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Entrepreneurship and Competition, what is the role of a Countries' Competitiveness?

Abstract

Opportunity-entrepreneurship is one of the key drivers of economic growth in a country. The level of entrepreneurial activity has a link with the competitiveness of a country. This study investigates this link between the level of competition across countries and entrepreneurship. Opportunity-entrepreneurship is measured in this study by the Global Entrepreneurship Index (GEI). To capture the competition of a country, twelve different pillars of competitiveness are used. The pillars are derived from the Global Competitiveness Index published by the World Economic Forum. In total 132 countries are in the database over four different years, where the most recent year (2016) is used as main investigation year. Positive robust associations are found between entrepreneurial activities in a country and the strength of institutions, the level of higher education and training, the technological readiness and the market size; i.e. when there is a higher competitiveness score for these pillars, the entrepreneurial activity within the country will increase. On the other hand, labour market efficiency appears to have a negative association with entrepreneurial activity within a country.

Keywords: Entrepreneurship, Competition, Pillars of Competitiveness, Entrepreneurial activity, Economic Growth.

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Introduction

For hundreds of years, economists have been trying to understand the determinants that drive productivity and economic growth. Engendering theories range from Adam Smith's focus on specialization and the division of labour to neoclassical economist' emphasis on investment in physical capital and infrastructure. Schumpeter (Schumpeter, 1942) has developed a framework for innovation driving economic growth, defining the entrepreneur as the innovator driving this growth and competition between companies driving others out of the market. Factors like education and training, technological progress, macroeconomic stability, good governance and more, have been proved to be important for competitiveness of countries and economic growth as well as having an impact on entrepreneurship (Sala-i-Martin et al., 2004). These named factors are often not mutually exclusive as has been shown in literature (Sala-i-Martin et al., 2004). This concept of competitiveness involves both static and dynamic components. Although the productivity of a country determines its ability to sustain a high level of income, it is also one of the central determinants of its return on investment, which is one of the key factors explaining an economy's growth potential. This potential of an economy to grow is essential for entrepreneurship to succeed (Acs & Szerb, 2007). The direct link between competitiveness and opportunity entrepreneurship has, to my best knowledge, not been made before. Economic growth related to competitiveness could potentially be explained by the amount of entrepreneurial activity in a country. This study will link the twelve pillars of competitiveness as defined by the World Economic Forum (WEF) to entrepreneurship (World Economic Forum, 2015) and the GEI which calculates a clear defined entrepreneurial opportunity indicator for every country worldwide (Global Entrepreneurship Index, 2017).

C*ompetitiveness* is defined as the set of institutions, policies, and factors that determine the level of productivity of a country. This is the same definition as used by the WEF (2014). The level of productivity sets the level of prosperity that can be reached by an economy. The productivity level also determines the rates of return obtained by investments in an economy, which in turn are the fundamental drivers of its growth rates. In other words, a more competitive economy is one that is likely to grow faster over time (Hunt, 1999; Wennekers & Thurik, 1999).

An entrepreneur is a person with the vision to see an innovation and the ability to bring it to market (GEI, 2017). One widely used measure for entrepreneurship is made by the Global Entrepreneurship Monitor (GEM). They measure entrepreneurial activity as follows: Total Entrepreneurial Activity (TEA) is the share of the working population that is about to start an entrepreneurial activity, or that has started one maximum 3.5 years ago. It does not measure entrepreneurship quality but rather entrepreneurship quantity, and in doing so captures primarily self-employment in a country. This study however, is concerned with entrepreneurship quality: the opportunity driven entrepreneur who generates commercial success. Entrepreneurship in this sense, is about having high growth in the entrepreneurs' business, scalability of the business model and serious job creation in the economy. This definition is known as *opportunity-entrepreneurship*. Literature shows that opportunity-entrepreneurship is positively correlated with economic growth. This view is already in place since theories from Schumpeter (1942) almost a century ago and more recently by Peter Drucker (2014) and William Baumol (1996). Growth-oriented entrepreneurship can only flourish when good policies are in place promoting innovations and the growth of businesses. This gives a different view on the entrepreneurial activity in a country than when the self-employment ratio captured by GEM's TEA rate is used (Acs et al., 2017). Opportunity-entrepreneurs envision scalable, high-growth businesses and possess the ability to make those visions a reality.

Over the past three decades, the role of entrepreneurship to drive economic growth has been an important research topic in economics (King & Levine, 1993; Wennekers & Thurik, 1999; Acs & Szerb, 2007). In combination with this realization of the importance of entrepreneurship, governments around the world have enacted various policies to promote enterprise development, focusing on microeconomic incentives such as favourable tax regimes, subsidies, growth and innovation funding, or simplified business regulations for small and medium-sized enterprises (Acs & Stough, 2008). While there have been microeconomic responses to the need for enterprise development, at the same time there has been comparatively less emphasis on the effect and use of macroeconomic policies on this same goal of entrepreneurship.

The main question of this study will be which pillars of competitiveness are most influential on entrepreneurship. The twelve pillars of competitiveness are: Institutions, Infrastructure, Macroeconomic Environment, Health & Primary Education, Higher Education & Training, Good market efficiency, Labour market efficiency, Financial market development, Technological readiness, Market size, Business sophistication and Innovation (Sala-i-Martin et al., 2014). In the theoretical framework of this study, a more detailed description of each pillar is given.

The twelve pillars of competitiveness, as introduced above, could show important lessons both for academic purpose as well as social implications. As to what determines productivity and potential economic growth, this study will show which pillars are superior and/or which pillars have a mutual effect on entrepreneurial firms. Also, literature concerning the chances for success of entrepreneurial firms and the likelihood of opportunity entrepreneurship over different worldwide regions and phases of economic development will be further investigated. Socially, this study could help governments showing which aspects in their policies are favourable for opportunity entrepreneurship and what encourages them to thrive in an economy. For entrepreneurs, this study could show what aspects in an economy matter: they can learn which competitiveness pillars are in general more important for entrepreneurship to thrive. Knowing these competitive advantages of countries, they can decide to start a business in a country with a relatively favourable environment for their opportunities. Some pillars are likely to show a positive association between competitiveness and entrepreneurship and others might not be as important for entrepreneurship. Examples of expected positive associations are: institutional strength, higher education and market size.

