurial activity keeping in view the differences between opportunity motivated and necessity based entrepreneurial practices. Opportunity entrepreneurial activity is mostly the preferred choice as it is more sustainable in developing a robust entrepreneurial ecosystem. However, from policy perspective an increase in the number of opportunity entrepreneurs should be the result of eliminating the factors that breed necessity based entrepreneurial practices like reduction in unemployment and improvement in physical capital. A reduction in necessity entrepreneurial activity will induce an increase in opportunity motivated entrepreneurs, and this would strengthen the economic climate hence improving the process of economic catch-up.

Our research presents the importance of differentiating between different types of entrepreneurship and also signifies the importance of business context. It offers the choice of a new field of research for the scholars. There are certainly limitations with respect to the availability of data in the above analysis. Still the results drawn from this paper may have ramifications for our understanding of the process of entrepreneurial contribution and by consequence underscore the value of further research on the topic.

Appendix A

Table A 4-1 Summary description of variables and data sources

Variable	Definition	Sources
GDP Gap	The difference between US GDP per worker and GDP per worker of the incumbent country. The measure of GDP is in Purchasing Power Parity (PPP) constant 2011, US$	The data on GDP is from World Economic Outlook (WEO), while the data on workers is from World Development Indicators (WDI).
Initial level of GDP Per worker	GDP per worker of the incumbent country at $t-1$	Same as above
Physical Capital Accumulation	The measure is the ratio of Gross Capital Formation (constant 2011) and GDP (PPP, constant 2011, US$)	The data on Gross Capital Formation is from WDI, while data on GDP is from WEO
Human Capital	Index of human capital per worker, based on years of schooling and returns to education	Penn World Tables (PWT) 8.1
Population Growth $n_{i,t}+g+d$	Yearly rate of total population growth + 0.05 to account for $(g+d)$	The data on population is from WDI
Opportunity Total Entrepreneurial Activity (Opp. TEA)	Percentage of 18-64 population TEA who claim to be driven by opportunity as opposed to finding no other option for work	Global Entrepreneurship Monitor (GEM)
Necessity Total Entrepreneurial Activity (Ncc. TEA)	Percentage of 18-64 population TEA who are involved in entrepreneurship because they had no better choice for work	Global Entrepreneurship Monitor (GEM)
Dummy catching up countries	Dummy variable that assumes the value of 1 if a country is classified as catching up and 0 otherwise	Own calculations
TEA in catching up countries	Interactive variable measured with the interaction of TEA and catch-up dummy	Own calculations
Dummy no. of years	Dummy variable for the years from 2002 – 2012	Own calculations

Table A 4-2 The economic convergence and entrepreneurial activity (2-SLS)

Second-Stage	Type of TEA Measure	
Dependent Variable: Log of GDP gap per worker (w.r.t G8 Countries)	Opportunity TEA	Necessity TEA
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.9793***	- 0.9689***
	(-64.15)	(-81.72)
Entrepreneurship (TEA)	0.2980***	0.0389
	(3.70)	(1.25)
L1. Entrepreneurship (TEA)	- 0.1651***	- 0.0063
	(-3.05)	(-0.29)
Physical capital accumulation	0.0129	0.0242
	(0.53)	(1.30)
Human capital	-0.0774	- 0.0078
	(-0.89)	(-0.13)
Population Growth $n_{i,t} + g + d$	- 1.5260	0.1141
	(-1.54)	(0.21)
TEA in catching up countries	- 0.1136***	-0.0018
	(-2.73)	(-0.11)
Dummy catching up countries	-0.0048	0.0104
	(-0.24)	(0.69)
p > F	0.00	0.00
Under identification test	0.00	0.00
Weak identification test (Ct. Value at 10% = 19.93)	28.23	23.994
Valid Instruments (Hansen J Statistics)	0.1224	0.7444
Number of Observations	303	305
First-Stage	Type of TEA Measure	
Dependent Variable: Entrepreneurship (TEA)	Opportunity TEA	Necessity TEA
Initial level of GDP per worker $ln(x_{i,t-1})$	-0.0068	0.0011
	(-0.23)	(0.03)
Unemployment	- 0.0379	0.1548***
	(-1.39)	(3.65)
Market expansion potential	0.1793***	0.4112***
	(5.10)	(6.74)
L1. Entrepreneurship (TEA)	0.4354***	0.5148***
	(7.33)	(11.12)
Physical capital accumulation	- 0.0250	- 0.2505***
	(-0.52)	(-3.86)
Human capital	0.2099	0.2922
	(1.12)	(1.26)
Population Growth $n_{i,t} + g + d$	4.7501**	-0.9220
	(2.45)	(-0.34)

TEA in catching up countries	0.3805***	0.2416***
	(6.36)	(3.99)
Dummy catching up countries	0.0423	0.0525
	(1.09)	(0.84)

*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients. Estimates for time and country dummies are not presented but can be provided upon request. All calculations are conducted by STATA 12.0.

