



LUND UNIVERSITY
SCHOOL OF ECONOMICS AND MANAGEMENT

TO BE OR NOT TO BE?

THE ROLE OF ENTREPRENEURSHIP FOR
ECONOMIC GROWTH

Fall term 2009/10

Master thesis

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ABSTRACT

Despite the worldwide importance of entrepreneurship, economic research on this topic has been only fragmented so far. Therefore, the goal of this study was firstly to find a common ground between the established neoclassical, endogenous and institutional growth frameworks on the one hand and the entrepreneurial school on the other hand. For this purpose the distinctive models developed by Solow, Romer and Porter were reviewed in order to uncover possible similarities with entrepreneurship according to the seminal works of Schumpeter and Kirzner. The models were then consolidated subject to the gained insights.

Secondly, the hypothesis was tested whether entrepreneurship is good for growth. Thus, the above models were furnished with fitting data and subsequently estimated. The estimation results confirm the general implications of the growth models that capital accumulation is growth enhancing while countries that are closer to their steady state equilibrium experience a growth slow-down. Further, the production of knowledge appears to have merely a weak and positive influence of growth. Differences in institutions are also responsible for varying growth rates. The hypothesis that overall high levels of entrepreneurship have a positive effect on growth was rejected. However, a closer look at different types of entrepreneurship reveals that the effect on growth depends on which kind of entrepreneurship we are looking at. Entrepreneurship in sectors with predominantly large scale production and increasing returns to scale is in fact good for growth. Entrepreneurship in services however is either inconclusive regarding growth rates or shows a negative trend.

Key words: entrepreneurship, growth, institution, Solow, Romer, Porter, Kirzner, Schumpeter

ACKNOWLEDGEMENTS

I would like to express my gratitude to Åsa Hansson for her mentorship in this master thesis. The constructive feedback and suggestions as well as her patience were much appreciated.

Thank you to the Global Entrepreneurship Monitor Consortium for providing high quality data on entrepreneurship, without which this study would not have been possible.

A special thank to my brother Alexander Rösch for the push and motivation when it was needed. He and Julia Teyssen provided much valuable academic advice during the process of writing.

Thank you to Andreas Both, Tobias Knopf, Simone Solli and Berit Stenlund for the constant encouragement.

Thank you to Julia Uffenorde for being there when it was most difficult. You mean the world to me.

My greatest thank goes to my parents, Anna and Harri Rösch, for their enduring faith in me and for being my greatest role models.

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LIST OF ABBREVIATIONS

<i>AG</i>	<i>Argentina</i>	<i>IE</i>	<i>Ireland</i>
<i>AT</i>	<i>Austria</i>	<i>IS</i>	<i>Island</i>
<i>AU</i>	<i>Australia</i>	<i>IT</i>	<i>Italy</i>
<i>BE</i>	<i>Belgium</i>	<i>JM</i>	<i>Jamaica</i>
<i>BR</i>	<i>Brazil</i>	<i>JP</i>	<i>Japan</i>
<i>CA</i>	<i>Canada</i>	<i>LV</i>	<i>Latvia</i>
<i>CH</i>	<i>Switzerland</i>	<i>MX</i>	<i>Mexico</i>
<i>CL</i>	<i>Chile</i>	<i>NL</i>	<i>Netherlands</i>
<i>CN</i>	<i>China</i>	<i>NO</i>	<i>Norway</i>
<i>DE</i>	<i>Germany</i>	<i>NZ</i>	<i>New Zealand</i>
<i>DK</i>	<i>Denmark</i>	<i>SE</i>	<i>Sweden</i>
<i>ES</i>	<i>Spain</i>	<i>SG</i>	<i>Singapore</i>
<i>FI</i>	<i>Finland</i>	<i>SI</i>	<i>Slovenia</i>
<i>FR</i>	<i>France</i>	<i>TH</i>	<i>Thailand</i>
<i>GB</i>	<i>Great Britain</i>	<i>US</i>	<i>United States</i>
<i>GR</i>	<i>Greece</i>	<i>VE</i>	<i>Venezuela</i>
<i>HR</i>	<i>Croatia</i>	<i>ZA</i>	<i>South Africa</i>
<i>HU</i>	<i>Hungary</i>		

1 INTRODUCTION

1.1 BACKGROUND AND MOTIVATION

The causes and consequences of entrepreneurship have long been subject to extensive debate among economists. And while scientists are pondering, the extent of *entrepreneurial* activity is vast. As of 2004, 500 million of the worldwide working age population was directly involved in new firm creation¹. A recent report of the European Commission (2006) finds that some 23 million small and medium-sized enterprises provide around 75 million jobs in Europe, which corresponds to around 67% of private employment. Hence, as policy makers begin to grasp the potential of entrepreneurship they turn to economic research for advice.

The fundamental assumptions of the seminal neoclassical research models are smoothly running markets where perfectly informed individuals maximize their utility. There are neither transaction costs nor risks to be considered, issues typically associated with entrepreneurship. And while the neoclassical models explain economic growth through labor force growth and accumulation of capital, the endogenous growth models add the increased ability to produce new ideas, the so called technological progress, as a further explanation for sustained growth.

Institutional economists like North and Thomas (1973) on the other hand claim that capital accumulation, labor force growth and innovation “...are not causes of growth, they *are* growth”. In their view, the fundamental explanation of relative growth is differences in institutions – institutions make and break growth. Thus, the institutional framework aims at explaining how markets actually occur, before they can reach *perfection*. Porter (1990) further develops the idea of the institutional framework which he links to the competitive advantage of nations.

Both theoretical frameworks implicitly assume an entrepreneur acting as the *agent of change*, without, however formally incorporating him or her into the respective models. Contrasting this view, entrepreneurial economists like Schumpeter (1934) and Kirzner (1973) highlighted the central role of entrepreneurs in the economic process while arguing that any growth

¹ Reynolds et al. (2004)

framework that does not consider an active entrepreneur who drives the economic process is necessarily incomplete. The importance of entrepreneurship for the dynamics of the economic process was further backed by empirical studies, while some efforts have been undertaken to link entrepreneurial activity to economic growth².

1.2 AIM, DATA AND METHOD

The present work identifies similarities between the neoclassical, the endogenous and the institutional growth frameworks on the one hand and the entrepreneurial school on the other hand. The distinctive models developed by Solow, Romer and Porter are introduced and contrasted with the definitions of entrepreneurship according to seminal works of Schumpeter and Kirzner. Further, the hypothesis whether entrepreneurship has a positive impact on economic growth is tested with the help of theoretical models utilized above.

This study uses data on entrepreneurship from the Global Entrepreneurship Monitor. It is complemented by datasets from the United Nations Statistics Division, United States Patent and Trade Mark Office and the World Economic Forum's Global Competitiveness Report. In order to test the effects of entrepreneurship on economic performance the dataset is analyzed using descriptive statistics and ordinary least squares regression techniques.

1.3 STRUCTURE OF THE STUDY

The introductory *Chapter 1* is followed by *Chapter 2* where a theoretical background on the fields of entrepreneurship and economic growth as well as on previous research that connects both concepts is provided. In *Chapter 3* growth models where entrepreneurship is incorporated are presented together with an explanation of the methodology. A review of the variables and a description of the data used in this study will be provided in *Chapter 4*. *Chapter 5* presents the estimation results as well as their discussion. Conclusions that can be drawn from the findings are found in *Chapter 6*.

² see e.g. Aghion and Howitt (1992)

2 THEORETICAL BACKGROUND

Chapter 2.1 gives an account of the research on entrepreneurship. It is followed by a summary of models of economic growth according to the neoclassical, the endogenous and the institutional schools of thought in *Chapter 2.2*. *Chapter 2.3* provides a review of works that attempt to combine both concepts.

2.1 ENTREPRENEURSHIP

Entrepreneurship as a phenomenon underwent various changes throughout history. In Ancient Greece Xenophon³ wrote about merchants who “...would cross the sea” in order to buy up corn at places where it was abundant and ship it to areas with corn scarcity in order to realize the arbitrage. Landström (2005) gives an overview of how the term evolved over time. In Medieval France it was often connected to brutal warriors and war like activities, thus containing an element of risk taking. Parallel to it another group of risk takers evolved – the building contractors; initially those supervising the construction of castles and cathedrals. Gradually entrepreneurship was most commonly referred to as a contract between the state and a wealthy person who obliged him or herself to supply goods to a fixed price. In Britain the terms meaning changed from adventurer and seeker of opportunities towards owners and managers of big businesses. During the 20th century entrepreneurship as a research topic attracted academics from a wide range of fields and below the central concepts are reviewed.

2.1.1 ENTREPRENEURSHIP AS A RESEARCH TOPIC

Although entrepreneurship as a phenomenon stretches back to ancient times, as a research topic it is still scattered. Shane and Venkataraman (2000) remark that “...the absence of entrepreneurship from our theories of markets, firms, organizations and change makes our understanding of the business landscape incomplete” (p. 219). Davidsson (2004) points out

³ Karayiannis (1992)

that a major roadblock in the field of entrepreneurship research has been the *vagueness* and *uniqueness* of the term that led to a problem of defining it uniformly (p. 8).

In one of the first attempts, Cantillon (1755) defined the entrepreneur as a rational decision maker who assumed risk and provided management for the firm. Since then many researchers tried to define the entrepreneur and in recent decades entrepreneurship research experienced a true revival. Today the body of literature harbors a multitude of definitions. Gartner (1990) counts 90 different descriptions of an entrepreneur. Among the most prominent definitions there are such that focus on the functional aspects such as "...the creation of organizations" (Gartner, 1988) or "an act of innovation that involves endowing existing resources with new wealth-producing capacity" (Drucker, 1985). Others focus on unique personality features of entrepreneurs such as "...a way of thinking, reasoning, and acting..." (Timmons, 1997) and "...a process by which individuals pursue and exploit opportunities..." (Stevenson, 1985). Venkataraman (1997) pleads for a definition that centers on the emergence of opportunities. He reasons that entrepreneurship as a scholarly field "seeks to understand how opportunities to bring into existence *future* goods and services are discovered, created, and exploited, by whom, and with what consequences" (p. 120).

Kirzner (1973) proposes to look at the phenomenon of entrepreneurship as "competitive behaviors that drive the market process" (pp. 19-20). Davidsson (2004) argues that this description is to be preferred because it does the job of addressing the decisions at the micro level to introduce new products to the market and at the same time has implications at the aggregate macro level. It also puts entrepreneurship into the context of competition. The increased choices for customers and competitive pressure towards other market participants drive the market process and eventually attract new entrants, further reinforcing competition and innovation.

Davidsson (2004) proposes a framework for a more systematic way to filter out entrepreneurial and non-entrepreneurial behavior (*Figure 1*). Accordingly, the framework is divided in four quadrants where an activity is either new or old to the firm or to the market respectively. While there is no disagreement to see quadrant *I* as the classic definition of entrepreneurship, and quadrant *III* as non-entrepreneurial behavior, quadrant *II* and *IV* are more challenging. Both imply the emergence of new opportunities, however, in the case of section *II* those occur internally to the firm and it is often referred to this phenomenon as *intrapreneurship*. While it requires a certain degree of entrepreneurial thinking and action, it is very difficult to measure.

Figure 1 Framework for analyzing entrepreneurial behavior

		To Market	
		New	Old
To Firm	New	I New offer and new competitor (incl. imitative entry)	II Organizational change (acquisition, internal re-organization, buy-outs, etc.)
	Old	IV Geographic market expansion (internationalization)	III Business as usual

Source: Davidsson, 2004. *Researching Entrepreneurship*

Therefore, Davidsson (2004) pleads for a market oriented definition stating that entrepreneurship is "...the launching of new business activities [...], and not the organizational change itself." (p. 11). Following this logic the definition in section II would not be labeled as entrepreneurship while section IV can be regarded as entrepreneurship since new businesses actually arise from it.

The discussion above illuminates that economists have defined the function of entrepreneurs in different ways. These differences are also visible in the seminal works of Schumpeter (1934) and Kirzner (1973). Both authors have been considerably influential in the field of entrepreneurship research and therefore I introduce their concepts closer below.

2.1.2 SCHUMPETER AND CREATIVE DESTRUCTION

In his book, *The Theory of Economic Development* (1911), the Austrian economist Alois Schumpeter laid out a theory where economic change starts with the action of an energetic individual, the entrepreneur, and then spreads to the rest of the economy. His point of departure was that equilibrium is predominant in the economic system. Radical changes occur in the system due to a tendency of the entrepreneur to break the peace of the equilibrium and Schumpeter (1934) makes the case to see the market as organic and evolving. In his view it is crucial to see the market process "...in its role in the perennial gale of creative destruction; it cannot be understood [...] on the hypothesis that there is a perennial lull". Thus, it is the entrepreneur who introduces innovations in the form of new products, production methods, services or reorganization of whole industries. Schumpeter (1934) described this dynamic process:

[The] organizational development from the craft shop and factory to such concerns as U.S. Steel illustrate the [...] process of industrial mutation [...] that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one (pp. 83-84).