Expectations about the association between the twelve pillars of competitiveness and entrepreneurship will be formed and tested using an ordinary least squares regression. The dependent variable for entrepreneurship will be the GEI. As robustness check, also different indexes for entrepreneurship will be used: Entrepreneurial Abilities Index (ABT), Entrepreneurial Attitudes Index (ATT) and Entrepreneurial Aspirations Index (ASP). The explanatory variables are the twelve pillars. The control variables for country fixed effects are proxies such as population, GDP per capita and unemployment will be used. Data of the years 2012, 2013, 2015 and 2016 is publicly available to use for this study. Since only four years are available, regressions will be run for each year separately and then checked for similarities instead of creating a panel data regression with limited variance. The most recent year — 2016— will be used as main year of investigation.

First, a theoretic framework about the pillars of competitiveness and the entrepreneurial ecosystem is made. Next, hypotheses and expectations are formed which will be tested as described in the data and methodology sections. Hereafter, results are presented and conclusions drawn. Lastly, limitations and suggestions for future studies are made.

Theoretical framework

In this section, a theoretical framework is built. Previous literature is reviewed and the different elements of competitiveness, economic growth and entrepreneurship are first described independently before they are combined in the twelve different pillars. For each pillar separately, argumentation is provided whether it has an association with entrepreneurship and what the directions are.

Pillars of competitiveness

This study will use an index for competitiveness published yearly by the WEF, known as the Global Competitiveness Index (GCI). This index provides an overall score based on twelve different pillars of competitiveness, it distributes different weights to the pillars for different country fundamentals. The GCI is widely used as an important tool by policymakers of countries over recent years (Jeremic et al. 2016). It was first publicized in 2005 and since then the index has become one of the key assessment of global competitiveness and is widely recognized (Ketels, 2016). In line with well-known economic theory of stages of development, the GCI assumes that, in the first stage, the economy is factor-driven and countries compete based on their factor endowments—primarily unskilled labour and natural resources (WEF, 2017). Companies compete on price and sell basic products or commodities, with their low productivity reflected in low wages. Maintaining a high level of competition across countries at this stage of development hinges primarily on well-functioning public and private institutions (pillar 1), a well-developed infrastructure (pillar 2), a stable macroeconomic environment (pillar 3), and a healthy workforce that has received at least a basic education (pillar 4).

When a country is able to use most of their factor endowments, it is likely to transform into a more competitive economy: companies need to increase productivity to stay ahead of their competitors since all factor endowments will be used. As a result, wages will rise and wealth will increase with advancing development (WEF, 2017). Countries will then move into the efficiency-driven stage of development. Governments need to alter their policies and introduce a different economic climate, since companies begin to develop more efficient production processes and increase product quality. Wages have risen for the more educated working population and firms cannot increase prices any further in their home country as that will drive demand to competitors in other countries. At this point, the relative competitiveness of a country is increasingly driven by higher education and training (pillar 5), efficient goods markets (pillar 6), well-functioning labour markets (pillar 7), developed financial markets (pillar 8), the ability to harness the benefits of existing technologies (pillar 9), and a large domestic or foreign market (pillar 10).

Finally, as countries move into the innovation-driven stage, wages will have risen by so much, that companies and the working population are able to sustain those higher wages and the associated standard of living only if their businesses are able to compete with new and unique products (Drucker, 2014). At this stage, firms must compete by producing new and different goods using the most sophisticated production processes (pillar 11) and by innovations based on technological and non-technological knowledge (pillar 12). The GCI takes the stages of development into account by attributing higher relative weights to those pillars that are more

relevant for an economy given its stage of development. Although all 12 pillars matter to a certain extent for all countries, the relative importance of each one depends on a country's stage of development. To implement this concept, the pillars are organized into three sub-indexes, each critical to a stage of development. This study will use the allocated countries over the stages of development of the GCI. The allocation can be found in Table A1 in the Appendix.

Since the GCI uses the different stages of development of a country, the score represents the competitiveness within each stage of development. Factor-driven economies, efficiency-driven economies and innovation-driven economies got weights assessed to the relative importance of the subsequent pillars in the overall GCI score. This makes the score robust against biases when similar weights would be attributed for the different stages. Competitiveness and economic growth have a positive relationship, when a country gets more competitive it is more likely to grow (Sala-i-Martin et al., 2004). The competitiveness index can thus be used to determine growth of an economy. Entrepreneurs, as this study focuses on, are one of the necessities in an economy to start growth and job creation (Sala-i-Martin, 2014). Since competitiveness is one of the factors entrepreneurs need to consider, knowing which of the twelve different pillars matters for them can increase the chances of success. Moreover, opportunities can be more easily recognized and commercialized by entrepreneurs when the particular pillar is strongly present in a certain country.

More detailed theories and directions for entrepreneurship in relation to the different pillars will follow later. First the link between entrepreneurship and economic growth will be made, then the twelve pillars will be explained in more detail and associations between competitiveness and entrepreneurship for every pillar will be made when they are considered to have an influence.

Entrepreneurship & Economic growth

Over the years there have been many definitions for entrepreneurship and it still is an ill-defined concept (Woolridge, 2009; Wennekers & Thurik, 1999). As stated in the introduction, this study sees an entrepreneur as a person with the vision to see an innovation and the ability to bring it to market. Entrepreneurship is in this meaning about high growth, scalability and serious job creation. This is in line with views from many economic theories including theories from Eisenberg (1996) and Schumpeter (1942).

In their theories, entrepreneurship is one of the determinants of economic growth. However, the concept of economic growth is relevant at the level of firms, industries and nations whereas entrepreneurship is about activities of individual persons. Linking entrepreneurship to economic growth means linking the individual level to the aggregate levels. This leads to three levels of analysis that can be distinguished when discussing this relationship: the level of the individual entrepreneurs operating on their own or in teams and partnerships, the firm level and the aggregate levels of industries, regions and national economies. Usually, a direct link between entrepreneurship and economic growth is not present since many factors might influence the ability of the entrepreneur to make his or her work a successful growth story. Personal traits lie at the origin of entrepreneurship, if an entrepreneur does not have skills to recognize opportunities or cannot bring them to the market, he is not likely to cause growth. Furthermore, both entrepreneurship and intermediate linkages may depend upon underlying cultural and institutional conditions. The environment for a successful entrepreneur can therefore also be described as an ecosystem. Since an ecosystem always involves many different factors and external influences, intermediate variables or linkages to explain how entrepreneurship influences economic growth are needed. Examples of these intermediate

variables are innovation, and entry and exit of firms. The latter is also known as competition and thus competitiveness.