Table A 4-3 The economic convergence and entrepreneurial activity (2-SLS)

Second-Stage	Type of TEA Measure	
Dependent Variable: Log of GDP gap per worker (w.r.t Scandinavian Countries)	Opportunity TEA	Necessity TEA
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.9793***	- 0.9689***
	(-64.15)	(-81.72)
Entrepreneurship (TEA)	0.2980***	0.0389
	(3.70)	(1.25)
L1. Entrepreneurship (TEA)	- 0.1651***	- 0.0063
	(-3.05)	(-0.29)
Physical capital accumulation	0.0129	0.0242
	(0.53)	(1.30)
Human capital	-0.0774	- 0.0078
	(-0.89)	(-0.13)
Population Growth $n_{i,t} + g + d$	- 1.5260	0.1141
	(-1.54)	(0.21)
TEA in catching up countries	- 0.1136***	-0.0018
	(-2.73)	(-0.11)
Dummy catching up countries	-0.0048	0.0104
	(-0.24)	(0.69)
p > F	0.00	0.00
Under identification test	0.00	0.00
Weak identification test (Ct. Value at 10% = 19.93)	28.23	23.994
Valid Instruments (Hansen J Statistics)	0.1224	0.7444
Number of Observations	303	305
First-Stage	Type of TEA Measure	
Dependent Variable: Entrepreneurship (TEA)	Opportunity TEA	Necessity TEA
Initial level of GDP per worker $ln(x_{i,t-1})$	-0.0068	0.0011
	(-0.23)	(0.03)
Unemployment	- 0.0379	0.1548***
	(-1.39)	(3.65)
Market expansion potential	0.1793***	0.4112***
	(5.10)	(6.74)

L1. Entrepreneurship (TEA)	0.4354***	0.5148***
	(7.33)	(11.12)
Physical capital accumulation	- 0.0250	- 0.2505***
	(-0.52)	(-3.86)
Human capital	0.2099	0.2922
	(1.12)	(1.26)
Population Growth	4.7501**	-0.9220
$n_{i,t} + g + d$	(2.45)	(-0.34)
TEA in catching up countries	0.3805***	0.2416***
	(6.36)	(3.99)
Dummy catching up countries	0.0423	0.0525
	(1.09)	(0.84)

*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients. Estimates for time and country dummies are not presented but can be provided upon request. All calculations are conducted by STATA 12.0.

Table A 4-4 The economic convergence and entrepreneurial activity (2-SLS) with additional variable Corruption Perception Index (CPI)

Second-Stage	Type of TEA Measure	
Dependent Variable: Log of GDP gap per worker (w.r.t US)	Opportunity TEA	Necessity TEA
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.9592***	- 0.9623***
	(-57.90)	(-75.79)
Entrepreneurship (TEA)	0.3394***	0.0628
	(3.66)	(1.92)
L1. Entrepreneurship (TEA)	- 0.1579***	- 0.0220
	(-2.76)	(-1.00)
Physical capital accumulation	0.0609**	0.0573***
	(2.05)	(2.64)
Human capital	-0.0628	0.0063
	(-1.39)	(0.10)
Population Growth	- 1.5160	0.5862
$n_{i,t} + g + d$	(-1.39)	(0.98)
Corruption perception index (CPI)	- 0.0230***	- 0.0117***
	(-4.24)	(-3.15)
TEA in catching up countries	- 0.1452***	- 0.0108
	(-2.84)	(-0.60)
Dummy catching up countries	-0.0297	- 0.0012
	(-1.32)	(-0.08)
p > F	0.00	0.00
Under identification test	0.00	0.00
Weak identification test (Ct. Value at 10% = 19.93)	24.20	24.145

Valid Instruments (Hansen J Statistics)	0.7962	0.5128
Number of Observations	276	278
First-Stage	Type of TEA Measure	
Dependent Variable: Entrepreneurship (TEA)	Opportunity TEA	Necessity TEA
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.0256	0.0278
	(-0.83)	(0.64)
Unemployment	- 0.0223	0.1400***
	(-0.78)	(3.32)
Market expansion potential	0.1719***	0.4401***
	(4.76)	(6.72)
L1. Entrepreneurship (TEA)	0.3915***	0.4962***
	(6.38)	(9.90)
Physical capital accumulation	- 0.0370	- 0.2300***
	(-0.71)	(-3.15)
Human capital	0.0989	0.1606
	(0.49)	(0.61)
Population Growth $n_{i,t} + g + d$	4.8219**	-1.465
	(2.45)	(-0.53)
Corruption perception index (CPI)	0.0176*	- 0.0254
	(1.70)	(-1.52)
TEA in catching up countries	0.4184***	0.2210***
	(6.68)	(3.60)
Dummy catching up countries	0.0542	0.0659
	(1.27)	(1.05)

*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients. Estimates for time and country dummies are not presented but can be provided upon request. All calculations are conducted by STATA 12.0

Table A 4-5 The economic convergence and entrepreneurial activity (2-SLS) with additional variable Corruption Perception Index (CPI)

Second-Stage	Type of TEA Measure	
Dependent Variable: Log of GDP gap per worker (w.r.t G8 Countries)	Opportunity TEA	Necessity TEA
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.9591***	- 0.9617***
	(-59.09)	(-78.63)
Entrepreneurship (TEA)	0.3337***	0.0486
	(3.72)	(1.59)
L1. Entrepreneurship (TEA)	- 0.1671***	- 0.0140
	(-2.87)	(-0.66)
Physical capital accumulation	0.0641**	0.0538***
	(2.23)	(2.62)
Human capital	- 0.1357	- 0.0224
	(-1.44)	(-0.37)

Population Growth	- 1.6128	0.4605
$n_{i,t} + g + d$	(-1.50)	(0.81)
Corruption perception index (CPI)	- 0.0219***	- 0.0115***
	(-4.23)	(-3.28)
TEA in catching up countries	- 0.1348***	- 0.0063
	(-2.87)	(-0.38)
Dummy catching up countries	-0.0287	0.0002
	(-1.31)	(0.02)
p > F	0.00	0.00
Under identification test	0.00	0.00
Weak identification test (Ct. Value at 10% = 19.93)	24.950	26.221
Valid Instruments (Hansen J Statistics)	0.7803	0.5521
Number of Observations	285	287
First-Stage	Type of TEA Measure	
Dependent Variable: Entrepreneurship (TEA)	Opportunity TEA	Necessity TEA
Initial level of GDP per worker	- 0.0264	0.0276
$ln(x_{i,t-1})$	(-0.85)	(0.63)
Unemployment	- 0.0227	0.1426***
	(-0.79)	(3.40)
Market expansion potential	0.1731***	0.4431***
	(4.84)	(7.02)
L1. Entrepreneurship (TEA)	0.4153***	0.4962***
	(6.87)	(10.02)
Physical capital accumulation	- 0.0501	- 0.2326***
	(-0.98)	(-3.21)
Human capital	0.2582	0.1970
	(1.33)	(0.81)
Population Growth	5.0861**	-1.2687
$n_{i,t} + g + d$	(2.57)	(-0.46)
Corruption perception index (CPI)	0.0168	- 0.0254
	(1.64)	(-1.52)
TEA in catching up countries	0.4003***	0.2198***
	(6.54)	(3.64)
Dummy catching up countries	0.0526	0.0653
	(1.24)	(1.05)