Since innovation had to be implemented by somebody, Schumpeter (1934) ascribes the ability to break with established routines to individual entrepreneurs and a key trait of Schumpeter's entrepreneur is the boldness that allows him or her to introduce innovations despite social resistance and skepticism. According to Swedberg (2000), the Schumpeterian entrepreneur is not only driven by the monetary incentives but is also characterized by the desire for power and independence, the will to succeed, and the satisfaction from getting things done.

Other individuals are inspired to follow the lead of innovative entrepreneurs. In a market dominated by a few large suppliers, the innovative new firms will increase the overall demand for the product or service offered while at the same time capturing some market shares from existing suppliers. Thus, the new firm will expand the overall economic activity as well as break up the market structure and reallocate market shares from existing firms to the new ones.

2.1.3 KIRZNER AND THE ALERT ENTREPRENEUR

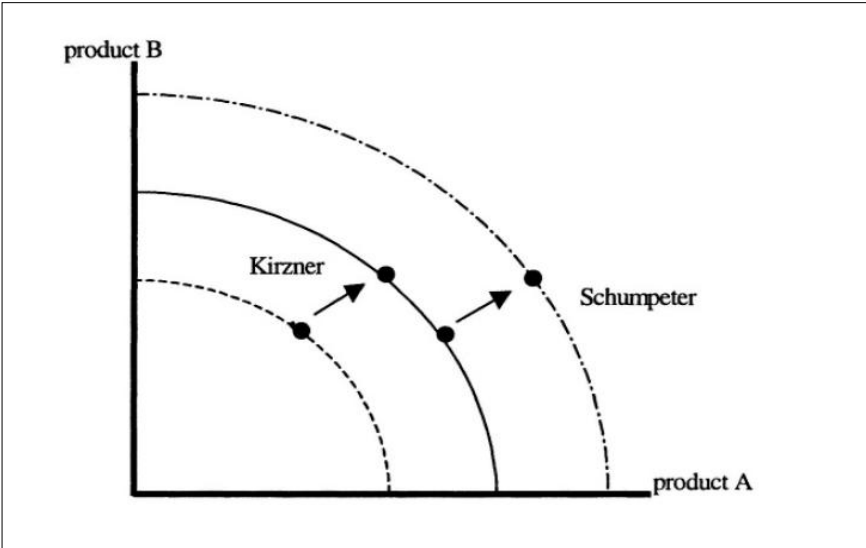
Kirzner broadens the definition of the entrepreneur to the extent that almost all behavior could be regarded as some kind of entrepreneurial action. He argues that all individuals are facing an uncertain world and they therefore constantly have to improvise while assuming some risk. Much as in the proverb – you cannot step into the same river twice – everybody has to face uncertainty and to operate in a constantly changing environment.

Since economic actors are acting in a world where means and ends are not already given, the key feature of the Kirznerian entrepreneur is *alertness* to the unnoticed opportunities. According to Kirzner the task of the entrepreneur is to discover possible gaps between supply and demand. These gaps are persistently closed through arbitrage. Hence, the market process is not characterized by perfect information and zero profits but by a continuous entrepreneurial discovery of and acting upon opportunities. Essentially, this entrepreneur is comparable to an arbitrageur who "...is [...] the first to understand that there is a discrepancy between what is done and what could be done" (1973, p. 89).

Kirzner extends the idea of discovery of opportunities even to innovation. However, the entrepreneur will only act upon such opportunities if she can expect a profit. Markets that preclude free entry through e.g. a monopolistic market structure will consequently hamper entrepreneurial activity and introduction of innovations. Halted entry also reduces the competitive pressure upon the existing companies “...inevitably congealing their entrepreneurial juices” (1973, p. 90). Thus, the entrepreneur not only closes the gaps that occur in the market process, but also helps to introduce innovations and enhance the competitive process.

Kirzner regards also the market process as being in constant change. While Schumpeter’s entrepreneurs *destroy* the current market equilibrium in order to reach a new one, Kirzner emphasizes the *alertness* of entrepreneurs who bring an underutilized market closer to its equilibrium. *Figure 2* illustrates Schumpeter’s view stating that production is on the edge of the possibilities curve and the entrepreneur is pushing the curve outwards with the introduction of innovations and creation of new markets. The Kirznerian entrepreneur on the other hand is within the curve since there are always some opportunities that remain undiscovered. Thus, the entrepreneur facilitates the discovery of new business opportunities and pushes the production possibilities curve towards its edge.

Figure 2 The production possibility curve according to Schumpeter’s and Kirzner’s view on entrepreneurship



Source: from Landström (2005)

However, Kirzner (1973) disagrees with the notion of actually reaching a given equilibrium as a goal. The entrepreneur's activity is seen as being essentially competitive. Thus, competition is inherent in the nature of the entrepreneurial market process and would lose its meaning in an equilibrium framework where "...competition has ceased, [...] reduced to a technical tool convenient when solving mathematical models" (1973, p. 17).

While entrepreneurial scholars were concerned with the issues of growth, growth theorists remained mostly silent on the role of entrepreneurship in the growth process. Below I present the most influential theories that prevailed in the field of growth.

2.2 GROWTH

Simon Kuznets (1973) defined a country's economic growth as being a result of "...a long-term rise in capacity to supply increasingly diverse economic goods", whereby "...this growing capacity [is] based on advancing technology". Kuznets (1973) points out that while technological progress is key for the growth process "...institutional [...] adjustments must be made to effect the proper use of innovations generated by the advancing stock of human knowledge".

The *neoclassical* and *endogenous* paradigms on the one hand and the *institutional* on the other hand had the most influence in the growth research. While the former schools of thought assumed functioning markets to be in place, the latter school provides an analytical framework that aims at explaining how markets develop in the first place as well as why they might fail to provide efficient outcomes. Below all three growth theories are reviewed.

2.2.1 SOLOW AND THE NEOCLASSICAL GROWTH THEORY

A model around the fundamental relationship between capital accumulation and economic growth was developed by Robert Solow (1956). The basic model revolves around a production function of the Cobb-Douglas form⁴ that is given by:

⁴ Cobb & Douglas (1928)

$$Y = F(K, AL) = K^\alpha (AL)^{1-\alpha} \quad 1.1$$

An economy's output consists of one homogeneous good Y that is being produced with the help of two factors of production: capital, K , and labor, L . The technology variable, A , stands for technological progress which takes place over time. There are further no scale economies, hence there is a large number of firms that all are price-takers and the production factors are remunerated according to their marginal product.

Both the labor force L and the technological progress A increase exogenously over time with the rates n and g respectively:

$$\dot{L} = e^{nt} \quad 1.2$$

$$\dot{A} = e^{gt} \quad 1.3$$

A constant fraction of the income is being saved and reinvested. Thus capital grows over time with savings from the output (sY) minus the depreciation of the stock of capital (dK), so that the capital accumulation function is:

$$\dot{K} = sY - dK \quad 1.4$$

Accordingly, output per worker⁵, \tilde{y} , and the growth rate of capital per worker, $\dot{\tilde{k}}$, are:

$$\tilde{y} = \tilde{k}^\alpha \quad 1.5$$

$$\dot{\tilde{k}} = s\tilde{y} - (n + g + d)\tilde{k} \quad 1.6$$

Solow could demonstrate with this two central equations that in a steady-state⁶

$$\tilde{k}^* = \left(\frac{s}{n+g+d} \right)^{1/(1-\alpha)} \quad 1.7$$

and

$$\tilde{y}^* = \left(\frac{s}{n+g+d} \right)^{\alpha/(1-\alpha)} \quad 1.8$$

⁵ $\tilde{y} = \frac{Y}{AL}$

⁶ At this point the reinvestments offset the capital depreciation so that $\dot{\tilde{k}} = 0$ and $sy=(n+d)k$

Solow's analysis illustrates that countries which tend to have higher net savings rate will accumulate more capital per worker that in turn will result in greater output per worker. Therefore such countries will have a tendency to aggregate greater wealth. The pace of economic growth depends on the position of the country in respect to its steady-state – the growth rate increases the further under its steady-state a country is and decreases the further above it lies.

The Solow model left technological progress to take place exogenously. Researchers seeking to understand the economic incentives that underlie the innovative process developed a model where technology doesn't fall from heaven like manna but expands due to rational decision making of economic agents. One of the prominent endogenous growth models was developed by Romer and is presented below.

2.2.2 ROMER AND THE ENDOGENOUS GROWTH MODEL

As in the Solow model, the aggregated production function in the Romer model describes how inputs in labor and capital are being combined in order to produce output. However, Romer (1986) demonstrated that ideas are non-rivalrous in consumption since they have to be produced just once and can be reused later with close to zero marginal costs. This leads to production with increasing returns to scale and breeds together with the exclusive ownership of technology (e.g. through patents) a monopolistic structure of the markets.

While capital and labor grow similarly to the Solow model (see *equation 1.2* and *1.3*), the basic difference here is the production function of ideas, described by the rate at which ideas are being discovered:

$$\dot{A} = \delta L_A^\sigma A^\tau \tag{1.9}$$

L_A is the part of the labor force that is engaged in research, A is the stock of knowledge and δ the rate at which ideas are discovered. σ symbolizes the “stepping on toes effect”⁷, since a crowding of the research sector might lead to diminishing returns for each individual researcher, and τ stands for the “standing on shoulders”⁸ effect, since there are positive

⁷ Jones & Williams (1998)

⁸ Jones & Williams (2000)

spillovers from the already discovered ideas. Total labor force amounts to $L = L_A + L_Y$, with L_Y being the sum of labor employed in the production of output.

On the balanced growth path (steady-state) per capita output, capital and technology grow at the same rate. Thus, if there is no technological progress there would be no growth. Assuming that the growth rate of the number of researchers, L_A , is the same as the growth rate of the population, n , Romer showed that the growth rate of technology is

$$g_A = \frac{\sigma n}{1-\tau} \quad 1.10$$

Thus, the long-run growth of this economy is determined by the parameters of the production function for ideas and the rate of growth of researchers – just as more workers can produce more output, more researchers can produce more ideas. Phelps (1968) noted on this interrelation that:

One can hardly imagine [...], how poor we would be today were it not for the rapid population growth... If I could re-do the history of the world, halving population size each year [...] on some random basis, I would not do it for fear of losing Mozart in the process.

In order to explain the economics that underlie the production and use of ideas in the Romer model, the economy is split into three sectors: a final-goods sector, an intermediate-goods sector and a research sector. The final goods sector is facing perfect competition and produces the homogeneous good Y , employing capital and labor. However, the capital goods have to be purchased from the intermediate sector. The rental price p_j for each (intermediate) capital good x_j is:

$$p_j = \alpha L_Y^{1-\alpha} x_j^{\alpha-1} \quad 1.11$$

In the intermediate sector firms use the rights obtained from the research sector to manufacture the capital goods which are being sold to the final goods sector. The market is characterized by monopolies which arise from the exclusive designs purchased from the research sector. Profit maximizing firms in the intermediate sector generate profits of:

$$\pi = \alpha(1 - \alpha) \frac{Y}{A} \quad 1.12$$

The research sector has free entry where anybody is free to look for new designs for capital goods, in particular for ways to transform units of raw capital into units of new capital goods. The new designs are then patented and sold to the intermediate sector. With r being the interest rate, the price of patents along the balanced growth path will be:

$$P_A = \frac{\pi}{r-n} \quad 1.13$$

Thus, if the production of ever more new ideas is the *engine* of economic growth in the Romer model, the monopolistic rents that can be derived from their production are the *fuel* for this engine, since they incentivize the development of ever new ideas.

2.2.3 INSTITUTIONS AND PORTERS COMPETITIVE ADVANTAGE

Institutional scholars made the case that before growth can actually take off as described in the above growth models, some crucial institutions are needed to make sure markets develop in a growth friendly manner. Douglass North (1990) defined institutions as “the rules of the game” that form “...the incentive structure of an economy”. With regard to economic development he added “...as that structure evolves, it shapes the direction of economic change towards growth, stagnation, or decline” (North, 1990).