While requiring skills and other qualities are important to be successful, essentially entrepreneurship is about behaviour of individuals (Wennekers & Thurik, 1999). When an entrepreneur takes entrepreneurial actions or activities, this takes us to the firm level: entrepreneurs need to find a way to transform their personal qualities and ambitions into actions. Small firms where the entrepreneur has a controlling stake provide such possibilities for example. On the other hand, larger firms often mimic smallness (using organizational forms like business units, subsidiaries, and joint ventures) to introduce corporate entrepreneurship (Wennekers & Thurik, 1999). The outcome of these entrepreneurial manifestations at the firm level is generally linked to newness and thus innovations. This can be newness through product, process- and organizational-innovation, entry of new markets and innovative business start-ups.

At the aggregate level of industries, regions and national economies, the many individual entrepreneurial actions compose a mosaic of new experiments. A process of competition between these various new ideas and initiatives takes place continuously, leading to the selection of the most viable firms and industries. Competition, selection and imitation (Baumol, 1993) expand and transform the productive potential of a regional or national economy: by replacement or displacement of obsolete firms, by higher productivity and by expansion of new niches and industries. They enhance its international competitiveness and thereby its market share. Viewed from within a closed economy or even the world economy, one could say that the additional productive potential in a competitive environment would create its own demand, this is also known as Say's law (Sowell, 2015). The outcome of this chain of variables linking the individual level to the macro level, is competitiveness and economic growth (Wennekers & Thurik, 1999).

Having introduced the linking determinants between the individual and macro level: competitiveness across countries as an important driver for entrepreneurship to lead to economic growth. In literature, this is previously discussed in frameworks of several historic economists (Swan, 1956; Schumpeter, 1942) and more recently by Wennekers & Thurik (1999). This study will research this linkage as well and focus especially on the competitiveness-side instead of economic growth. Looking to innovations, competition between firms can have both positive and negative effects on economic growth and the competitiveness of a country. As Aghion et al. (2005) show, when competition is low then also technology spread is low. If a firm innovates, it becomes the leader in the market. Marginal increases in competition are therefore stimulating innovations, since firms can escape the competition by becoming a leader when innovating.

However, when competition is high then also the technology spread is high. In this case, laggard firms perform innovations, when there is a marginal increase in competition it is bad for innovation. These effects result in an inverted U-shape in the relation between competition and innovation. For entrepreneurs, a similar theory could count, when there is a high level of competition in a country then technology spread could be high (pillar 9). This might lead to less entrepreneurial activity since new opportunities are only taken on by laggard firms. This study will test more in-depth than current literature did, for example, whether the technology spread and readiness matter for entrepreneurial activity in relation to competitiveness across countries.

Next, all twelve pillars of competitiveness will be explained and expectations (and in which direction) for the associations with entrepreneurship will be formed. Identifying which pillars could theoretically be associated with the entrepreneurial activity in a country forms the basis of this study how competitiveness plays a role for entrepreneurship and economic growth.

Pillar 1: Institutions

The institutional environment is a framework where individuals, firms and governments interact on legal and administrative cases to generate wealth. The importance of a sound and fair institutional environment should not be underestimated, a fair institutional environment is crucial for further solidifying the fragile recovery after a financial crisis for example, given the increasing role played by the state at the international level and for the economies of many countries. The exploitation of opportunities for entrepreneurs are depending on the fairness of the institutional environment as well because the quality of institutions has a strong bearing on competitiveness and growth (Easterly, 1997; Sala-i-Martin, 2003). It influences investment decisions and the organization of production and plays a key role in the ways in which societies distribute the benefits and bear the costs of development strategies and policies. For example, owners of intellectual property are unwilling to invest in improvements and update of their property if their rights as owners are not protected (Soto, 2000). Often new intellectual properties come from entrepreneurs who recognize opportunities and take actions to make them work.

The role of institutions goes beyond the legal framework. Government attitudes toward markets and freedoms and the efficiency of its operations should also be considered: excessive bureaucracy and red tape (Soto & Abbot, 1990), overregulation, corruption, dishonesty in dealing with public contracts, lack of transparency and trustworthiness, inability to provide appropriate services for the business sector, and political dependence of the judicial system impose significant economic costs to businesses and slow the process of economic development (Verheul et al., 2002). This harms entrepreneurial activities and imposes burdens for more actions. In addition, the proper management of public finances is critical for ensuring trust in the national business environment. Indicators capturing the quality of government management of public finances are therefore included to complement the measures of macroeconomic stability captured in pillar 3 (WEF, 2014).

Although the economic literature has focused mainly on public institutions, private institutions are also an important element in the process of creating wealth (Sala-i-Martin, 2003). The global financial crisis, along with numerous corporate scandals, has highlighted the relevance of accounting and reporting standards and transparency for preventing fraud and mismanagement, ensuring good governance, and maintaining a healthy entrepreneurial ecosystem. An economy is well served by businesses that are run honestly, where managers abide by strong ethical practices in their dealings with the government, other firms, and the public at large (Shleifer, 1997). Private-sector transparency is indispensable to business; it can be brought with standards as well as auditing and accounting practices that ensure access to information in a timely manner (Kaufmann, 2001).

Based on the argumentation provided above and as shown by Verheul et al. (2002), the government plays an important role in the decisions entrepreneurs make. The policies of governments regarding taxation and small business subsidies matter for entrepreneurs according to their study, this is also shown by the OECD (1998a).

Expectations therefore are that Institutions have a positive assocation with entrepreneurial activities. In other words, when the Institutions pillar has a higher score this results in more entrepreneurial activities. The hypothesis is thus:

There is a positive association between entrepreneurship and institutional strength in a competitive country.

Pillar 2: Infrastructure

Extensive and efficient infrastructure is critical for ensuring the effective functioning of the economy; it is an important factor in determining the location of economic activity and the kinds of activities or sectors that can develop within a country. A well-developed infrastructure reduces the effect of distance between regions, integrating the national market and connecting it at low cost to markets in other countries and regions. Entrepreneurs can gain from a strong infrastructure as they do not need to make large investments to create the infrastructure themselves. In addition, the quality and extensiveness of infrastructure networks significantly impact economic growth and reduce income inequalities and poverty in a variety of ways (Aschauer, 1989). However, a well-developed transport and communications infrastructure network is a prerequisite for the access of less-developed communities to core economic activities and services and provides thus opportunities for entrepreneurs in areas where this is not yet in place (Canning et al., 1994).