*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides *t* statistics for the respective coefficients. Estimates for time and country dummies are not presented but can be provided upon request. All calculations are conducted by STATA 12.0.

Table A 4-6 The economic convergence and entrepreneurial activity (2-SLS) with additional variable Corruption Perception Index (CPI)

Second-Stage	Type of TEA Measure	
Dependent Variable: Log of GDP gap per worker (w.r.t Scandinavian Countries)	Opportunity TEA	Necessity TEA
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.9613***	- 0.9636***
	(-63.57)	(-84.10)
Entrepreneurship (TEA)	0.3066***	0.0454
	(3.70)	(1.59)
L1. Entrepreneurship (TEA)	- 0.1532***	- 0.0133
	(-2.84)	(-0.68)
Physical capital accumulation	0.0588**	0.0494***
	(2.21)	(2.57)
Human capital	- 0.1253	- 0.0212
	(-1.44)	(-0.38)
Population Growth $n_{i,t} + g + d$	- 1.4403	0.4654
	(-1.45)	(0.87)
Corruption perception index (CPI)	- 0.0204***	- 0.0107***
	(-4.25)	(-3.29)
TEA in catching up countries	- 0.1240***	- 0.0056
	(-2.86)	(-0.36)
Dummy catching up countries	-0.0269	- 0.0004
	(-1.33)	(-0.03)
p > F	0.00	0.00
Under identification test	0.00	0.00
Weak identification test (Ct. Value at 10% = 19.93)	24.950	26.221
Valid Instruments (Hansen J Statistics)	0.7459	0.5900
Number of Observations	285	287
First-Stage	Type of TEA Measure	
Dependent Variable: Entrepreneurship (TEA)	Opportunity TEA	Necessity TEA
Initial level of GDP per worker $ln(x_{i,t-1})$	- 0.0264	0.0276
	(-0.85)	(0.63)
Unemployment	- 0.0227	0.1426***
	(-0.79)	(3.40)
Market expansion potential	0.1731***	0.4431***
	(4.84)	(7.02)
L1. Entrepreneurship (TEA)	0.4153***	0.4962***
	(6.87)	(10.02)

Physical capital accumulation	- 0.0501	- 0.2326***
	(-0.98)	(-3.21)
Human capital	0.2582	0.1970
	(1.33)	(0.81)
Population Growth	5.0861**	-1.2687
$n_{i,t} + g + d$	(2.57)	(-0.46)
Corruption perception index (CPI)	0.0168	- 0.0254
	(1.64)	(-1.52)
TEA in catching up countries	0.4003***	0.2198***
	(6.54)	(3.64)
Dummy catching up countries	0.0526	0.0653
	(1.24)	(1.05)

*,** and *** determine the level of significance at 10%, 5% and 1% respectively. Bracket (.) provides t statistics for the respective coefficients. Estimates for time and country dummies are not presented but can be provided upon request. All calculations are conducted by STATA 12.0.

Table A 4-7 Variance inflation factor (necessity TEA model)

Variable	VIF
Initial level of GDP	3.63
Physical Capital	1.81
Human Capital	2.27
Population Growth	1.23
Necessity TEA	2.74
Mean VIF	2.34

Table A 4-8 Variance inflation factor (opportunity TEA model)

Variable	VIF
Initial level of GDP	2.90
Physical Capital	1.70
Human Capital	2.28
Population Growth	1.32
Opportunity TEA	1.58
Mean VIF	1.96

Table A 4-9 List of catching up countries in our sample

Argentina	Iran	Romania
Brazil	Jamaica	South Africa
China	Korea	Taiwan
Colombia	Latvia	Thailand
Croatia	Malaysia	Turkey
Iceland	Peru	Uganda
India	Poland	Uruguay

Table A 4-10 List of non-catching up countries in our sample

Australia	Hungary	Russia
Belgium	Ireland	Singapore
Canada	Israel	Slovenia
Chile	Italy	Spain
Denmark	Mexico	Sweden
Finland	Netherlands	Switzerland
France	Norway	United Kingdom
Germany	Japan	United States
Greece	Portugal	