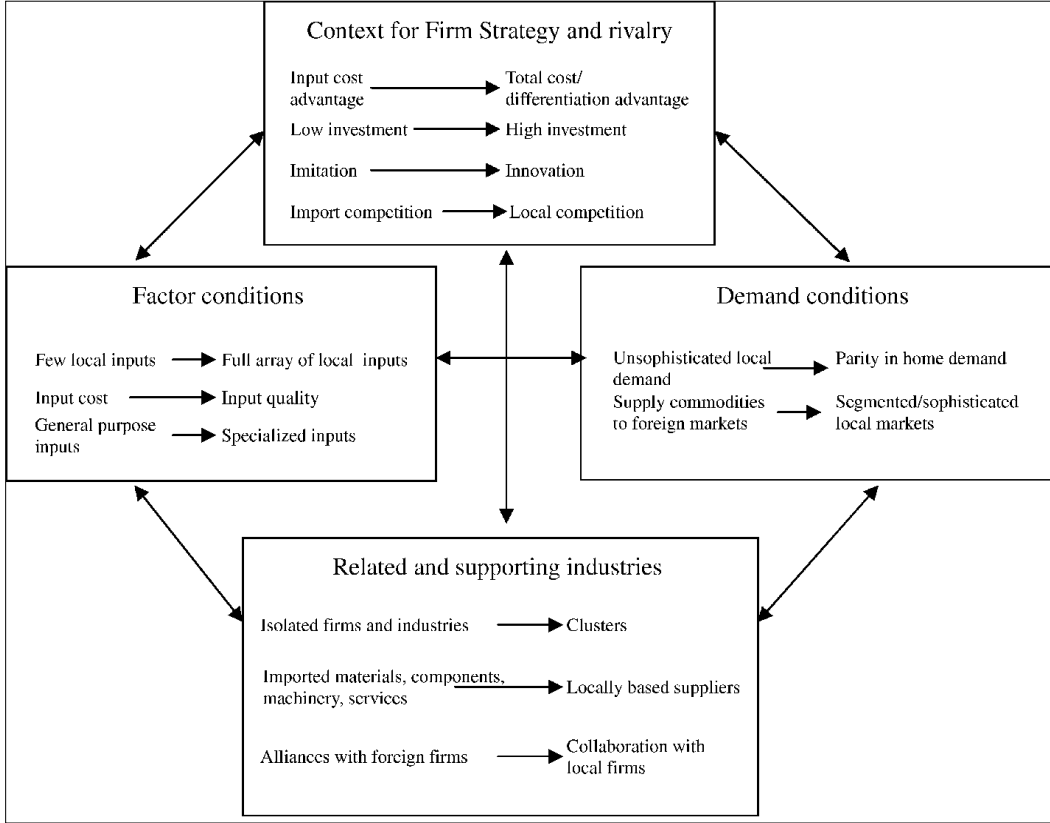
Studying the development of Great Britain, Acemoglu, Robinson et al. (2005) conclude that its emergence as the first industrial society in the 18th century was due to the creation of a state that put in place key missing institutions, such as private property rights. Scully (1988) observes that property rights are “...fundamental, a precondition for accumulation and innovation”. Keefer and Knack (1997) define property rights as “...the rights of a firm or individual to assets, to the revenue streams generated by assets and to other contractual obligations due the firm or individual”.

Taking China as an example of a historical growth failure, Landes (2006) observes on the institutional arrangements from the 16th century onwards that “...almost every element usually regarded [...] as a major contributory cause to the Industrial Revolution [...] was also present in China”. Technology like gunpowder and silk were invented in China but they weren't capitalized upon and didn't become a building block for further development. Described by Balazs (1964) as *totalitarian*, the Chinese state suffocated all private initiative, which led to widespread corruption and personal bondage, very high transaction costs and the flight of

talent from production. Landes (2006) pins down the ultimate cause for the Chinese economic stalemate in the “...ineffable stillness of immobility”.

Building on this research, Porter (1990) made a case connecting the institutional framework to the productivity level of firms and their ability to stay competitive. Porter’s research led to the formulation of the so called *diamond* – a combination of interconnected factors that shape the potential for productivity growth (Figure 3). Hence, Porter (1990) argues, “...advantages throughout the *diamond* are necessary for achieving and sustaining competitive success” (p. 73).

Figure 3 Porters’ competitiveness diamond



Source: from Porter (2000)

As of *factor conditions*, Porter (1990) distinguishes basic factors like natural resources, arable land and unskilled labor from advanced factors like modern infrastructure, highly skilled labor, knowledge resources and capital. Contesting standard theory according to which nations will export those goods which make intensive use of the factors with which it is relatively well endowed, he argued that it is not merely the stock of the factor endowment that

is important but rather with which rate they are “...created, upgraded and made more specialized to particular industries” (1990, p. 74).

The demand conditions consist of three main elements: the nature of buyer needs in the home market, the size of home demand and the existence of mechanisms by which a nation’s domestic preferences are transmitted to foreign markets. Sophisticated demand at home gives the nations firms a better picture of future buyer needs and might even pressure them to innovate quicker. A large home market can as well be regarded as a benefit, however, companies in small nations can create a national advantage if they manage to anticipate buyer needs abroad or transmit domestic preferences to other nations markets.

The presence of internationally *competitive suppliers* and *related industries* creates another advantage for the national firms since it can provide them with preferential access to the most recent cutting edge technologies. Ongoing cooperation and proximity of home suppliers allows for faster exchange of information and feedbacks in the process of innovation, thus facilitating the advancement of technology.

The *structure and culture of domestic rivalry* describes opportunities provided to possible new entrants. While the role of a dominant firm strategy remains disputable, the role of rivalry has the strongest implications on international competitiveness. Porter (1990) concludes that “...nations with leading positions often have a number of strong local rivals” and that the pressure from rivals pushes the firms to “...lower costs, improve quality and service, and create new products and processes” (p. 118).

Having discussed the concepts of entrepreneurship and growth, the next chapter provides a review of the works that combine both concepts.

2.3 ENTREPRENEURSHIP AND GROWTH

2.3.1 ENTREPRENEURSHIP IN GROWTH MODELS

The concept of entrepreneurship is linked to individual decisions and behavior of economic agents whereas the concept of growth is usually linked to processes at e.g. the national level. Hence, Carree and Thurik (2003) remark, that “...linking entrepreneurship to economic growth means linking the individual level to the aggregate level”.

Schmitz's (1989) was first to present an endogenous growth model that relates entrepreneurial activity and economic growth. His model implies that the equilibrium fraction of entrepreneurs in an economy is lower than the social optimal level, providing a rationale for policies stimulating entrepreneurial activity. However, his entrepreneurs are *passive* because their role is restricted to *imitation*. This contributed to the model being less influential.

Carree, van Stel, Thurik and Wennekers (2002) further develop the notion that there is an *equilibrium* rate for entrepreneurship, and that for economies with similar levels of income per capita a deviation of the actual level of entrepreneurship from the *equilibrium* has a negative effect on the growth potential of the economy. While agreeing that too little entrepreneurship is detrimental for growth, they add that a situation with too many entrepreneurs could lead to a surplus of marginal businesses and a misallocation of means of production. They conclude that "...economies can have [...] too few or too many business owners and both situations can lead to a growth penalty" (2002).

Peretto (1998) presents a model where innovations are initially driven by inventor-entrepreneurs in a regime of *competitive capitalism*. However, after the market size has reached a critical number, established firms also start undertaking R&D which results the economy to shift towards a regime of *trustified capitalism*. Thus, entrepreneurship plays an important role only during the period of economic development, it phases out as innovations are increasingly dominated by the large firms. The model has similarities with what Schumpeter described as the *Mark I* and *Mark II* regimes⁹, the former dominated by entrepreneurs the latter by established firms.

Aghion and Howitt (1992) introduce the notion of Schumpeterian *creative destruction* into a growth model by letting firms invest resources in research of new products that render the previous products obsolete. Firms are motivated by the prospect of monopoly rents after a successful innovation is patented. However, innovations in the next time period will destroy these rents as the existing good is being made obsolete by the Schumpeterian entrepreneur. Thus, growth is a consequence of competition among firms that generate innovations and the technological progress that they induce.

⁹ The labels *Mark I* and *Mark II* stem from Nelson & Winter (1982), depicting the models proposed by Schumpeter in *The Theory of Economic Development* (1934) and *Capitalism, Socialism and Democracy* (1942).

Acs et al. (2010) criticize the concept from the knowledge-based endogenous growth models that the produced innovations automatically spill over to the rest of the economy and translate into economic growth. While they agree that the incumbent firms are responsible that some of the innovations get commercialized, they maintain that not all patented knowledge immediately ends up as a commercial product. The authors therefore introduce the entrepreneurs into the model who perceive these opportunities in order to start new firms. Accordingly, the entrepreneurs serve as conduits for the spillover of new knowledge that was not picked up previously. Thus, there are two ways in which the produced knowledge is commercialized – partly through the incumbent firm and partly through the entrepreneurs who actively help to increase the effects of innovations on economic growth.

2.3.2 EMPIRICAL EVIDENCE

There is a growing empirical support for a positive relationship between entrepreneurship and sustained growth. A low level of entrepreneurship is usually assumed to diminish competition harmfully affecting the competitiveness of the economy. It also reduces diversity and learning through the market process while retarding the speed with which innovations are spread.

One of the most obvious pieces of evidence that economic history offers, is the absence of entrepreneurial activity in the former planned economies. Acs (1996) remarks that the lack of private ownership of the means of production coupled with state-ownership and a monopolistic market structure “...constituted one of the major factors leading to the collapse of state socialism”. One of the first reform steps of the Chinese administration was to allow for entrepreneurial activity in the early 80s, which led to an unprecedented upswing of economic progress. And in today’s transitional economies the focus lies on fostering a thriving ground for small and medium enterprises, as they are considered the backbone of an economy.

Studies of Western economies have mainly focused on proxies for entrepreneurship such as the sum of entries and exits in industries, share of small firms in a region, number of market participants and number of self-employed. Bosma and Nieuwenhuijsen (2000) study the entry-exit rates in Dutch regions during the period from 1988 to 1996 and find a positive effect on total factor productivity growth, however only for the service sector. Caves (1998) finds little evidence for a positive contribution of entries and exits to growth of productivity in

the short run, yet there is support for it in the long run. A similar result is derived by Acs and Armington (2002) who find a robust correlation between high entrepreneurial activity and high growth rates.

However, a number of studies hint to that it is only a small percentage of the new firms that is responsible for the majority of the new jobs. Storey (1994) found that during the period of ten years only 4% of new firms that lasted created around 50% of all new jobs in the UK. Kirchhoff (1996) confirms that only 10% of companies started in the US in 1978 stand for over 75% of new employment possibilities during an eight year study period. For Finland Autio et al. (2000) conclude that a minority of 1% of the so called *gazelles* generated around 40% of the employment growth during a period of four years.

What is more, an inconsistency first known as the *Swedish Paradox* called the attention of researchers. Sweden is among the countries that invest most into innovative efforts hoping that this will translate into higher growth rates, as predicted by endogenous growth theories. However, the country suffers from chronically low growth rates despite relatively high investments in the generation of new knowledge. Davidsson and Henrekson (2002) find that from 1987 to 1996 the net job impact of new firms in Sweden was insignificant. Thus, the potential of startups to generate new jobs differs according to the national framework.

This apparent contradiction of chronically low growth rates despite high investments in knowledge prevails even in many other European countries. Audretsch (2007) maintains that a knowledge filter that hinders investments in knowledge from spilling over for commercialization is responsible for this *European Paradox*. Hence, as knowledge is a key factor of production, knowledge spillovers are equally crucial for the process of economic growth. According to the author *entrepreneurship capital* is the missing link that serves as a mechanism for knowledge to become commercialized in a new enterprise. The *European Paradox* is thus a manifestation of low entrepreneurship capital in most European countries.

3 MODELS AND METHODOLOGY

The discussion above showed that the entrepreneur, though recognized as an important part of the economic process, is missing in the most influential theoretical models, or as Baumol puts it “...the Prince of Denmark has been expunged from the discussion of Hamlet” (1968).

This chapter therefore attempts to consolidate the distinctive growth models developed by Solow and Romer on the one hand and definitions of entrepreneurship according to Schumpeter and Kirzner on the other hand. Specifically, Solow’s growth framework is found to fit best Kirzner’s concept of the *alert* entrepreneur while Romer’s theory matches best Schumpeter’s notion of the entrepreneur who drives the process of *creative destruction*. Porter’s model incorporates a notion of entrepreneurship from the beginning.