Effective modes of transport—including quality roads, railroads, ports, and air transport—enable entrepreneurs to get their goods and services to market in a secure and timely manner and facilitate the movement of workers to the most suitable jobs. Economies also depend on electricity supplies that are free from interruptions and shortages so that businesses and factories can work unimpeded. Finally, a solid and extensive telecommunications network allows for a rapid and free flow of information, which increases overall economic efficiency. By ensuring that businesses can communicate freely, decisions are made by economic actors considering all available relevant information (Sala-i-Martin, 2003). This decreases the potential asymmetric information bias and increases chances for economic growth and thus the competitiveness of an economy. However, one could also argue that when such systems are not yet in place and working efficiently, entrepreneurs could exploit opportunities better as they can work in more secrecy and offer other firms the network and infrastructure exclusively (Aschauer, 1989).

If the entrepreneur provides this infrastructure, it can lead to economic growth since the society will improve their wealth and different firms mutually gain from it, eventually creating higher GDP at the country level. Since entrepreneurship is defined as opportunity entrepreneurship which will eventually lead to economic growth, the correlation of this pillar towards entrepreneurship is expected to be negative. When there is not yet a strong infrastructure, this will play entrepreneurial opportunities and activity in hand (Cohen & Winn, 2007). This effect of creating new infrastructure and exploiting it, is expected to have a larger effect than the infrastructure in place which reduces their sunk investment costs. Entrepreneurs can gain more from the exploitation than they reduce costs for sunk investments, therefore the hypothesis is:

The strength of infrastructure is negatively correlated with entrepreneurial activity within a country.

Pillar 3: Macroeconomic Environment

The stability of the macroeconomic environment is important for businesses and, recalling the link to economic growth, is significant for the overall competitiveness of a country (Fischer, 1993). Although it is true that macroeconomic stability alone cannot increase the productivity of a nation, it is also recognized that macroeconomic disarray harms the economy, as could be seen in recent years, conspicuously in the European context (WEF, 2017). The government cannot provide services efficiently if it needs to make high-interest payments on its past debts. Running fiscal deficits limits the government's future ability to react to business cycles. Firms cannot operate efficiently when inflation rates are out of hand. In sum, the economy cannot grow in a sustainable manner unless the macro environment is stable. Macroeconomic stability captured the attention of the public most recently when some advanced economies, notably the United States and some European countries, needed to take urgent action to prevent macroeconomic instability when their public debt reached unsustainable levels in the wake of the global financial crisis. It is important to note that this pillar evaluates the stability of the macroeconomic environment, so it does not directly consider the way in which public accounts are managed by the government. This qualitative dimension is captured in the institutions pillar described above.

Various studies argue that a higher level economic development and its stability, is accompanied by a decrease in the self-employment rate, and thus entrepreneurship (Kuznetz, 1966; Schultz, 1990; Bregger, 1996). This decrease has been persistent since the Middle Ages; economic activity moved away from families towards factories (Wennekers & Thurik, 1999). Several arguments have been brought forward supporting a negative impact of economic growth on the level of entrepreneurship (Carree, Van Stel, Thurik & Wennekers, 1999). Macroeconomic development is accompanied by an increase in wage levels and often by an improved system of social security. Rising real wages raise the opportunity costs of self-employment and thus make wage employment more attractive (EIM/ENSR, 1996). Fewer people are willing to leave 'secure' jobs as wages increase with economic development (Iyigun & Owen, 1997). Marginal entrepreneurs may be induced to become employees and this pushes up the average size of firms (Lucas, 1978). Moreover, higher wages stimulate enterprises to work more efficiently, leading to the use of economies of scale.

On the other hand, it is observed that, since the 1970s, per capita income has a positive impact on the self-employment rate in most developed countries (Carree, Van Stel, Thurik & Wennekers, 1999). There are arguments that support this positive impact of economic growth on the level of entrepreneurship. Recent economic development often is accompanied by the emergence of new industries. Small firms have a relative innovative advantage in high innovative industries (Acs & Audretsch, 1987). New technologies have reduced the importance of scale economies in many sectors and small firms are no longer at a disadvantage. Moreover, small firms are well equipped to implement technological advances (Carlsson, 1992). Increasing wealth leads to higher consumer needs and the demand for a variety of products and services increases. Small firms are well equipped to supply these new and specialized goods. Moreover, a higher level of prosperity may lead to higher personal needs (Bregger, 1996).

This higher need of self-realization is likely to be better fulfilled through entrepreneurship than working in routinized teams in established companies. The employment share of the service sector increases with per capita income and the service sector is characterized by small firm size, thus creating opportunities for entrepreneurship (EIM/ENSR, 1997). The literature is two-folded on the macroeconomic environment and it does not provide direct evidence for the relation between the macroeconomic stability of an economy and entrepreneurship: all effects

previously described are indirect effects of macroeconomic environment being influenced by different determinants first such as self-employment indicators and the wage levels. Therefore, no expectations are made on the relationship between entrepreneurship and a competitive macroeconomic environment. Moreover, the macroeconomic environment is captured not only by this pillar but also by country fixed effect control proxies as GDP per capita and the unemployment rate. Lastly, for the sake of multicollinearity this pillar is dropped from the regression. However, the country fixed effect controls still capture the macroeconomic environment.

Pillar 4: Health and Primary Education

A healthy workforce is vital to a country's competitiveness and productivity. Workers who are ill cannot function to their full potential and will be less productive. Poor health leads to significant costs to business, as sick workers are often absent or operate at lower levels of efficiency (WEF, 2017). Investments in the provision of health services are thus critical for economic, as well as moral, considerations: this also involves entrepreneurship (Sachs, 2001). In addition to health, this pillar uses the quantity and quality of the basic education received by the population, which is increasingly important in today's economies around the world. Basic education increases the efficiency of each individual worker. Moreover, workers who have received little formal education can often carry out only simple manual tasks and find it difficult to adapt to more advanced production processes and techniques, and therefore they contribute less to devising or executing innovations. In other words, lack of basic education can become a constraint on business development, with firms finding it difficult to move up the value chain by producing more sophisticated or value-intensive products.