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5 CONCLUSION

5.1 Introduction

Drawing on the economic and entrepreneurship literature this thesis aims to identify the role of entrepreneurial activity in economic catch-up. In this context, it argues that catching up countries provide greater entrepreneurial activity as compared to the non-catching up countries and the increased entrepreneurial activity helps them to achieve sustained economic performance to help reduce the GDP gap with the developed world. This argument is in line with the previous research which suggests that entrepreneurship is the engine of economic growth (Davidsson, Lindmark and Olofsson, 1995; Ferreira et al., 2017; Holcombe, 1998) and 'the more entrepreneurs there are in an economy, the faster it will grow' (Dejardin, 2000 p.2). Similarly, Anokhin, Grichnik and Hisrich (2008) suggest that entrepreneurship is indispensable for economic growth and considers it to be the main vehicle for economic development. Although the literature extensively discusses the role of entrepreneurship as a determinant of economic growth (Acs et al., 2016; Capello and Lenzi, 2016; Martinez-Fierro, Biedma-Ferrer and Ruiz-Navarro, 2016; Naude, 2010), it has been less concerned to investigate the business context in terms of catching up and non-catching up characteristics of the country under which entrepreneurship may influence economic performance. In this regard particularly the role of entrepreneurial activity in convergence or facilitating economic catch up remains absent in the literature. Also, the effect of the feedback loop from one year of entrepreneurial activity to another is ignored in the research which deals with measuring the impact of entrepreneurship on economic growth. Finally, as there are significant differences between opportunity and necessity entrepreneurial activity, it is unclear how these differences impact the process of economic catch-up This PhD thesis attempts to fill these gaps, and in doing so, it builds on the neoclassical growth theory to establish the role of entrepreneurial activity in economic convergence.

This paper comprises of five sections. The next section presents the summary of key research findings, followed by a section on contribution to knowledge, then it discusses the implications for policy and research, and finally, it concludes by acknowledging the limitations of this research and presenting the ideas for future research.

5.2 Summary of Key Research Findings

The data presented in figure 5.1 presents the average data used in this research on economic growth, and entrepreneurial activity for 47 countries from 2002 – 2014. The data on entrepreneurial activity is drawn from GEM, and the data on economic growth is extracted from the World Economic Outlook. The black dotted line provides the comparison with the United States which is considered as a benchmark country for the purpose of this research. It shows that on average, countries with higher rates of economic growth experience higher levels of total entrepreneurial activity. For example, consider the case of China where the rate of economic growth is almost thrice compared to the USA, and similarly entrepreneurial activity is almost 1.5 times higher. The research reveals that on average entrepreneurial activity is twice as high in the catching up countries as compared to the non-catching up countries. In this regard, the findings in chapter three of this PhD thesis suggest that if evaluating without considering the feedback loop, an increase in entrepreneurial activity has no statistical significance in allowing the catching up countries to reduce their gap in productivity per worker w.r.t the United States. However, for the slow-growing non-catch up countries, an increase in entrepreneurial activity helps them to reduce their gap in productivity per worker w.r.t the United States. However, this result is argued to be incomplete as it does not include the feedback loop. Since it is already established that one year of entrepreneurial activity feeds into another (Galindo and Méndez, 2014; Mills and Schumann, 1985; Storey, 2003), this research purports that the feedback loop cannot be ignored in the studies measuring the impact of entrepreneurial activity on economic growth. In the presence of a feedback loop, the impact of entrepreneurial activity as a whole remains insignificant within catching up, non-catching up and the world as an aggregate. This is primarily due to lack of data and a limited number of observations for the catching up and non-catching up countries. To cater for this and to observe the impact of entrepreneurial activity in catching up economies, an interaction variable is