3.1 KIRZNER’S ENTREPRENEUR AND SOLOW’S GROWTH MODEL

Kirzner (1973) argued that as long as the standard economic theory does not include individuals pursuing entrepreneurial opportunities, something significant is being omitted. Accordingly, it is the task of the entrepreneur to make sure that resources are allocated in the best possible way and therefore resource allocation and growth are two aspects of the same phenomenon. However, since Solow assumes that each economic agent has a costless access to all relevant information, there is no need for the Kirznerian entrepreneur (or any entrepreneur for that matter).

Indeed, this information criterion is handy but unfortunately highly unrealistic. If we relax the perfect information assumption of the Solow model, the model would become more realistic but at the same time it would lose some of its elegance. Misallocations would become possible and transaction costs would have to be added to the model. It would be considerably harder to derive reliable predictions from such a model. The notion of the Kirznerian entrepreneur could offer a way out of this dilemma. According to Kirzner (1973) “...economics explains that where there are unexploited profit opportunities, resources have been misallocated [and] entrepreneurship corrects [such] waste”. Thus, if we loosen up the unrealistic assumption of perfect information in the Solow model it becomes clear that a window of opportunities opens up to the Kirznerian entrepreneur. Assuming that the ideal

entrepreneurs would be able to find and close all gaps left open in the market process, it would be possible to relax the assumption of perfect information and at the same time introduce an active entrepreneur that is motivated by possible profits in the market. According to Kirzner, the ability to realize previously unnoticed business opportunities derives less from increased investments into market research, but more from the *alertness* of entrepreneurs, a trait that comes at zero costs.

The dynamics of resource allocation provide thus a link between entrepreneurship and growth. With regard to the production possibility curve (*Figure 2*) the role of the entrepreneur according to Kirzner is to bring the economy closer to the so called *equilibrium* – a situation where all arbitrage possibilities have been realized. Kirzner’s notion of entrepreneurship is thus an efficiency enhancer, something that ought to be in the growth model. If we take Kirzner’s notion that the entrepreneur is exploiting existing markets and increasing competitive pressure upon and efficiency among incumbent firms, thus helping to create a *more perfect market*, we can link it to the Solow growth model. In this setting the entrepreneur becomes an active agent who brings the market closer to the assumed equilibrium. And even if the equilibrium is never actually reached, the entrepreneur can come close enough to assume that it is. To be able to analyze the model we can assume that the equilibrium is reached for a moment and snapshot of the situation is taken.

In order to test whether entrepreneurship plays a positive role for growth, I augment the Solow model by incorporating an entrepreneurship variable. Solow ascribed all factors unexplained by the model to the size of the so called Solow residual¹⁰. Accordingly, the level of entrepreneurship is captured by it, alongside with other factors. Since I specifically would like to find out which role entrepreneurial activity plays for economic growth, I single it out from the residual, so that the growth rate of an economy is being explained by the capital formation rate, labor growth and the level of entrepreneurship:

$$\text{Growth of Output} = \text{Growth of Capital} + \text{Growth of Labor} + \text{Entrepreneurial Activity} \quad (I)$$

¹⁰ Mata & Louca (2009)

3.2 SCHUMPETER'S ENTREPRENEUR AND ROMER'S GROWTH MODEL

In endogenous growth models the long-term growth process is assumed to be determined by purposive investments in knowledge and technology. However, it is not common for such models to address the issue of entrepreneurship as the driving force of technological and economic development.

Schumpeter's notion of entrepreneurship is the driving force behind economic development. The entrepreneur is ground-breaking; the *creative destroyer* that unhinges the markets from their sleepy equilibrium. For him, the entrepreneur is the supplier of innovations or "new combinations", which in turn generate economic growth. Much of that idea is incorporated in Romer's endogenous growth model, where innovations drive the market towards a new equilibrium. The act of searching for innovations in the Romer model can be seen as entrepreneurial since new companies are set up and the outcome of the investments often is uncertain. In order to realize such investments an amount of the Schumpeterian *boldness* is needed.

Romer assumes that markets operate under imperfect competition enabling firms to charge prices above marginal cost in order to compensate for the large investments into the development of new technologies. This advantage over the competition is also what spurs the Schumpeterian entrepreneur. The wedge between price and marginal costs becomes as in the Romer model the *fuel* for the engine of growth. Thus, entrepreneurship according to Schumpeter is well suited to go along with Romer's growth model.

Following the logic above entrepreneurship and innovation become indispensable partners. Without entrepreneurs no innovation would be introduced to the markets and technological progress would not take place. Analogical to the Solow model, entrepreneurship is included in the Romer growth model:

$$\text{Growth of Output} = \text{Growth of Capital} + \text{Growth of Labor} + \text{Innovative Activity} + \text{Entrepreneurial Activity} \quad (II)$$

3.3 ENTREPRENEURSHIP AND PORTER'S COMPETITIVE ADVANTAGE

Porter (1990) makes a case for entrepreneurship in his institutional framework stating that "...entrepreneurship [is] at the heart of national advantage" (p. 125). In particular, domestic rivalry creates an "incubation environment" for entrepreneurs and entrepreneurship can enhance the quality of the factor conditions through feedback mechanisms in the course of starting businesses and the learning process that it provides.

Especially for countries that are characterized by a strong emphasis on innovation, domestic rivalry becomes most important creating the needed pressure on firms. Porter's research showed that while some "pure inventions" might happen at a random base it is far from random that they develop into a "competitive industry". Thus, a country with good infrastructure, skilled labor force and a competitive home market will be more apt to mobilize entrepreneurial energy in order to commercialize on an invention and develop it into a growth generating industry. Porter (1990) cites the example of insulin that was isolated in Canada first, but "...it was turned into commercial success by companies in Denmark and the United States" where "...a favorable environment for commercializing medical innovations" existed and "dozens of entrepreneurs sprang up in [...] new product and service areas" (p. 126).

Entrepreneurial activity is included in the Porter framework in order to detect its effect on productivity next to institutional measures of the *basic requirements* as well as *efficiency enhancers*:

$$\text{Growth of Output} = \text{Basic Requirements} + \text{Efficiency Enhancers} + \text{Entrepreneurial Activity} \quad (III)$$

3.4 ECONOMETRIC MODEL

The empirical model to test the effects of entrepreneurship in the Solow and Romer models is derived from a Cobb-Douglas production function with constant returns to scale:

$$Y = A^0 K^\alpha L^{1-\alpha} \quad 3.1$$

with Y being the output, K the stock of physical capital, L the labor force and A^0 factor productivity¹¹. Dividing both sides by L and multiplying the right hand side by $\frac{L^\alpha}{L^\alpha}$ yields

$$\frac{Y}{L} = A^0 \left(\frac{K}{L}\right)^\alpha \quad 3.2$$

Taking logs on both sides yields:

$$\ln\left(\frac{Y}{L}\right) = \ln A^0 + \alpha \ln\left(\frac{K}{L}\right) \quad 3.3$$

Taking first differences to obtain growth in output per worker as the dependent variable shows that for small changes $\Delta \ln\left(\frac{Y}{L}\right)$ represent the percentage change in output per worker and changes in $\Delta \ln\left(\frac{K}{L}\right)$ represent the rate of capital accumulation per worker, so that we can write:

$$\Delta \ln\left(\frac{Y}{L}\right) = \Delta \ln A^0 + a \left[\Delta \ln\left(\frac{K}{L}\right)\right] \quad 3.4$$

To estimate the Solow model the level of entrepreneurship is singled out from A^0 :

$$\Delta \ln A^0 = B^0 + \delta(\ln TEA) + \epsilon \quad 3.5$$

where B^0 is a constant and TEA represents the level of total entrepreneurial activity.

In order to estimate the Romer model, A^0 is further split into the level of innovation (represented by patents) and the level of total entrepreneurial activity:

$$\Delta \ln A^0 = B^0 + \gamma(\ln PATENTS) + \delta(\ln TEA) + \epsilon \quad 3.6$$

Though the econometric models for the Solow and the Romer growth theories appear to be very similar, they allow testing for the effects of entrepreneurship and innovation separately.

Previous research showed that in datasets where growth rates of countries with considerable differences in output levels are assessed, a possible catch-up effect¹² should be accounted for. In order to account for faster growth rates in countries further away from the steady-state the

¹¹ For the empirical model it is irrelevant if A is labor or capital augmenting

¹² Adolfo (2009)

natural logarithm of the initial levels of output per worker, $(\ln Y_0)$, is used¹³, so that we can write for the estimation model for Solow:

$$\Delta \ln \left(\frac{Y}{L} \right) = B^0 + a(\ln Y_0) + \beta \left[\Delta \ln \left(\frac{K}{L} \right) \right] + \delta(\ln TEA) + \epsilon \quad 3.7$$

and for the Romer model:

$$\Delta \ln \left(\frac{Y}{L} \right) = B^0 + a(\ln Y_0) + \beta \left[\Delta \ln \left(\frac{K}{L} \right) \right] + \gamma(\ln PATENTS) + \delta(\ln TEA) + \epsilon \quad 3.8$$

The estimation model for Porters framework seeks to investigate the interplay of growth, institutions and entrepreneurship. The institutional variables are obtained from World Economic Forums (WEF) Global Competitiveness Report (2005). The work of the WEF is based on Porters diamond and derives different indices that represent the competitiveness diamond. The first index that is used in the estimation model measures the quality of the *basic requirements* of the economy such as the quality of institutions, infrastructure, macroeconomy and primary education. The second index is concerned with the *efficiency enhancers* such as higher education and training, market efficiency and technological readiness. Following North and Thomas (1973) in their argument that capital accumulation basically represents growth, the rate of annual capital growth per worker $(\Delta \ln \left(\frac{K}{L} \right))$ is also included here. Finally, the model is augmented by including the level of total entrepreneurship activity such that the estimation model reads:

$$\Delta \ln \left(\frac{Y}{L} \right) = B^0 + \beta_0 \left[\Delta \ln \left(\frac{K}{L} \right) \right] + \beta_1 \ln \left(\begin{matrix} basic \\ requirem. \end{matrix} \right) + \beta_2 \ln \left(\begin{matrix} efficiency \\ enhancers \end{matrix} \right) + \beta_3(\ln TEA) + \epsilon \quad 3.9$$

¹³ see McArthur and Sachs (2002)

4 DATA AND DESCRIPTIVE STATISTICS

4.1 DATA

The dependent variable in all estimation models is the annual *Growth of Output per Worker*. It is computed by dividing the gross output of a country during one year by the total of employed adult population in the same year. In the next step then the percentage change of this output per worker is calculated relative to the following year. A similar procedure is performed for the independent variable *Growth of Capital per Worker*, using gross capital accumulation instead of gross output. In order to smooth out potential cyclical fluctuations and shocks, three year averages for the years 2005 to 2007 are computed.

The data on gross fixed output, gross fixed capital formation and employed adult population is retrieved from the United Nations Statistics Division. Both, gross output and gross capital formation are measured in fixed 1990 USD, while the data on workers is a simple headcount. Gross output is comprised of the total value added in a country during a year and gross capital formation measures additions to the fixed assets¹⁴ of the economy plus net changes in the level of inventories¹⁵.

The total level of entrepreneurial activity, TEA, is the limiting factor since data on only 35 countries is available for the year 2005. Despite this seemingly low number of observations it is not unusual in a cross-country context to regard data on around 30 countries as sufficient to be able to draw inferences from the estimation. Data on TEA comes from the Global Entrepreneurship Monitor Consortium (GEM), a cooperation of research facilities from a number of countries. In each participating country at least 2000 randomly selected working age individuals are surveyed. The data is complemented with expert knowledge and third-party data on demographics, infrastructure and national conditions for entrepreneurial activity¹⁶.

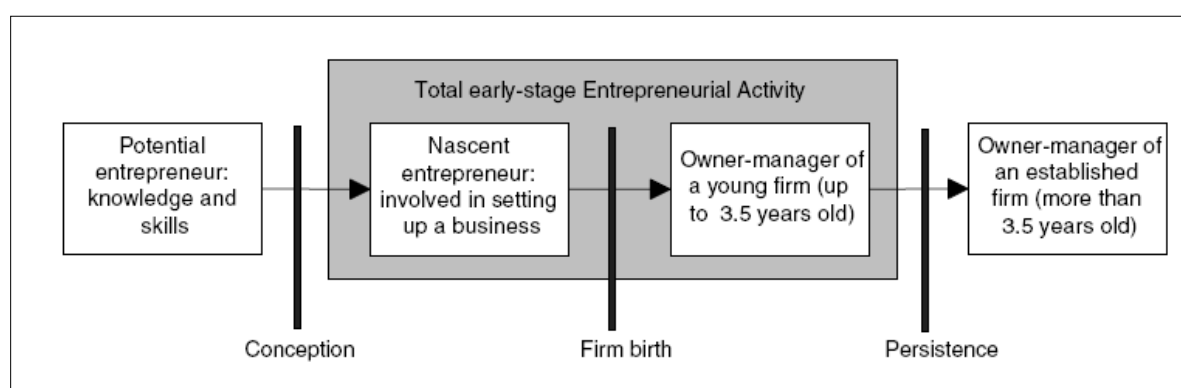
¹⁴ Fixed assets include land improvements, plant, machinery, and equipment purchases and the construction of roads, railways, schools, offices, hospitals, private residentials, and commercial and industrial buildings.