This vital importance of a healthy and educated country to be competitive and successful is expected to have a positive association with entrepreneurship as is also supported by earlier studies (Van Praag, 1999). However, since education and the effectiveness of a countries workforce on entrepreneurial activity is not only captured by this pillar on health and primary education but also by the fifth pillar on higher education and training, the correlation is expected to be high and cause insignificant coefficients. The effect of the educational level of the workforce in a country on entrepreneurial activity will be higher when the workforce is more highly educated. Following this line of reasoning, this pillar is dropped from the regression to prevent multicollinearity and biased coefficients.

Pillar 5: Higher education and training

As described in the fourth pillar, an educated workforce is crucial for a countries competitiveness and productivity. Higher education and training is crucial for economies that want to move up the value chain beyond simple production processes and products (Schultz, 1961; Lucas, 1988; Becker 1993; Kremer 1993). Today's globalizing economy requires countries to keep pools of well-educated workers in place who can perform complex tasks, adapt rapidly to their changing environment and the evolving needs of the production system. They need to improve the quality of education standards to stay competitive. This pillar measures secondary and tertiary enrolment rates as well as the quality of education as evaluated by business leaders. The extent of staff training is also taken into consideration because of the importance of vocational and continuous on-the-job training —which is neglected in many economies— for ensuring a constant upgrading of workers' skills. A higher level of training and higher quality educations makes an economy more competitive. A more competitive workforce will have a positive correlation with entrepreneurship. When entrepreneurs have more highly educated people to work for them, they will be able to grow faster, work more

efficiently and smarter. They will have a higher chance of transforming opportunities in economic successes.

When investigating the impact of education on the level of entrepreneurship in a country, a distinction needs to be made between different levels of education: primary (pre-high school), secondary (high school) and tertiary education. Reynolds, Hay & Camp (1999) conclude that the larger a country's investment in education at the tertiary level, the higher the rate of new firm formation. Education –in the broadest sense– is important for stimulating entrepreneurship because of several reasons (Reynolds, Hay & Camp, 1999). First, education provides individuals with a sense of autonomy, independence and self-confidence. These qualities are important when starting a business. Second, education makes people aware of alternative career choices. Third, education broadens the horizons of individuals, thereby making people better equipped to perceive opportunities and finally, education provides knowledge that can be used by individuals to develop new entrepreneurial opportunities.

One can distinguish between this general education and more specific, education focusing on the promotion of entrepreneurship and stimulating entrepreneurial skills and knowledge. The educational system can be used for the encouragement of commercial awareness, raising the social standing of the entrepreneur and the development of necessary entrepreneurial skills (Gavron, Cowling, Holtham & Westall, 1998). Kourilsky & Carlson (1997) make a similar distinction, in their view that entrepreneurship education has multiple goals: creating awareness of entrepreneurship as a career option and the role of the entrepreneur in the economy, promoting readiness through basic knowledge and (entrepreneurial) qualities and stimulating application of knowledge and qualities in an entrepreneurial context. Universities (tertiary education) can provide courses on entrepreneurship, enabling the development of practical business skills. Moreover, universities could incorporate business modules into their regular curriculum (Reynolds, Hay & Camp, 1999).

Based on these studies and findings for the association between entrepreneurship and higher education, expected is to find a similar positive correlation between the competitiveness pillar of a country on higher education and entrepreneurial activity. More educated people could have better skills recognizing opportunities and making those a success resulting in economic growth. The hypothesis which will be tested is thus:

Higher education and training has a positive association with entrepreneurial activity.

Pillar 6: Goods market efficiency

Countries with efficient goods markets are well positioned to produce the right mix of products and services given the supply and demand conditions, as well as to ensure that these goods can be most effectively traded in the economy (WEF, 2014). Healthy market competition, both domestic and foreign, is important in driving market efficiency and thus business productivity. By ensuring that the most efficient firms, producing goods demanded by the market, are those that thrive best. The best possible environment for the exchange of goods requires a minimum of government intervention that impedes business activity, institutions should be in place and have strict regulations that enhance an open market. The recent economic crisis has highlighted the high degree of interdependence of economies worldwide and the degree to which growth depends on open markets (WEF, 2017). Market efficiency also depends on demand conditions such as customer orientation and buyer sophistication. For cultural or historical reasons, customers may be more demanding in some countries than in others. This can create an important competitive advantage, as it forces companies to be more innovative and customer-

oriented and thus imposes the discipline necessary for efficiency to be achieved in the market. Moreover, once a country is in a higher state of wealth, customers might be searching for more advanced products and are in that way creating new opportunities for entrepreneurs.

Regarding entrepreneurship, the literature gives different views on the relationship between goods market efficiency and entrepreneurial activity, however the relative relevance is questioned to other more important factors influencing entrepreneurship and competitiveness. On one hand, it is argued that when markets are efficient and in equilibrium: entrepreneurship is stimulated to develop new technologies, driving inefficient firms out of the market and leading to economic growth (King & Levine, 1993). On the other hand, entrepreneurship succeeds when there are market imperfections and there is a disequilibrium (Fischer, 1993). They provide significant opportunities for the creation of radical technologies and innovative business models. Cohen & Winn (2007) show that these opportunities establish the foundations for an emerging model of sustainable entrepreneurship, one which enables founders to obtain entrepreneurial rents while simultaneously improving local and global social and environmental conditions.

Based on this discussion when entrepreneurship flourishes best, no expectations can be formed if there is a positive or negative link between entrepreneurship and competitiveness when goods markets are efficient or inefficient. The impact of goods market efficiency on entrepreneurship might be inferior to the relevance of several other pillars to capture the link between competitiveness and entrepreneurial activities. In the case of an economy in equilibrium, new technologies will drive inefficient firms out of the market, this is closely related to the Innovation and Technological readiness pillars, which are more likely to capture the true effect instead of this pillar about goods market efficiency. Also in the case when there is a disequilibrium in the economy, it is more probable that the Institutional and Infrastructure pillars capture the effect. This pillar will therefore be dropped from the regressions since insignificant results are expected based on the relative relevance of this pillar.