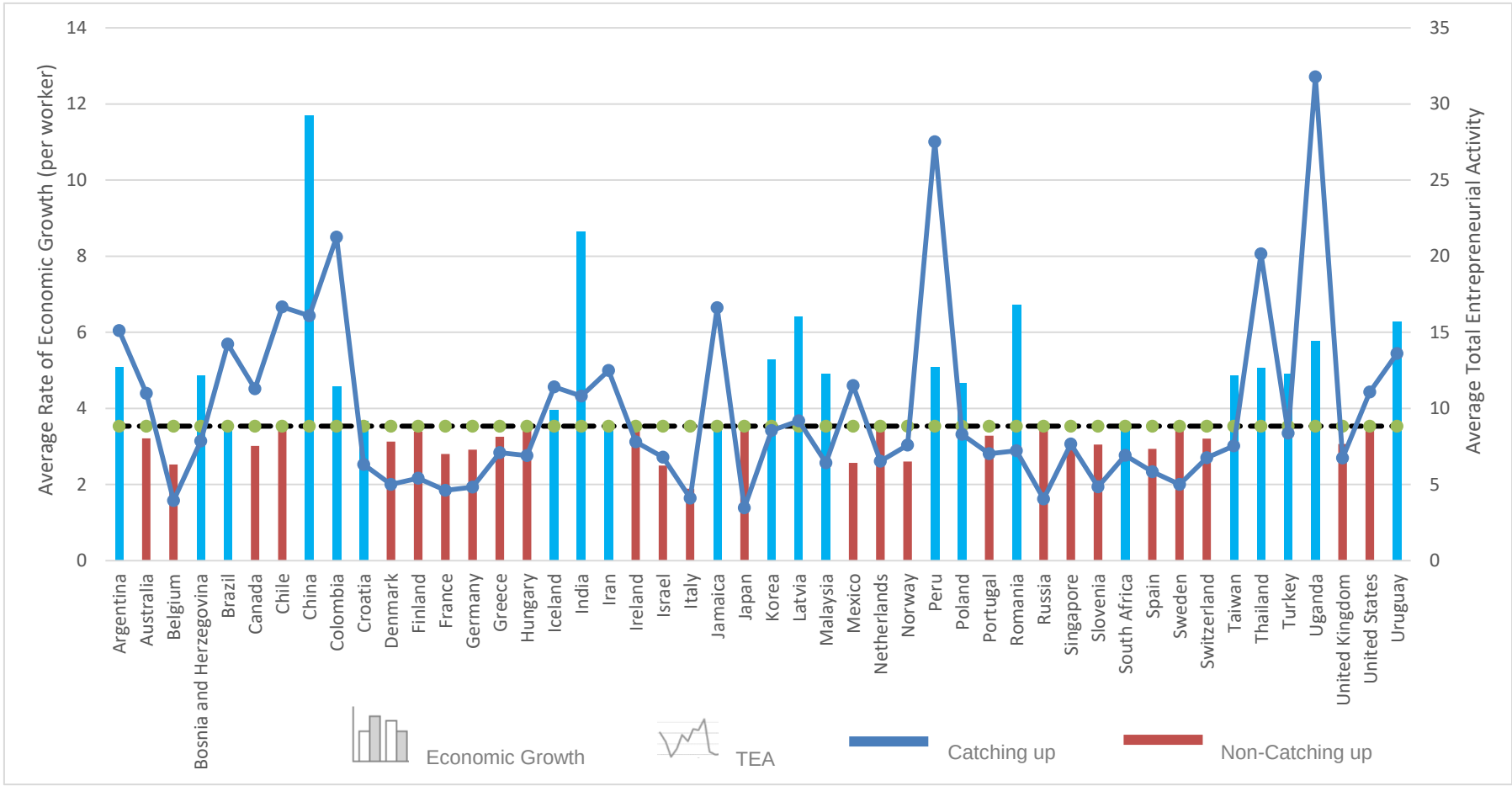

Figure 5-1 Graphical presentation of average data on TEA and economic growth from 2002 – 2014

Source: Author

introduced in the whole world model, interacting entrepreneurial activity with the dummy variable of catching-up countries. In this model, the impact of entrepreneurial activity within catching up countries is observed to be significant in reducing the productivity gap per worker w.r.t. USA. In other words, this result reflects that impact of entrepreneurial activity in catching-up economies is only significant when considering the whole world together in the presence of a feedback loop. The improved entrepreneurial performance from one year feeds into another, helping the catching-up countries to grow faster and reduce the respective GDP gap with the higher incumbent economies. This result also underscores the importance of considering the feedback loop when accounting for the impact of entrepreneurial activity on economic growth.

When considering the whole world model in the presence of a feedback loop a one percent increase in entrepreneurial activity within catching up countries is shown to reduce the GDP gap per average worker w.r.t USA by 5.3 percent. In this endeavour, the second phase (presented as chapter four) of this PhD thesis aims to explore if the catching up countries are any different from the non-catching up countries. This research includes all the 47 countries that were reported in the first phase, but due to data limitations, it only considers the period from 2002 to 2012. The data reveals significant differences between catching up and non-catching up countries. According to the data, on average catching up countries grow faster than the non-catching up countries, but their GDP gap w.r.t the United States which is a benchmark for the non-catching up countries is almost eight times higher. To this end, this research explores if all types of entrepreneurial activity result in reducing this GDP gap or is it a specific type of entrepreneurial activity which supports economic catch-up. To answer this question, this PhD thesis explores two types of entrepreneurial classification as defined by Reynolds et al. (2002), i.e. necessity driven entrepreneurial activity and opportunity driven entrepreneurial activity. The research reveals significant mean differences between opportunity and necessity entrepreneurial activity for all the three groups, i.e. catching up countries, non-catching up countries and the world as a whole. It shows that only opportunity entrepreneurial activity has a significant impact in reducing the GDP gap, while necessity entrepreneurship is insignificant. In this context on average, the level of opportunity entrepreneurial activity is almost the same in catching up countries as in non-catching up countries, while necessity-driven

entrepreneurship is more than double in catching up economies. Since necessity entrepreneurship has no significant impact in reducing the GDP gap, this suggests why catching up countries despite their higher level of overall entrepreneurial activity and rate of economic growth remain behind in the race of economic development with respect to the developed world.

Finally, this research shows that opportunity entrepreneurial activity in an economy increases with the increase in market expansion potential. As defined by GEM market expansion potential is the impact in terms of market expansion by those who are involved in entrepreneurial activity. Therefore, it is assumed that once markets expand and they reduce their GDP gap with the developed world, they are increasingly characterised by opportunity-driven entrepreneurs in the economy. Hence, this PhD thesis concludes that for catching up countries only higher rate of economic growth or an increase in entrepreneurial activity is not enough to allow them to catch up with the developed world. They need to focus on strengthening their market expansion potential which will encourage the entry of more and more opportunity entrepreneurs, and this will help the catching up countries to reduce their GDP gap vis-à-vis the developed world, and this will provide a sustained catching up.

5.3 Contribution to Knowledge

To discuss the contribution to knowledge let us reiterate the objectives and the research question of this PhD thesis presented in the introduction chapter. The first objective is to develop a conceptual framework through the synthesis of literature on economic development and the role of entrepreneurial activity in economic catch-up, the aim is to provide a research question for empirical investigation and to outline a direction for future research. The second objective is to establish the role of entrepreneurial activity in economic catch-up and to provide empirical evidence with theoretical underpinnings. The last objective is to critically evaluate different types of entrepreneurial motivation, how these impact economic catch-up and what it entails for the policymakers. Each of these objectives is covered as a separate chapter in this PhD thesis, and is tied to the central research question which is: ‘to define the role of entrepreneurial activity in economic catch-up and to highlight how entrepreneurial motivation may affect this dynamic association’. In answering the research question

this thesis contributes to the body of knowledge, and this section provides a discussion on this contribution presenting it separately aligned with each objective.

5.3.1 Contribution Objective 1

The main contribution of this thesis is that it provides a synthesis of two separate fields of research, i.e. entrepreneurship and economic catch-up/divergence. This allows for a better understanding of these two discrete fields and helps to establish a more holistic and interdisciplinary appreciation of this important area of business performance and economic behaviour. Previous research on entrepreneurship does not consider the business context in terms of catching up or diverging behaviours of the economy as a binding constraint on entrepreneurial performance. By placing catching up or diverging behaviours of the economy centrally and highlighting the difference between the respective entrepreneurial performance this paper provides a conceptual framework which marks its additional contribution to knowledge. This framework summarises important interdependencies and establishes the role of the GDP gap in facilitating varying business contexts and its subsequent impact on entrepreneurial performance. It further establishes the role of the feedback loop which has never been tested before in the models of entrepreneurial contribution to economic growth.