¹⁵ Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales. Net acquisitions of valuables are also considered capital formation.

¹⁶ see Autio et al. (2005) for a detailed description

Figure illustrates the concept of defining entrepreneurial activity in the data set. Accordingly, the TEA index measures the share of individuals between 18 - 64 years who are either active in the start-up of new entrepreneurial companies (*nascent entrepreneurs*), or who are currently owner-managers of new entrepreneurial companies (*young business managers*). A *nascent entrepreneur* counts as one if he or she has written a business plan or explored an opportunity during the past year while at the same time intending to act as the manager of the firm to be. *Young business managers* on the other hand had to be owners and managers of a firm not older than 42 months at the time of the survey.

Figure 4 The entrepreneurial process and GEM operational definitions



Source: Autio et al (2005)

Since entrepreneurial firms in different industries may not have the same effect on economic growth, the data on TEA is parted into four sectors according to the respective industries where the entrepreneurial activity occurs. Hence, the share of businesses active in the *extractive* sector represents TEA in agriculture, forestry, fishing, and mining. The percentage of TEA firms that are in *transformative* sectors stands for construction, manufacturing, transportation, communication, utilities, and wholesale entities. The *business services* sector represents TEA occurring in the finance, insurance, real estate, and other business service industries. Finally the share of TEA entities in *consumer services* covers retail, lodging, restaurants, personal services, health, education and recreational services. These shares will be used in the regressions alongside with the overall TEA index of the country in order to investigate the role of entrepreneurship in the respective branch.

For the level of innovative activity data on the number of patents that were filed at the United States Patent and Trade Mark Office is used, with the nationality of a patent being determined by the nationality of its inventor. Autio et al. (2005) recommend this measure over the ratio of R&D expenditure to GDP as the latter is an input measure, whereas patenting implies greater

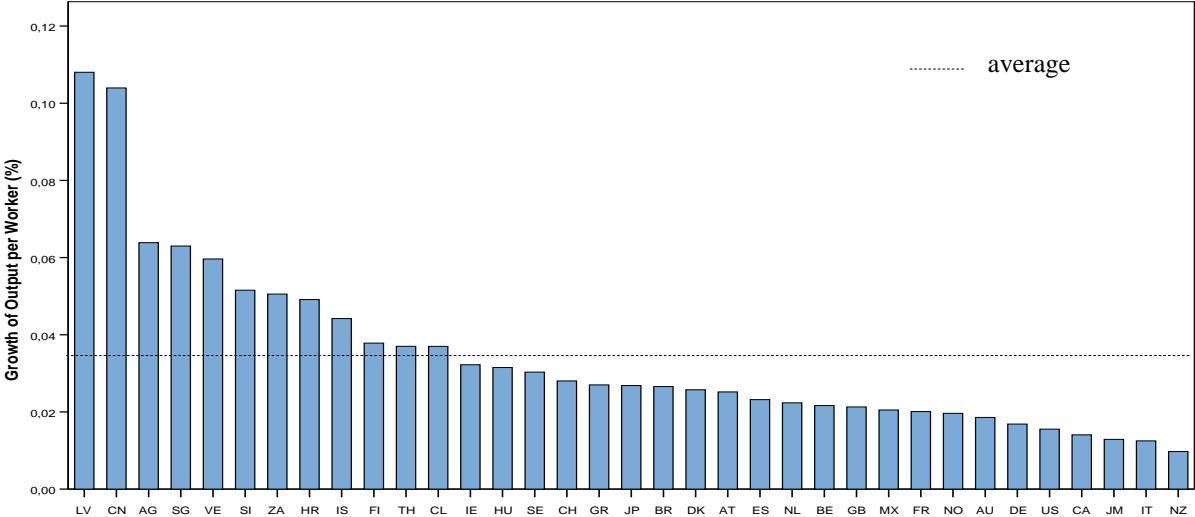
proximity to commercialization. Due to the fact that the discovered knowledge from one period usually gets commercialized in the next period, the data on patents stems from 2004, one year prior the data on entrepreneurship. In order to make the data comparable across countries the total amount of patents is set into relation to gross output and is hence measured in number of patents per one billion USD output.

Data on the quality of institutions stems from World Economic Forum’s Global Competiveness Report (2005). The institutional indices in this report are calculated with the intention to capture the factors that Porter singled out as decisive for the growth framework of the so called competitiveness diamond. They are compiled from extensive interviews with business owners, policy makers, academics and other relevant experts. The *basic requirements* index that is used in the regression measures the quality of institutions, infrastructure, macroeconomy, health and primary education and the *efficiency enhancers* index captures the levels of higher education and training, market efficiency and technological readiness.

4.2 DESCRIPTIVE STATISTICS

There is broad variety in output growth rates across the countries present in the data set. *Figure* shows that New Zealand experienced the lowest rate of growth with only 1% on average during the years 2005-07, while countries like China and Latvia grew considerably faster with 10% and 11% respectively.

Figure 5 Average growth of output per worker during 2005-07 (%)

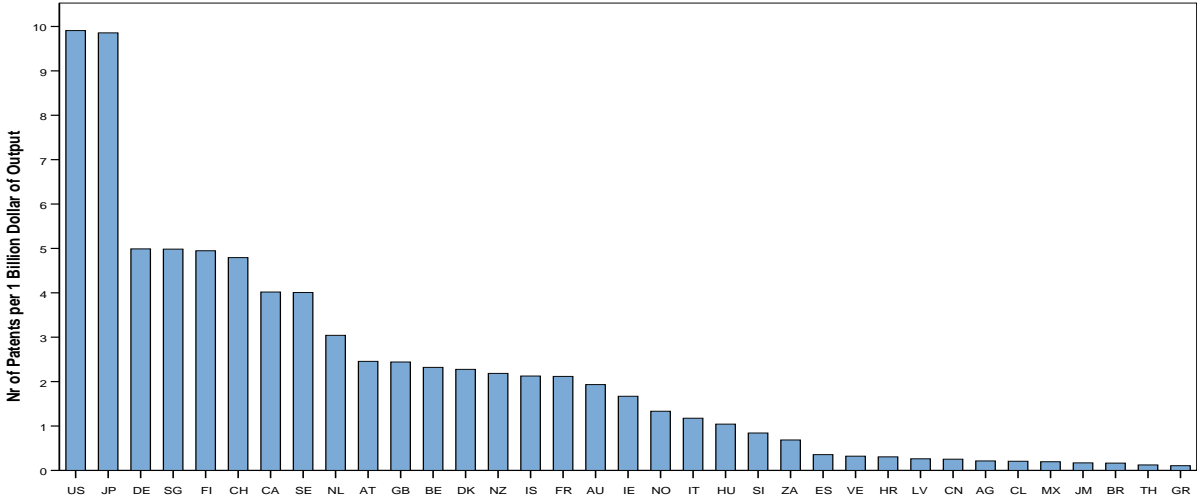


Whereas the average of all growth rates is 3.45%, there seems to be a general trend that poorer countries exhibit higher growth rates. The exceptions here are Mexico and Jamaica that rank among low growth countries with only 2% growth rate despite low average income levels and Singapore with high average income levels and relatively high growth of 6.3%.

When countries at different levels of economic development are compared to each other their respective divergence in performance may have very different sources. There might be e.g. cyclical fluctuations or crises that interfere with the fundamental assumptions of the growth models. However, this caveat is somehow controlled for since three year averages for cyclically sensible variables are used. Also, the reason for fast growth often times is the so called catch-up effect, where poorer countries simply grow faster. This is in line with the dynamics of the Solow model that predicts a growth slow down for wealthier countries.

The level of technological advancement as described in the Romer model is depicted in *Figure 6*. It shows the number of patents per output of the respective country that were filed in the United States, the worldwide largest market for the potential commercial application of the patents. Thus, they reflect a countries ability to produce knowledge that can be commercialized, and according to Romer’s argument ultimately be a source for growth.

Figure 6 Number of patents per one billion USD of output in 2004



Not surprisingly, wealthy countries appear to be highly knowledge intensive. What surprises is that Greece, a long standing member of the European Union with moderately high income levels ranks last, is overtaken by much poorer countries like Jamaica and Thailand. Spain is another exception that breaks the pattern with just 0.4 patents per each billion USD of output. New Zealand has a comparably similar income level, its technology intensity however is more

than fivefold that of Spain. The most technology intensive countries appear to be Japan and the United States, with nearly 10 patents per one billion USD of output. Positive exceptions are Hungary and South Africa, countries ranked in the lowest income quarter of the present dataset, and still exhibiting quiet high capacity to generate patentable knowledge.

The Romer model predicts that a higher technological level is associated with faster growth rates. However, the present data seems to contradict this prediction. *Figure 7* shows that richer countries are more prone to have higher technological levels while experiencing lower growth rates at the same time. This negative relationship is thus in line with the so called *European Paradox* discussed previously. Thus, the data contradicts the theoretical predictions while confirming the empirical findings. Since the income differences are controlled for in the estimation, it remains to be seen whether there is positive effect of knowledge on growth.

Figure 7 Output per worker growth rates versus patent intensity

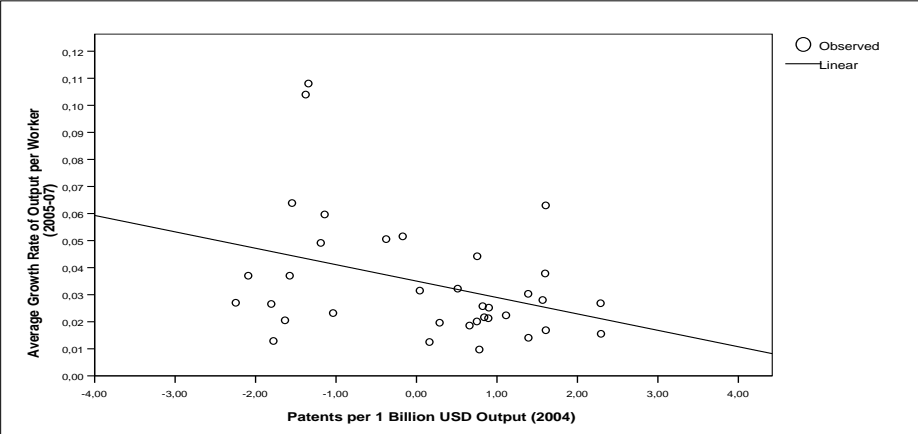
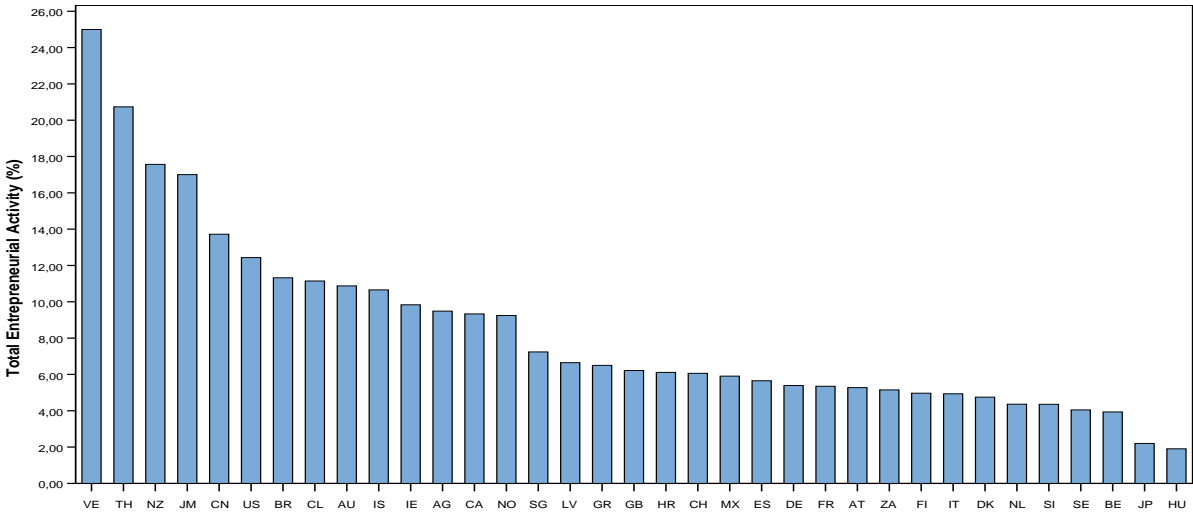


Figure 8 shows that the overall levels of entrepreneurship vary greatly across countries – from 1.9% in Hungary to 25% in Venezuela. Due to the multidimensional character of entrepreneurship, the causes behind the differences in entrepreneurial activity are not always obvious and it basically depends on the focus of the research undertaken how one categorizes it. La Porta et al. (1998) point to the fact that differences in legal traditions of the countries have an impact on the business environment in which companies have to operate. Hence, differences between the common law traditions of Anglo-Saxon countries¹⁷ and civil law

¹⁷ In the data set countries with common law legal origin are: Great Britain, Ireland, Canada, USA, New Zealand, Australia, Singapore and Jamaica.

traditions of most European countries¹⁸ may influence the conditions which the entrepreneurs are facing. Company and bankruptcy laws and shareholder protection rules in countries with common law traditions tend to encourage the start up of companies and risk taking in general. This causality seems to be reflected in the data, since virtually all common law countries rank in the upper half with the highest rates of overall entrepreneurial activity, while most European countries, with the exception of Norway, Island and Ireland, rank among those with lowest entrepreneurship rates.