Pillar 7: Labour market efficiency

The efficiency and flexibility of the labour market are critical for ensuring that workers are allocated to their most effective use in the economy and provided with incentives to give their best effort in their jobs. Efficient labour markets ensure strong incentives for employees and efforts to promote meritocracy at the workplace, and they provide equity in the business environment between women and men. These factors have a positive effect on worker performance and the attractiveness of the country for talent, two aspects that are growing more important as talent shortages loom on the horizon (WEF, 2017).

Labour markets must have the flexibility to shift workers from one economic activity to another rapidly, at low cost and to allow for wage fluctuations without much social disruption (Almeida 2009; Kaplan 2009). The importance of the latter has been dramatically highlighted by events in Arab countries, where rigid labour markets were an important cause of high youth unemployment. Youth unemployment continues to be high in some European countries, where important barriers to entry into the labour market remain in place. As argued in the fifth pillar, entrepreneurship flourishes best when there is a highly educated workforce present which makes the country more competitive. When this workforce can shift easily between different firms, it might not be an ideal situation for entrepreneurs since in general working in a start-up is riskier and provides employees with a lower wage.

Entrepreneurship and labour market efficiency tend to have a negative relationship (Banerjee & Newman, 1993). "Because of capital market imperfections, poor agents choose working for a wage over self-employment, and wealthy agents become entrepreneurs who monitor workers. Only with sufficient inequality, however, will there be employment contracts; otherwise, there is either subsistence or self-employment" (Banerjee & Newman, 1993). As argued before, entrepreneurial activities such as start-ups might work better when employees cannot shift between jobs easily. Employees will prefer a higher wage and security of their employment over working for a start-up or entrepreneur when society increases in wealth and development stage (Kaplan, 2009). The expectation is thus that entrepreneurship will have a negative link to labour market efficiency and competitiveness. When employees can shift more easily, they might choose sooner for established firms and starting entrepreneurs loose part a large pool of potential workers they can bind to their newly started business.

Labour market efficiency and entrepreneurial activities have a negative correlation.

Pillar 8: Financial market development

The financial and economic crisis has highlighted the central role of a sound and well-functioning financial sector for economic activities. An efficient financial sector allocates the resources saved by a nation's citizens, as well as those entering the economy from abroad, to their most productive uses. It channels resources to those entrepreneurial or investment projects with the highest expected rates of return rather than to the politically connected. A thorough and proper assessment of risk is therefore a key ingredient of a sound financial market.
Business investment is also critical to productivity. Therefore, economies require sophisticated financial markets that can make capital available for private-sector investment from such sources as loans from a sound banking sector, well-regulated securities exchanges, venture capital, and other financial products. To fulfil all those functions, the banking sector needs to be trustworthy and transparent, and financial markets need appropriate regulation to protect investors and other actors in the economy at large.

According to King & Levine (1993) "financial systems affect the entrepreneurial activities that lead to productivity improvements in four ways". They develop a model based on four views. First, financial systems always screen prospective entrepreneurs and choose the most promising projects. The screening process is a very complicated task, since many projects have an uncertain cashflow in the future, however this beyond the scope of this study. Second, financial systems mobilize resources to finance promising projects. Examples of where these financial resources can come from are: loans from banks, investments from venture capitalists or business angels, money from crowdfunding or cash from friends, family and fools. Third, financial systems allow investors to diversify the risk associated with uncertain innovative activities. Fourth, financial systems reveal the potential rewards to engaging in innovation, relative to continuing to make existing products with existing techniques. For entrepreneurship, better financial systems stimulate economic growth by accelerating the rate of productivity enhancement and financing. Thus, a more-developed financial system fosters productivity improvement by choosing higher quality entrepreneurs and projects, by more effectively mobilizing external financing for these entrepreneurs, by providing superior vehicles for diversifying the risk of innovative activities, and by revealing more accurately the potentially large profits associated with the uncertain business of innovation.

Comparing the way financial development is measured in relation to the competitiveness of a country and the way the literature on entrepreneurship investigates financing start-ups: different ways of achieving financial support for entrepreneurial opportunities are described. This

deviation results in no clear expected sign between the two. The financial development pillar will be included in the regressions, however insignificant results are expected on basis of no clear evidence in literature how the financial development of a countries economy is correlated to the entrepreneurial activity. In contrast to for example the Goods Market Efficiency pillar, there are direct links between entrepreneurship and competitiveness found in previous literature. It can be either positive or negative, and expectations are that positive and negative effects will cancel each other out.

Pillar 9: Technological Readiness

In today's globalized world, technology is increasingly essential for firms to compete and prosper. The technological readiness pillar measures the agility with which an economy adopts existing technologies to enhance the productivity of its industries, with specific emphasis on its capacity to fully leverage information and communication technologies (ICTs) in daily activities and production processes for increased efficiency and enabling innovation for competitiveness (Aghion & Howitt, 1992; Barro & Sala-i-Martin, 2003). ICTs have evolved into the "general purpose technology" of our time (Hall & Trajtenberg, 2005), given their critical spillovers to other economic sectors and their role as industry-wide enabling infrastructure. Therefore, ICT access and usage are key enablers of countries' overall technological readiness.

Whether the technology used has or has not been developed within national borders is irrelevant for its ability to enhance productivity (Hall & Trajtenberg, 2005). The central point is that the firms operating in the country need to have access to advanced products and blueprints and the ability to absorb and use them. In other words, there needs to be a free market for technology and restrictions on access should be minimized. Among the main sources of foreign technology, Foreign Direct Investment (FDI) often plays a key role, especially for countries at a less advanced stage of technological development. It is important to note that, in this context, the level of technology available to firms in a country needs to be distinguished from the country's ability to conduct blue-sky research and develop new technologies for innovation that expand the frontiers of knowledge. That is why there is a separate technological readiness from innovation, captured in the 12th pillar, described below.

For entrepreneurs, access to general technologies is of vital important since sunk costs are reduced and entrepreneurs can focus on their core business model. The presence of industry clusters contributes to the access of technologies and a higher level of efficiency (Gilbert et al., 2008). Theory by Aghion et al. (2005) on the technological spread in combination with innovation and competition results in a U-shaped figure as described earlier. There is no previous literature that specifically studies the link between entrepreneurship and technology readiness. Following the line of reasoning that entrepreneurs can focus more on their core business model when a country is more competitive having a stronger technological readiness, they can create more growth. Entrepreneurial activity will profit from an ecosystem in a country with a high level of technological readiness. The expectation is hence that there is a positive correlation between the degree of technological readiness and entrepreneurial activity:

Technological readiness has a positive correlation with entrepreneurial activity.