According to this framework, the gap in productivity with respect to the more developed countries termed as GDP gap, constitutes catching up, non-catching up and divergent economic behaviours. Since catching up countries are characterised by a wider GDP gap, they typically demonstrate higher rates of economic growth and this provides them with more opportunities which result in increased entrepreneurial activity. The increased entrepreneurial activity generate net positive impact, and this leads to a convergence cycle with the high performance of one period leading to the enhanced performance of the other conforming to the idea of the feedback loop. This feedback loop helps in increasing the speed of catch-up which results in the reduction of GDP gap.

Previous research on entrepreneurship is only concerned with its role in economic growth, and the concept of GDP gap has never been explored in this context. The idea of GDP gap provides an influential concept which measures the difference in per capita economic growth between the incumbent and the leading economy. While the

value of GDP or rate of growth of GDP (i.e. economic growth) alone may not offer enough information, its difference with the leading economy offers a complete picture. For example, it may be that a country has a positive rate of growth but is still classified as a divergent economy because of its difference with the leading country which grows at a higher rate. In this case, if we only consider the rate of economic growth it will offer incomplete results.

To summarise, this paper contributes to the body of knowledge in several aspects. First, it adequately provides the synthesis of two divergent fields of research that inform each other. Secondly, it establishes the framework which constitutes the theoretical underpinnings for this research. Finally, it establishes the role of GDP gap and the feedback loop which has never been explored before in the literature encompassing the impact of entrepreneurship on economic growth.

5.3.2 Contribution Objective 2

In an attempt to achieve the second objective this thesis develops its arguments based on the neoclassical growth theory and makes several contributions to the body of literature. The first contribution is that it establishes the empirical association between economic convergence and entrepreneurial activity. Economic convergence is the basic premise in the models of economic growth (Solow, 1956), and the role of entrepreneurship in this context has never been tested before. The terms economic convergence and economic catch-up are often used interchangeably. While economic convergence is a collective phenomenon, economic catch-up is related to the efforts of an individual country. If all the countries below the average economic frontier start to catch-up, this overall trend of reduction in the gap of productivity and income is defined as economic convergence, while the ability of an individual country to reduce the gap in productivity and income as compared to a leading economy is defined as economic catch-up (Fagerberg and Godinho, 2006). The growth empirics increasingly relate this phenomenon of economic catch up to the exponential progress in technology (Freeman, 1989; Lee, 2013; Mankiw, Romer and Weil, 1992) and the central role that entrepreneurs play in this process remains hidden. This thesis questions the technological independence and highlights the central role of entrepreneurial activity in the process of economic convergence.

To examine the impact of entrepreneurial activity on economic convergence this thesis uses a panel data of 47 countries over 13 years (2002 -2014). While previous models in the research literature utilise the variable of economic growth as a measure of economic convergence (Acs et al., 2012; Acs, Desai and Hessels, 2008; Audretsch and Thurik, 2002; Carree et al., 2002; Wong, Ho and Autio, 2005), this thesis purports that GDP gap vis-à-vis a leading economy is a better measure of economic convergence and offers a more holistic picture. In addition, the literature on the economics of entrepreneurship only accounts for the threshold effects and does not consider the performance that feeds in from the previous years. This thesis uses feedback loop which captures one year's entrepreneurial performance that feeds into another and hence offers a dynamic panel data model which has never been studied before in a similar context.

To summarise, this part of the thesis provides an empirical justification to some portions of the framework established earlier in chapter two as a result of the literature review. In doing so, it offers several contributions to the body of knowledge. Firstly, it establishes the empirical evidence for the role of entrepreneurial activity in economic convergence, and this provides a new direction to the literature on entrepreneurship and economic development. Secondly, it testifies the partial convergence hypothesis of Solow (1957), and this reaffirms the conceptual and theoretical underpinnings of this thesis. Thirdly, it highlights the importance and presence of a feedback loop from one year of entrepreneurial activity to another. Finally it provides an estimate of half-life which is a measure of the time required for an economy to cover half the gap between the USA and its steady-state level. These results serve as fundamental evidence to partially answer the research question and to highlight the central role that entrepreneurs play in the process of economic catch-up.

5.3.3 Contribution Objective 3

Once the empirical association between entrepreneurial activity and economic convergence is established, this research aims to inquire if all types of entrepreneurial activity result in reducing the GDP gap or is it a specific type of entrepreneurial activity which supports economic catch-up. To answer the question, this PhD thesis explores two types of entrepreneurial classification as discussed above, i.e. necessity driven entrepreneurial activity and opportunity driven entrepreneurial activity. The research

reveals significant mean differences between opportunity and necessity entrepreneurial activity for all the three groups, i.e. catching up countries, non-catching up countries and the world as a whole. Similarly, it shows that average opportunity entrepreneurial activity is almost the same in catch-up and non-catch-up countries, while necessity entrepreneurship is comparatively more than twice as high in catch-up countries. These results have great implications on the way we perceive necessity and opportunity entrepreneurial activity, and the significant difference between the two suggests that they need to be recognised and treated separately for a better policy outcome. The fact that opportunity and necessity entrepreneurial activity is significantly different and need a separate treatment towards better policy making marks the first contribution to knowledge under this objective.

Taking a step further, this research suggests that necessity entrepreneurial activity does not have a statistically significant impact in reducing the GDP gap. While it is only opportunity entrepreneurial activity that helps to reduce the GDP gap in catching up countries. For the World as a whole, initially GDP gap is exacerbated by opportunity entrepreneurial activity, but after a one year lag it settles down and helps to reduce the GDP gap. This result is in line with the earlier research by Fritsch (2011) who suggest that new firm formation can have both a positive and a negative impact depending upon the period in which the analysis is undertaken. However, in our research the lagged values are only significant for opportunity motivated entrepreneurial activity, while, although the necessity based entrepreneurial activity also has a negative impact, this is not statistically significant.