Figure 8 Total entrepreneurial activity in 2005



Similarly, the level and type of taxation may encourage or discourage firm start-ups. Studies showed that taxes on capital gains as well as progressive taxes tend to limit¹⁹ entrepreneurial activity while income taxation shows a positive relationship²⁰ with entrepreneurship. Using the levels of highest marginal taxes from the dataset compiled by the GEM consortium, a very weak negative correlation between the common law country dummy and tax levels could be found, suggesting that those countries have a tendency towards lower marginal tax. The link is however utterly weak, therefore no taxation variable will be added in the regression.

Another avenue to discuss entrepreneurship is its role together with the technological progress. New patented technology creates new goods and services that can enable new start-

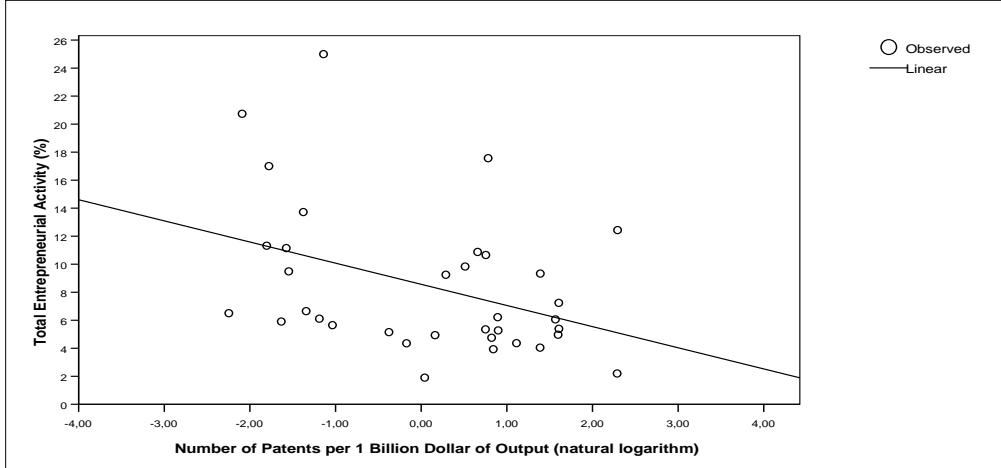
¹⁸ Countries with civil law legal traditions are: all other countries in the data set with the exception of South Africa and Thailand, which have a mixed common and civil law tradition.

¹⁹ Keuschnigg & Nielsen, 2004; Gentry & Hubbard, 2004

²⁰ Parker & Robson, 2003

ups. Additionally, entrepreneurship can play an important role as a conduit for the knowledge spillovers²¹. A look at the data in *Figure 9* however suggests quite the opposite. A pattern of decreasing entrepreneurial activity with increasing technological intensity unveils, thus suggesting a negative relationship of overall entrepreneurial activity and growth rates.

Figure 9 Patent applications (2004) versus entrepreneurship (2005)



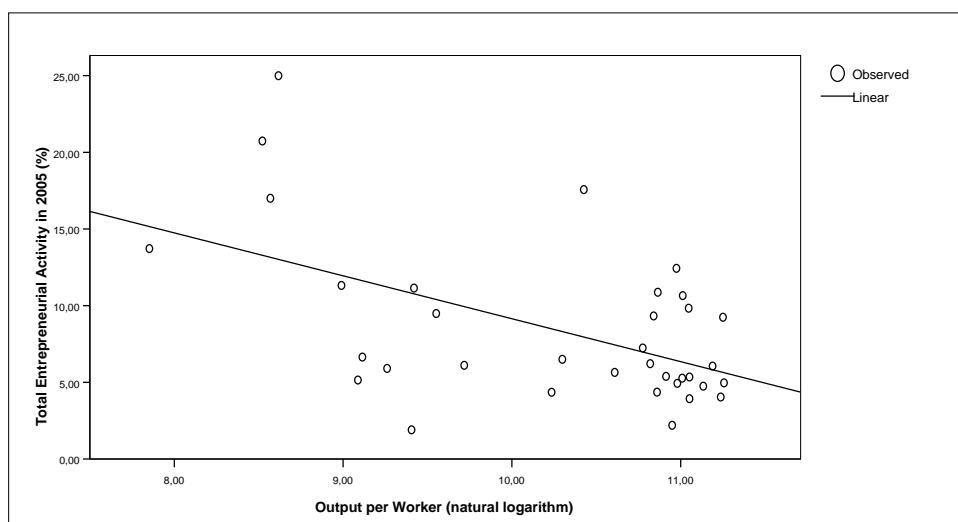
Bregger (1996) argued that economic progress goes together with falling self-employment due to increasing incomes and generous social security systems. Thus, the opportunity costs of entrepreneurship are higher due to higher wages while at the same time the need to engage in entrepreneurship in order to make a living becomes less urgent. Empirical studies on the other hand showed that in developed countries there has been a tendency towards higher entrepreneurial activity during the last 30 years²². As the economies shift towards greater knowledge intensity and as services become more important, the importance of scale economies in the traditional manufacturing sectors is decreasing. Small new firms are more apt to adapt to the occurring structural changes and hence become more important for the economy.

A look at *Figure 10* supports the argument of a negative relationship between income levels and entrepreneurship. Together with the implications for entrepreneurship and the level of technological development this strengthens the assumption that there may be a negative relationship between entrepreneurship and growth.

²¹ Zvi Griliches (1992)

²² Carree, Van Stel, Thurik and Wennekers, 2001

Figure 10 Output per Worker versus Entrepreneurship (2005)



According to Schumpeter’s view on entrepreneurship the economy is characterized by high entrepreneurial intensity, with many start-ups that drive the process of the *creative destruction* during the so called *Mark I* regime. Over time the *Mark I* regime goes over to the *Mark II* regime, where large corporations dominate the production while the overall entrepreneurial activity is low. Schumpeter described the times in which he himself lived. During the last 30 years the Western economies experienced yet another transition, from industrial production with scale economies and low levels of entrepreneurship (*Mark II*) towards a service intensive economy. Services are generally characterized by low entry barriers and small scale production. In terms of Schumpeter this transition can be seen as a *Mark I* regime, where entrepreneurial activity in Western countries became more relevant again. Sector specific levels of entrepreneurship may therefore be an indicator for the relative importance of entrepreneurship in the respective sector. Studies that identify entrepreneurship sub-categories such as high growth potential entrepreneurship²³ or academic entrepreneurship²⁴ point to the relevance of the “right” kind of entrepreneurship that is relevant for growth. It also may reflect the role of entrepreneurial activity at the current stage of economic development.

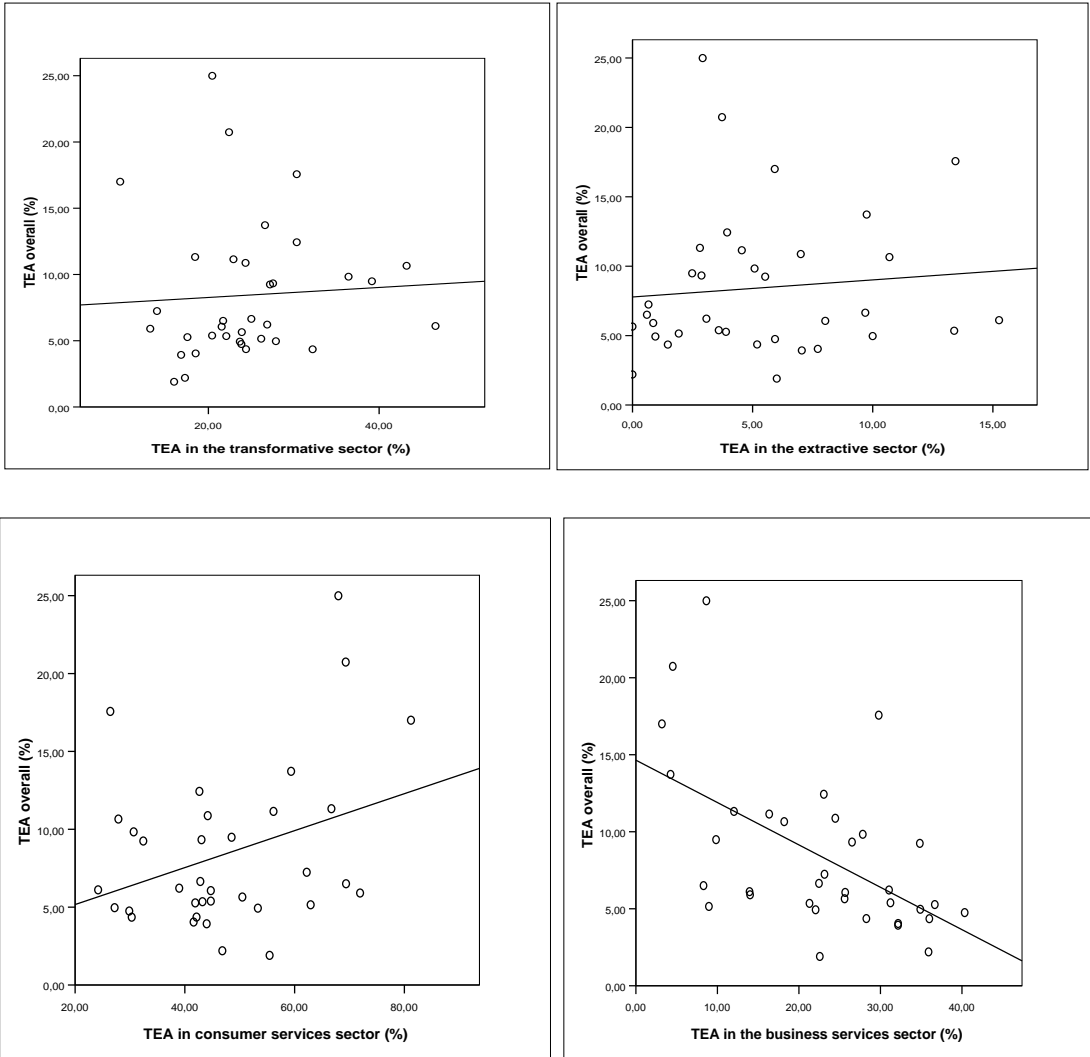
Figure 11 plots the overall levels of entrepreneurial activity against the sector specific levels of entrepreneurship. Additionally, the country-wise shares of the respective type of entrepreneurship relative to the overall levels can be found in the Appendix (Figure 14-17).

²³ Autio et al (2005)

²⁴ Henrekson & Rosenberg (2001)

Since the relationship between overall levels of entrepreneurship and the levels in the *extractive* and *transformative* sectors has a very weak positive trend, it remains open which direction can be expected in the estimation. The picture is clearer for the two remaining sectors. Thus, *business services* are increasing with decreasing levels of TEA. With the hindsight to the presumption that overall high TEA might be negative for growth, high shares of *business services* suggest their possible positive influence on growth rates. The opposite is true for *consumer services*, where the share is increasing with increasing levels of entrepreneurship, indicating a negative influence on growth.