Pillar 10: Market size

The size of the market affects productivity; large markets allow firms to exploit economies of scale. When economies of scale can be exploited this will eventually lead to lower costs and higher profits, increasing the enterprise value and creating growth. Traditionally, the markets available to firms have been constrained by national borders. In the era of globalization, international markets have become a substitute for domestic markets, especially for small countries. Empirical evidence shows that trade openness is positively associated with growth. Even if some recent research casts doubts on the robustness of this relationship, there is a general sense that trade has a positive effect on growth, especially for countries with small domestic markets (Sachs & Warner 1995; Frenkel & Romer 1999; Rodrik & Rodriguez 1999; Alesina et al. 2005; Feyrer 2009).

The European Union illustrates the importance of the market size for competitiveness. Although the reduction of trade barriers and the harmonization of standards within the European Union have contributed to raising exports within the region, many barriers to a true single market, in particular in services, remain in place and lead to important border effects. Therefore, the size of both the national domestic and foreign market is used to capture the market size in the index for competitiveness (WEF, 2017).

An increase in the home market size can have both positive and negative effects on the profits of firms and the decision of (potential) entrepreneurs regarding whether or not to start a new business. Positive effects arise from technological externalities of agglomeration economies due to density economies as evidenced by Ciccone & Hall (1993) and Ciccone (2002). Such density economies are generated by technological spillovers and knowledge exchange with heterogenous entrepreneurs and workers (Carlino et al.,2007), and by better matching in labour market pooling (Helsley & Strange, 1991). Positive effects arise also from pecuniary externalities of market expansion due to the home market effect as shown by Krugman (1980). Other positive effects of an increase in the market size can be that entrepreneurs recognize opportunities to create more economies of scale. When markets increase in size, the general sense is that this has a positive effect on economic growth as described earlier.

On the other hand, a negative effect stems from pecuniary externalities of competition among firms. When the size increases, firms will have more firms to compete with who try to eat parts of their market share away. Also, technological externalities of congestion diseconomies and increases in land rents and wage rates are negative effects when market size increases. Since there is a higher level of competition, firms need to pay their employees more to keep them satisfied for example and chances of employees transferring to competitors increases. If the positive effects dominate the negative one, entrepreneurs will establish a new firm in a large market and the entrepreneurial activity indicator will increase (Sato et al., 2012). This argument leads to a positive effect on size and entrepreneurship. Moreover, entrepreneurship is one of the drivers of economic growth and when size increase also a higher growth level is expected. As such, entrepreneurial activities are likely to increase and cause more economic growth when market size increases. The hypothesis is thus:

Market size has a positive association with entrepreneurial activity.

Pillar 11: Business sophistication

"There is no doubt that sophisticated business practices are conducive to higher efficiency in the production of goods and services (WEF, 2017)." Business sophistication concerns two elements that are intricately linked: the quality of a country's overall business networks and the quality of individual firms' operations and strategies. These factors are especially important for countries at an advanced stage of development when, to a large extent, the more basic sources of productivity improvements have been exhausted. The quality of a country's business networks and supporting industries, as measured by the quantity and quality of local suppliers and the extent of their interaction, is important for a variety of reasons. When companies and suppliers from a particular sector are interconnected in geographically proximate groups, called clusters, efficiency is heightened. Greater opportunities for innovation in processes and products are created and barriers to entry for new firms are reduced. Individual firms' advanced operations and strategies (branding, marketing, distribution, advanced production processes, and the production of unique and sophisticated products) spill over into the economy and lead to sophisticated and modern business processes across the country's business sectors.

The entrepreneurs' skills and abilities come forward in this pillar as well as the investment climate in a country and the quantity and quality of local partners and their interactions. Many studies have involved the individual skills of an entrepreneur and its abilities to recognize entrepreneurial opportunities and bring them to work (Schumpeter, 1942; King & Levine, 1993). However, this study uses not the individual skills and abilities but focuses on the business sophistication in an economy and the competitive advantage this gives, so entrepreneurial activity is more likely to thrive. Business sophistication is likely to happen in more advanced economies where productivity improvements have already been exploited, undeveloped economies are not likely to have a high level of sophistication.

This pillar might be of less importance in the relationship between entrepreneurial activity and competitiveness leading to economic growth. Before business sophistication can happen, a strong institutional background to back-up a country's economy is needed first for example. Also, the infrastructure and financial market development matter before a healthy investment climate can be created and interaction are not likely to happen between entrepreneurs and business networks. Business sophistication is thus inferior to several other pillars, and can only happen after the previously mentioned pillars are persistent in an economy. Since the relevance can be questioned, this pillar is dropped from the regression to place more weight on the relevant pillars with a strong theoretical background on the link between entrepreneurial activities and the competitiveness of a county.

Pillar 12: Innovation

Innovation can emerge from new technological and non-technological knowledge (WEF, 2014). Non-technological innovations are closely related to the knowledge, skills, and working conditions that are embedded in organizations and therefore largely covered by the eleventh pillar which is argued to be inferior to different more fundamental pillars. The final pillar of competitiveness focuses on technological innovation. Although substantial gains can be obtained by improving institutions, building infrastructure, reducing macroeconomic instability, or improving human capital, all these factors eventually run into diminishing returns (Aghion & Howitt, 1992). The same is true for the efficiency of the labour, financial, and goods markets. Standards of living can be largely enhanced by technological innovation (Grossman & Helpman, 1991). Technological breakthroughs have been at the basis of many of the productivity gains that our economies have historically experienced. These range from the industrial revolution in the 18th century and the invention of the steam engine and the

generation of electricity to the more recent digital revolution. The latter opens a wider range of new possibilities in terms of products and services. Innovation is particularly important for economies as they approach the frontiers of knowledge, and the possibility of generating more value by merely integrating and adapting exogenous technologies tends to disappear (Romer 1990; Grossman & Helpman 1991; Aghion & Howitt 1992).