In summary, this paper analyses the impact that opportunity and necessity entrepreneurial activity has in reducing the GDP gap and facilitating economic catch-up. This research reveals that it is only the opportunity entrepreneurial activity that has a significant impact, while necessity entrepreneurship is insignificant in reducing the GDP gap. This result is in line with earlier studies, such as the one carried out by Ferreira (2017) and Aparicio et al. (2016) which suggest a positive relationship between opportunity TEA and economic growth. However, the difference between opportunity and necessity entrepreneurial activity has never been explored in the context of economic convergence/catch-up and therefore these results present contribution to the body of knowledge. Finally, this research suggests that

entrepreneurial activity in an economy increases with the increase in market expansion potential.

5.4 Implications for Policy and Research

According to Acs et al. (2016, p3), the question 'who is the entrepreneur is at the heart of much confusion about entrepreneurship policy'. This thesis provides clarity to this debate as it establishes the role and purpose of the entrepreneur extending the economic justification provided by Leibenstein (1968) in which he argues that entrepreneurship is a significant factor in economic development. From a policy perspective, this research addresses a fundamental question, i.e. is it the entrepreneur in the economy who creates the catching up environment or is it the catching up environment that is a precursor to the entrepreneurial activity. By answering this question, this research helps to bridge the disconnect between economic development and entrepreneurship literature. In this regard although there is a substantial body of research literature available on the role of entrepreneurial activity in economic development and the way it contributes through job creation, innovation and a number of other spillover effects, surprisingly the role it plays in economic convergence has never been explored before. Given that economic convergence is the basic premise of the neoclassical growth models and it deals with the growth and structural change of the economies, its omission in entrepreneurship literature seems surprising and it represents a critical gap that this research addresses.

Similarly, although there may be a genuine appreciation of the role of entrepreneurship in economic development literature, the research on entrepreneurship does not provide a classification of the business context in terms of catching up and non-catching up economic performance. This is a cause of concern as it represents a blind spot in economic development and entrepreneurship literature. From a policy perspective, this diversity amongst countries regarding their divergent and convergent changes in productivity has a fundamental impact on entrepreneurial performance. This research utilises the measure of the GDP gap as opposed to the conventional measure of economic growth to help classify and differentiate between catching up and non-catching up economic behaviours. It explores the important role entrepreneurship plays in supporting the countries in reducing their productivity gap w.r.t. USA. In doing so, it offers a more practical appreciation of the role of

entrepreneurship and later compares different entrepreneurial motivations providing greater insights for public policymakers who are interested in formulating policies for impactful entrepreneurship which can expedite the process of economic development.

This thesis highlights that there is comparatively more entrepreneurial activity in catching up countries as compared to non-catching up countries. In this regard, this research suggests that a one percent increase in entrepreneurial activity within catching up countries reduces the incumbent countries GDP gap per average worker w.r.t USA by 5.3 percent. However, further investigation reveals that most of the entrepreneurial activity in catching-up countries is driven by necessity as opposed to opportunity driven entrepreneurial motivation, while it is only the opportunity entrepreneurship that has a statistically significant impact in reducing the gap in productivity w.r.t a more developed country (in this case the USA). Consequently, the policy implication for countries aiming to catch-up and accelerate the process of economic development is to try and foster an environment which can support and reward opportunity-driven entrepreneurs in the economy. In this regard, a rather important aspect is to explore how to foster organic growth of opportunity-driven entrepreneurs. This research only provides an initial touch point to cover this aspect as this is not the research question for this thesis and therefore it needs further investigation. However, this work shows that entrepreneurial activity in general and opportunity entrepreneurial activity in particular is determined by the market expansion potential. Hence it is suggested that policymakers need to focus on attributes that can improve market expansion potential to create an environment that will organically motivate the entry of opportunity-driven entrepreneurs in the economy.

5.5 Critical Reflections and Limitations

This thesis reflects on the role of entrepreneurial activity in economic catch-up. Although the impact of entrepreneurship on economic growth is well researched in the literature, this thesis aims to confirm if this impact is strong enough to allow the developing countries to catch up with the developed world. The findings in this thesis confirm that the impact of entrepreneurial activity is only significant in the catching up economies and further that it is only opportunity driven entrepreneurial activity with a one year lag that drives economic catch up allowing the catching up countries to close their GDP gap with the developed world. These results confirm that the impact of

entrepreneurship is embedded and contingent to the business context and this has implications on our understanding of entrepreneurship and the way its impact is measured on economic growth. These outcomes have been discussed in detail in the earlier sections of this thesis, however, in this section, we critically reflect on some of these outcomes, and by doing so we aim to highlight the inherent limitations of this study.

The idea that the impact of entrepreneurial activity is only significant in catching up countries and that it is only opportunity entrepreneurship that contributes to the bridging of the gap between the developed world and the catching up economies present only one aspect of the double-sided coin. The other aspect of this story is seemingly more interesting which this thesis doesn't discuss at all. In this regard counterintuitively one may assume that this thesis suggests that entrepreneurial activity is meaningless for the non-catch up economies and similarly as necessity entrepreneurship has no impact on the economic growth hence it should be expunged. Although these arguments may have some weight (please see Acs et al., 2016) but if these conclusions are drawn from this study, they would simply represent a twist of evidence and false deduction from these results. This thesis in this regard contributes to only one side of the story while completely ignoring the other aspect of the argument. This may represent one of the main limitations of this work, but the niche focus determined by the research aim and objectives confines the ability to investigate this angle. However, future research on this aspect might bear some interesting results.