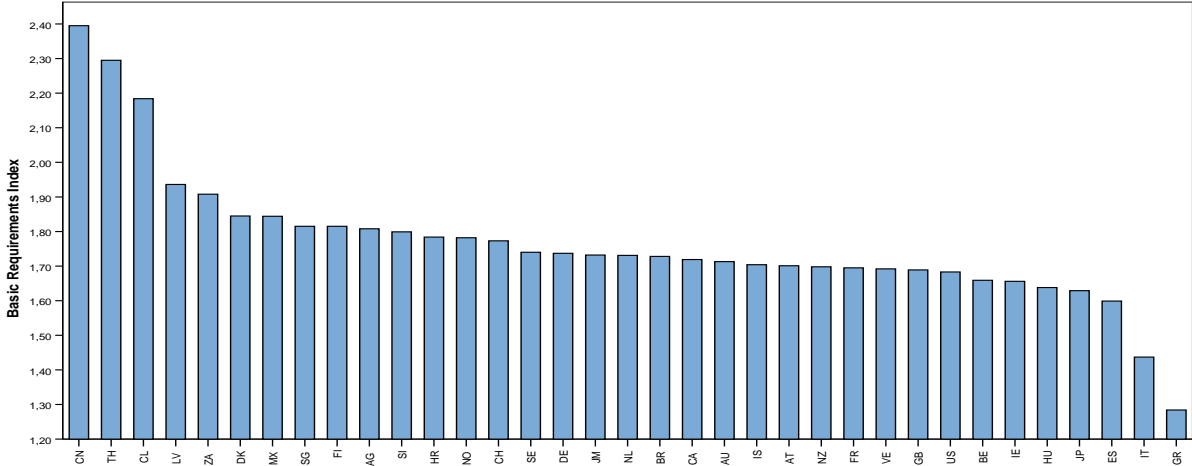
Figure11 Share of sectoral entrepreneurial activity versus overall entrepreneurship



The *basic requirements* index reflects the overall institutional and infrastructural quality, the degree of macroeconomic stability and well as levels of health and primary education while the *efficiency enhancers* index describes the levels of higher education and training, goods

and labor market efficiency, financial market sophistication, technological readiness and market size. *Figure 12* depicts the values of the *basic requirements* index that are weighted²⁵ according to the current stage of economic development of the country. The GCR index differs between three stages: developing²⁶, transitional²⁷ and developed²⁸. Thus, it captures not only the absolute quality of so called basic institutions, but also relates it to the current stage of economic development of the respective country.

Figure 12 Basic Requirements Index in 2005



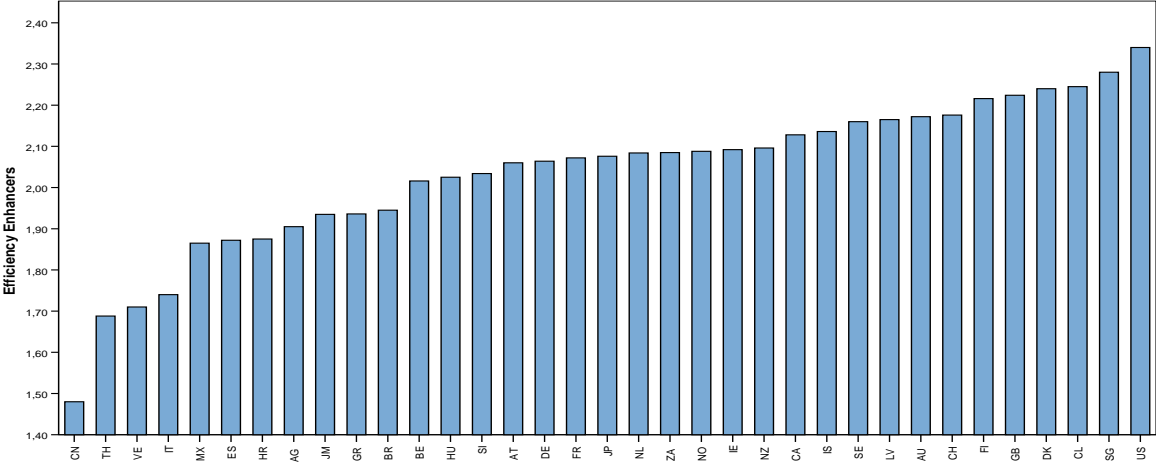
China leads the ranking, being the poorest country in the data sample. This is due to the fact that its economies’ stage of economic development is mainly reflected in the factors listed in the *basic requirements*. Therefore the value of this index is weighted more than for a country on a higher level of economic development, say Sweden or France. Accordingly, Denmark is highest ranked among developed countries while Italy and Greece appear to have the lowest quality of the basic institutions among its peers. For the transitional countries Chile and Latvia are leaders while Hungary ranks last.

The United States, Singapore and Denmark lead the ranks of the developed countries when it comes to the *efficiency enhancers* index in *Figure 13*. Their institutions are best fit to meet the needs of markets for sophisticated products and services. Italy is yet again last among developed countries, along with Spain and Greece, confirming the relatively low overall

²⁵ World Economic Forum (2005)
²⁶ China, Thailand
²⁷ Brazil, South Africa, Latvia, Mexico, Hungary, Chile, Argentina, Croatia, Jamaica, Venezuela and Slovenia
²⁸ All other countries from the data set

quality of their institutional framework. Among transitional countries, Chile and Latvia are leaders again, while Mexico and Venezuela are in the lowest bound.

Figure 13 Efficiency enhancers index in 2005



It is useful to note, that the efficiency of entrepreneurial activities will depend on the quality of the underlying institutions. According to the competitiveness indices, a firm start-up for an advanced financial service or a knowledge intensive technology can be expected to have greater impact in the United States or Singapore as compared to Italy or Spain.

5 RESULTS AND DISCUSSION

5.1 RESULTS

All estimations were run with the software SPSS, using OLS regression techniques with robust standard errors to control for heteroskedasticity problems. The estimation results for the Solow, Romer and Porter model are reported in *Table 1 – 3*. The dependent variable in all three models is the average growth rate of output per worker during the years 2005 to 2007. *Total Entrepreneurial Activity* is included in all models and the results are reported in regression *I* of the respective models. Regressions *II to V* include additionally entrepreneurship sub-indices for the *extractive, transformative, business services* and *consumer services* sectors respectively.

Correlations between independent variables of up to 66% were accepted in the regression. In the case of *output base* and *TEA business* there appears to be problem with multicollinearity since both variables have a correlation of over 70%. The coefficient for *TEA business* is virtually zero and non-significant in all models. While this issue does not put a serious restraint on the model as a whole, the individual coefficients have to be regarded more cautiously, since they could react erratically to data changes. The results improve somewhat if one of the variables is left out, however, the comparability of the models suffers and therefore these results are not reported here.

5.1.1 RESULTS FOR THE SOLOW MODEL

The results of the estimation based on the Solow model are reported in *Table 1*. In all five estimations the explanatory power is reasonably high with values from 55% in models *I* and *IV* to up to 62% in model *V*, suggesting that the model is fairly well defined.

The variable *output base* is significant at 99% level and has a negative effect on growth rates throughout all five estimations. This confirms the assumption that countries at higher levels of economic development experience slower growth rates. The coefficients for *growth of capital per worker* are positive and highly significant. Accordingly, the prediction of the Solow model that increases in capital stock lead to increases in output is verified. The significance

for the *TEA* coefficient varies from just below 90% in estimation *IV* to 95% in estimation *I* and *V* and 99% in estimation *II* and *III*. The sign of the coefficients is negative in all cases. This is a rejection of the hypothesis that higher levels of entrepreneurial activity have a positive effect on growth. However, *TEA extract* in estimation *II* appears to have a positive effect on growth, though it is significant at just 90%. The same applies to *TEA transform*, where the significance level is somewhat higher at 95%. Thus, despite the generally negative influence of high levels of entrepreneurial activity on growth, entrepreneurship in the extractive and transformative sectors appears to be growth enhancing. No inference can be derived for *TEA business* from estimation *IV*, probably due to the above mentioned problems of multicollinearity. The coefficient for *TEA consumer* is highly significant and negative, reinforcing the overall negative effect of entrepreneurial activity.

Table 1 Estimation results for the Solow model

Model	I	II	III	IV	V
constant	,140*** (3,814)	,142*** (3,976)	,147*** (4,167)	,159*** (3,772)	,228*** (4,705)
output base	-,010*** (-3,372)	-,011*** (-3,624)	-,012*** (-3,934)	-,013*** (-2,924)	-,016*** (-4,435)
growth of capital per worker	,246*** (4,348)	,246*** (4,471)	,217*** (3,861)	,241*** (4,216)	,214*** (3,981)
TEA	-,010** (-1,860)	-,011*** (-2,157)	-,012*** (-2,322)	-,008 (-1,363)	-,009** (-1,993)
TEA extract	-	,001* (1,725)	-	-	-
TEA transform	-	-	,001** (1,949)	-	-
TEA business	-	-	-	,000 (,925)	-
TEA consumer	-	-	-	-	-,001*** (-2,538)
Observations	35	35	35	35	35
Adjusted R ²	,552	,579	,589	,550	,619

*** Significant at 99%, **Significant at 95%, *Significant at 90%

5.1.2 RESULTS FOR THE ROMER MODEL

The results of the estimation based on the Romer model are reported in *Table 2*. Similarly to the Solow model, the estimations explain from 55% to 64% of the variation in average growth rates of output per worker. Likewise, the implications for *output base*, *growth of capital per worker* and *TEA* with all sub-indices are replicated here too, confirming the findings from the Solow model.

Patents are significant at 90% only in estimation *III*, while achieving lower levels of significance in the remaining estimations. However, keeping in mind the comparably low level of observations, the positive sign for all coefficients suggests a weak confirmation of the prediction from the Romer model that the production of new knowledge is growth enhancing.

Table 2 Estimation results for the Romer model

<i>Model</i>	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>V</i>
<i>constant</i>	,156*** (4,022)	,160*** (4,303)	,168*** (4,551)	,171*** (3,941)	,251*** (5,051)
<i>output base</i>	-,012*** (-3,556)	-,013*** (-3,933)	-,015*** (-4,282)	-,015*** (-3,124)	-,019*** (-4,757)
<i>growth of capital per worker</i>	,257*** (4,513)	,258*** (4,726)	,227*** (4,113)	,251*** (4,357)	,225*** (4,242)
<i>patents</i>	,002 (1,200)	,002 (1,456)	,002* (1,686)	,001 (1,103)	,002 (1,539)
<i>TEA</i>	-,009** (-1,845)	-,011*** (-2,188)	-,012*** (-2,393)	-,008 (-1,388)	-,009** (-2,001)
<i>TEA extract</i>	-	,001** (1,907)	-	-	-
<i>TEA transform</i>	-	-	,001*** (2,201)	-	-
<i>TEA business</i>	-	-	-	,000 (,809)	-
<i>TEA consumer</i>	-	-	-	-	-,001*** (-2,712)
<i>Observations</i>	35	35	35	35	35
<i>Adjusted R²</i>	,559	,594	,613	,553	,636

***Significant at 99%, **Significant at 95%, *Significant at 90%

5.1.3 RESULTS FOR THE PORTER MODEL

The results of the estimation based on the Porter model are reported in *Table 3*. The explanatory power of around 55% is on average somewhat lower compared to the estimations of the Solow and Romer models. The level of the economic development of a country is reflected in the indices *basic requirements* and *efficiency enhancers*, therefore the variable *output base* is not included in this estimation. And indeed, countries with high scores in *basic requirements* achieve higher growth rates, while countries where *efficiency enhancers* prevail experience a growth slowdown. The coefficients for *growth of capital per worker* as well as for *TEA* remain negative, similar to the previous models. The difference here is that none of the sectoral sub-indices for entrepreneurship shows any noteworthy significance. One possible explanation is that the variation of entrepreneurship levels in the respective sectors is also partly captured by the institutional variables *basic requirements* and *efficiency enhancers*.

Table 3 Estimation results for the Porter model

<i>Model</i>	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>	<i>V</i>
<i>constant</i>	,025 (,893)	,028 (,995)	,020 (,701)	,025 (,903)	-,032 (,952)
<i>growth of capital per worker</i>	,258*** (4,677)	,262*** (4,719)	,246*** (4,395)	,250*** (4,487)	,258*** (4,604)
<i>basic requirements</i>	,078*** (3,014)	,073*** (2,718)	,079*** (3,071)	,078*** (3,012)	,078*** (2,950)
<i>efficiency enhancers</i>	-,048* (-1,675)	-,052* (-1,784)	-,051* (-1,792)	-,029 (-,851)	-,053* (-1,662)
<i>TEA</i>	-,009* (-1,853)	-,010* (-1,933)	-,010*** (-2,013)	-,012** (-2,105)	-,009* (-1,748)
<i>TEA extract</i>	-	,001 (,935)	-	-	-
<i>TEA transform</i>	-	-	,000 (1,150)	-	-
<i>TEA business</i>	-	-	-	-,000 (-1,004)	-
<i>TEA consumer</i>	-	-	-	-	-,000 (-,392)
<i>Observations</i>	35	35	35	35	35
<i>Adjusted R²</i>	,558	,556	,563	,558	,545

***Significant at 99%, **Significant at 95%, *Significant at 90%

What is more, the results for all three models do not seem to suffer when a sensitivity analysis is performed. Neither does taking averages of different years nor for single years for the dependent variable change the overall predictions of the models. The same goes for the independent variables. Using different base years or other years for the growth rates of capital still yields similar results as the reported. For the technology level alternative proxies such as the tertiary enrollment rates and average years of schooling in a country are used, which do not contradict the results either. Finally, different types of entrepreneurship, included in the GEM master dataset, confirm the overall findings on entrepreneurial activity.

5.2 DISCUSSION

In general, the model specifications seem to confirm the theoretical implications of the Solow and Romer models – growth of the capital accumulation rate has a strong positive effect on overall output growth rates. The dynamics of both models propose fast growth the further the economy is away from its steady state – also this theoretical proposition is confirmed by the models. The implication of the Romer model that increased production of knowledge is positively influencing the growth rates can be weakly confirmed with the specification that the sample size does not allow for any stronger formulation.

The institutional regressions of the Porter model show that countries that score high in the basic features of their institutional framework achieve higher growth rates. On the contrary, countries where product sophistication is emphasized experience a growth penalty. The caveat of the institutional indices is that they partially reflect the current stage of economic development. The Pearson type correlation between *basic requirements* and *output base* is -0.519 and highly significant. The same correlation for *efficiency enhancers* is 0.644, also very significant. This suggests higher growth rates for poorer countries and vice versa for richer countries. An inclusion of the *output base* variable in the Porter model does not change this conclusion.

The discussion whether institutions cause economic development or economic development allows for better institutions is still ongoing in the economics profession²⁹. Therefore it is hard

²⁹ Glaeser et al. (2004)

to definitely say whether it is the income levels or the institutional quality that is responsible for the results of the Porter model.

The regression results for all three models show that if other decisive growth factors are controlled for, high overall entrepreneurial activity appears to be detrimental for growth rates of output per worker, rejecting the hypothesis that entrepreneurship plays a positive role in the process of economic growth. The negative effect of entrepreneurship is a surprising result given the arguments that were discussed in this paper. The reasons for the levels of entrepreneurship can have different origins. For once, the entrepreneurship that is captured by the TEA index might cover a large amount of “unproductive” entrepreneurship as suggested in Carree, van Stel, Thurik and Wennekers (2002), where countries above or beneath the equilibrium level of entrepreneurship experience a growth penalty due to resource misallocation. Here, the negative effect of “too much” entrepreneurship seems to dominate and most entrepreneurial activity happens in areas that are not growth enhancing. This implies that economic actors are apparently forced into unproductive activities for the lack of better options.

As discussed earlier, the current stage of economic development might encourage or suppress entrepreneurial activity as described in the Schumpeter *Mark I* and *Mark II* regimes and thus favor selectively low end production or production with increasing returns to scale. Looking at shares in the different sectors (*Figure 14-17*) it is obvious that on average the lion share of entrepreneurship occurs in the low end *consumer services* sector with an average share of 47%. This sector is characterized by such activities as retailing, lodging and restaurant services. Those might be occupations that improve job statistics but they usually are not expected to contribute greatly to the overall output growth. They also bind up resources that might be better utilized in more productive activities.

The average share in the *business services* is 23%, with occupations in finance, insurance and real estate. At first it appeared to indicate a positive influence on growth rates, yet this cannot be confirmed by the estimation due to overall inconclusiveness of the results. On average 25% and 5% of entrepreneurial activity happens in the transformative and the extractive sectors respectively. Both sectors showed a positive influence on growth with employments in manufacturing, communication, agriculture and mining. Typical for these activities are increasing returns to scale, thus nicely fitting the implications of the growth models.

6 CONCLUSION

Firstly, this study aimed at finding common ground between the neoclassical, the endogenous and the institutional growth frameworks on the one hand and the entrepreneurial school on the other hand. Hence, the distinctive models developed by Solow, Romer and Porter have been introduced and discussed in order to uncover possible disparities as well as similarities with the definitions of entrepreneurship according to Schumpeter and Kirzner. The models were then consolidated subject to the gained insights. Specifically, Solow's growth framework was merged with Kirzner's concept of the *alert* entrepreneur while Romer's theory matched best with Schumpeter's notion of the entrepreneur who drives the process of *creative destruction*. Porter's model appeared to incorporate a notion of entrepreneurship from the beginning.

Secondly, the hypothesis was tested whether entrepreneurship is good for growth. To do that, the above mentioned models were furnished with fitting data and subsequently described and estimated. The estimations confirm the general implications of the growth models that capital accumulation is growth enhancing while countries that are closer to their steady state equilibrium experience a growth slow-down. Further, the production of knowledge appears to have a weakly positive influence of growth. Differences in institutions are also responsible for varying growth rates. The hypothesis that entrepreneurship has a positive effect on growth has to be rejected. Overall high levels of entrepreneurship are bad for growth. However, a closer look at different types of entrepreneurship reveals that the effect on growth depends on which kind of entrepreneurship we are looking at. Entrepreneurship in sectors with predominantly large scale production and increasing returns to scale are in fact good for growth. Entrepreneurship in services however is either inconclusive regarding growth rates or shows a negative trend.

The results illustrate that the pursuit of overall high levels of entrepreneurship as a goal per se is detrimental for growth. In the past, policy makers who derived their conclusions from the Romer model, which assumed high levels of research to be growth enhancing, directed their efforts at generally emphasizing and subsidizing research activity. Decades later, the *European Paradox* of high knowledge production and low growth reveals that knowledge does not automatically spill over to be commercialized on the markets. A similar warning is in order when it comes to maintaining high levels of entrepreneurship – not all that glitters is gold.

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Electronic sources:

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<http://www.gemconsortium.org/>

<http://www.weforum.org/>

APPENDIX

Figure 14 Share of consumer services in TEA in 2005

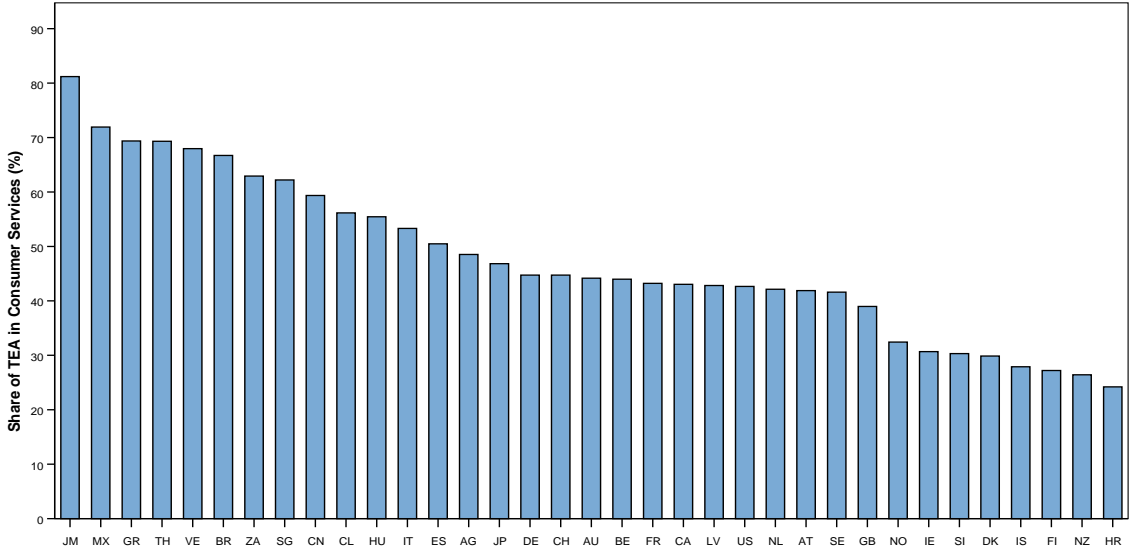


Figure 15 Share of business services in TEA in 2005

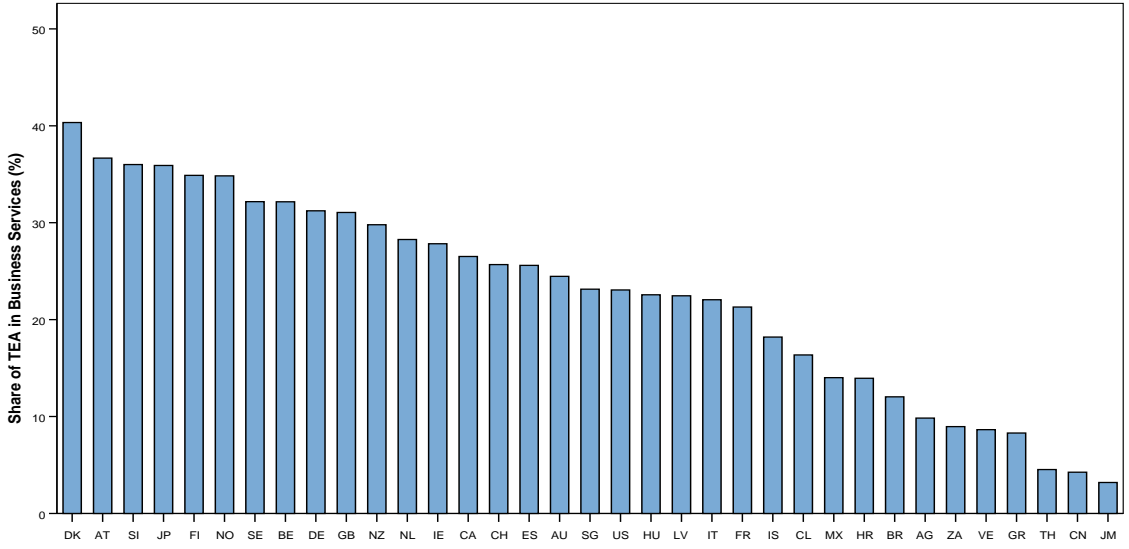


Figure 16 Share of the transformative sector in TEA in 2005

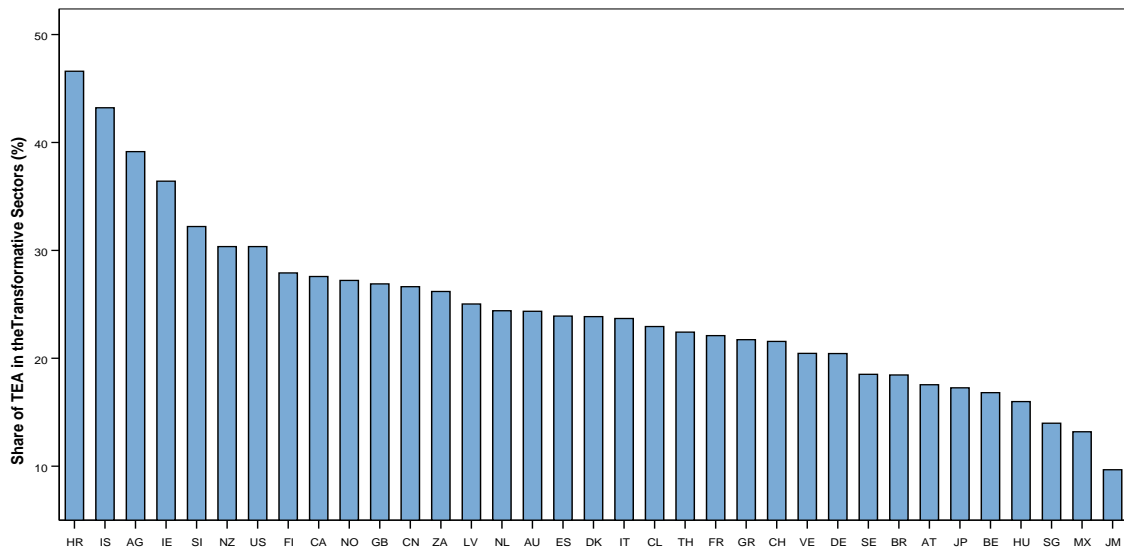


Figure 17 Share of in the extractive sector in TEA in 2005