Another aspect which inadvertently contributes to the weakness of this study is the strong focus on predominantly macroeconomic country-level indicators of economic growth. In this regard additional variables that might have an impact on economic growth have not been considered for example, 'enterprising' national culture is portrayed as a strong determinant of economic growth (Hundley and Hansen, 2012). It is argued that hard work, sense of achievement and frugality embodied in the national characteristics of a society are the epicentre of entrepreneurial success and also determinants of economic prosperity. Similarly, there are several other factors like 'structural change' (Noseleit, 2013), 'knowledge spillover' (Acs et al., 2009), 'Research and Development' (Lucas, 1988), Foreign Direct Investment (Anyadike-Danes, Hart and Lenihan, 2011), 'Politics and State Bureaucracy' (Fagerberg and Godinho, 2005)

that have a proven impact on both economic growth and the state of entrepreneurial activity in a country but are not considered. Since this thesis is developed with a specific focus, in line with the research aims and objectives the main variables adopted in this study are part of the Cobb-Douglas production function and the empirical model is based on the neoclassical models of economic convergence (Lucas, 1988; Romer, 1986; Solow, 1957). The selection of variables is further examined and justified in the concerned chapters respectively. In this regard, it is pertinent to note that the main aim of this research is to investigate the role of entrepreneurial activity in economic convergence hence the study limits itself to an exclusive set of variables. The study accounts for only those control variables that have previously been considered in similar models, and the variable of interest is restricted to TEA or its different forms for which sound theoretical and empirical arguments have been presented before introducing the numerical framework. This, however, means that unfortunately, this study cannot explain aspects over and above entrepreneurial activity that might have a confounding impact on economic growth. Although in the regression model this limitation has been counteracted by effectively controlling for these additional factors with country fixed effects and time fixed effects. From an econometric methodology, it is not always possible to include all the desired variables that may have an impact on the equation hence asymptotically using time and country fixed effects is the most suitable approach to justify the legitimacy of the results. Similarly, from a statistical perspective considering additional variables might present a confounding impact if it has a spurious association with the dependent and the independent variable (Pearl, 2009; VanderWeele and Shpitser, 2013). Hence the addition of variables might simply increase the variance and introduce a bias. However, this aspect needs to be checked and confirmed in future research before introducing any additional variable in the model.

Finally, critically reflecting on the study and the assumed liner development path of the economies from less to highly developed with the US economy being the benchmark to which other countries have to catch up, one may argue that this represents old-style stationary state analysis. While frankly no economy has ever been observed in a steady-state growth and also the linear association simply represents an abstract formulation. This argument is a fair reflection on the limitations of this research from a normative aspect, and it presents a major drawback of pretty much all economic

studies. In this regard, Brown and Deaton (1972, p.3) went a step further criticising modern economics as he argued that its assumptions are completely arbitrary and '*plucked from the air*'. Similarly voicing his concerns Worswick (1972, p.8) commented that '*there now exist whole branches of abstract economic theory which have no links with concrete facts and are almost indistinguishable from pure mathematics*.' These comments are legitimate in their stance but more than being limitations of this study they are limitations of the economic methodology and criticism on positivism. There is nothing much that can be done to satisfy this limitation except for the fact to explicitly acknowledge this inherent precinct.

From data perspective the first and foremost limitation is the availability of data and in particular data on TEA provided by GEM. The GEM project was initiated in 1999, but it was not until 2002 that a unanimous approach for surveying the population was agreed and the measures remained consistent till 2005. In 2006 the survey was revised once again, and the measures were updated. Therefore GEM offers different periods of measures which may not be consistent over time. However, the choice of variables used in this research are consistent with their approach and measurement from 2002 to onwards and therefore the period used for this study starts from the year 2002. Secondly, the data is not available for all the countries across all the periods; there are several periods and countries which are missing in between and hence our panel data model provides an imbalanced panel dataset. Because of these limitations, only a select number of 47 countries could qualify to be part of our data analysis, and it also meant that the time scale that we utilised for our modelling was restricted. Overall, the compiled dataset represents an unbalanced panel where availability of data is not consistent and remains a challenge. Thirdly, the variables used in our research were drawn from secondary data resources and were not developed specifically for the purpose of this research. This aspect needs to be kept in mind as this limits the explanatory potential of the data. However, it is typical to utilise secondary data resources and is often a common practice in research involving macroeconomic measures. The main reason for using secondary data resources is the costs associated with collecting certain data which makes it impossible to conduct primary data research and therefore many studies have to rely on secondary measures as an alternate.

5.6 Ideas for Future Research

This research has a limited scope determined by the research aim and objectives under study. Therefore it may have omitted few variables that might potentially have an impact on the equation under consideration but otherwise do not directly contribute to the research question. In this regard, future research may look into aspects related to the organic growth of entrepreneurs and especially opportunity driven entrepreneurial activity. Similarly, the role of freelancers in supporting entrepreneurial activity and generating subsequent economic catch up will be an interesting aspect to explore. Finally, as this research establishes the role of entrepreneurial activity in economic catch up, future research may look into aspects where an interaction between technology and entrepreneurship can be explored and hence the role of entrepreneurship in implementation of novel technologies and facilitating economic catch up can be elaborated.

The idea of economic catch up fostered by entrepreneurial activity is still a new concept, and this needs to be further developed and explored. Also, this research encompasses several important aspects which need to be included in entrepreneurial and economic development research. These include but are not limited to: the concept of GDP gap to measure economic performance; the idea of a feedback loop to capture the continuing impact of entrepreneurial activity and finally, the measure of economic convergence/catch-up needs to be incorporated in entrepreneurial growth equations.

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