Although less-advanced countries can still improve their productivity by adopting existing technologies or making incremental improvements in other areas, for those that have reached the innovation stage of development this is no longer sufficient to increase productivity. Firms in these countries must design and develop cutting-edge products and processes to maintain a competitive edge and move toward even higher value-added activities. This progression requires an environment that is conducive to innovative activities and supported by both the public and the private sectors. The presence of high-quality scientific research institutions that can generate the basic knowledge needed to build the new technologies; extensive collaboration in research and technological developments between universities and industry; and the protection of intellectual property in addition to high levels of competition and access to venture capital and financing that are analysed in other pillars of the GCI (WEF, 2017).

Entrepreneurship and innovation are two concepts that are often linked together. Some people see entrepreneurs as most innovative in our economies. However, many innovations are generated in R&D departments. Several studies and theories have been developed and tested on this relationship (Schumpeter, 1942; Audretsch, 2005). The consensus of these studies is that there exists a positive link between entrepreneurship and innovations. When an economy has many innovations, entrepreneurial activities are expected to grow. On the other hand, competition and innovation as described earlier in this framework leads to a U-shaped curve (Aghion et al.,2005). This tells us that not in all economies competition and innovation have a positive association, however the consensus stays that entrepreneurial activity and the innovation pillar have a positive link with each other. This positive link will be tested in the regressions applying the following hypothesis:

Innovation has a positive association with entrepreneurial activity.

Data

Using the theoretical framework and the formed hypotheses, a dataset is created to test those hypotheses. The database for this study on entrepreneurial activity in association to the competitiveness of a country is created by combining data from three different sources. Firstly, the entrepreneurial activity index is derived from The Global Entrepreneurship and Development Institute (The GEDI Institute). The Institute's flagship project is the Global Entrepreneurship Index (GEI), a breakthrough in measuring the quality and dynamics of entrepreneurship ecosystems at a national and regional level (WEF, 2017). The GEI of the years 2012, 2013, 2015 and 2016 are used, where the latter is the main year of investigation and the first years are used for robustness checks. Not all countries are reported consistently throughout the years, therefore all countries are dropped who have only a single observation. This results in 132 countries which have at least for two years a GEI score in the database. Moreover, the GEI also reports the scores of the following indexes which are used as alternative dependent variable in the model later as another way to check the robustness: ABT, ATT and ASP. These alternative dependent variables are however only available for the years 2012 and 2015.

Secondly, to measure competitiveness of a country the competitiveness pillars made by the World Economic Forum are used. Since 2005, the World Economic Forum has based its competitiveness analysis on the Global Competitiveness Index (GCI), a comprehensive tool that measures the microeconomic and macroeconomic foundations of national competitiveness. As described in the theoretical framework, this GCI is built on twelve different pillars. Moreover, the GCI uses criteria to allocate countries into three different stages of development as described before. The first criteria, is the level of GDP per capita at market exchange rates. This widely available measure is used as a proxy for wages because internationally comparable data on wages are not available for all countries covered. The index is updated yearly and the first publication was in 2005. Only the years are selected for which data was available from the GEI. The GCI database has a wider coverage worldwide and thus more countries are initially included than there were in the GEI. For consistency of the database only the countries are selected which were at least in two years in the GEI dataset, the other countries are dropped.

Lastly, data from the World Development Indicators (WDI), which is the primary collection from the World bank, is used to create several control variables for the countries tested in the previously named years. This database presents the most current and accurate global development data available, and includes national, regional and global estimates. The database covers the period 1960-2016 and is updated annually for 217 countries. From this database, a measure for GDP per capita, unemployment, population and the number of days it takes to start a business, are extracted. In this dataset, more years and countries are included, however only the relevant years and countries which are also present in the other datasets are selected.

The three databases are merged together on country and yearly basis. This results in a database where 132 countries are represented in four years, however not all countries are in all four years present; they are present in at least two years. An overview of the descriptive statistics is given in the table presented below. What can be seen is that on average the GEI score is 3.443 in its logarithmic form. The score indexation of the competitiveness report is between 0 and 7, where 0 is lowest and 7 is highest on the ranking how competitive a country is for a certain pillar. As can be seen from the table, all scores for the pillars lay between these 0 and 7 limits. An overview of the overall score for all countries is presented in Table A2 in the Appendix. The data is collected at the macro aggregate level, and are outcome measures over a period of time, such as the unemployment rate during 2012. The indexes for competitiveness and entrepreneurship are also flow databases and on the same macro level. This results in a consistent and normally distributed database where hypotheses can be tested formed in the theoretical framework. Next, the methodology behind the model used is explained before results are presented on the links between the different pillars of competitiveness and entrepreneurial activity.

Table 1 – Descriptive statistics

This table shows the number of observations, mean, standard deviation, minimum and maximum values of the dataset. Data is derived from GEI, WEF and WDI as described in the 'Data' section of this study. The different variables in the first section of the table represent the different pillars of competitiveness. Countries can get a score between 0-7. The second section shows the country fixed effect controls: GDP per capita growth, the number of days to start a business in a country, the unemployment rate of the total labour force and the total population.

Variable	Observations	Mean	Std. Dev.	Min	Max
Ln GEI	498	3.443	0.513	1.946	4.457
Market size	489	3.901	1.249	0.000	6.978
Innovation	489	3.469	0.994	0.000	5.784
Institutions	489	3.997	1.026	0.000	6.110
Infrastructure	489	4.053	1.322	0.000	6.722
Higher education	489	4.192	1.151	0.000	6.216
Labor	489	4.200	0.810	0.000	5.955
Technology	489	4.015	1.258	0.000	6.419
Financials	489	4.018	0.911	0.000	5.915
GDPCAP growth	487	1.784	3.202	-22.291	25.555
Business start	493	21.940	23.404	1.500	186.000
Unemployment	493	8.775	6.509	0.100	31.400
Ln Population	494	16.358	1.614	12.545	21.039

Methodology

After the database is complete, some intermediate steps are taken before hypotheses formed in the theoretical framework are tested. The regression performed in this study are based on the assumptions underlying the Ordinary Least Square estimator (OLS), also known as Gauss-Markov assumptions. Each assumption will be shortly described and when the validity of the assumption can be questioned a defence or solution is given to cope with these potential problems. The dependent variable in this study is the entrepreneurial activity index GEI, later different variables are used as robustness checks. The main independent variables are the different pillars for which a negative or positive association with the GEI is expected and a hypothesis was formed. To control for spurious effects, several controls as population, unemployment rate and time to start a business are included, these are reported as country fixed effect controls (γ_{it}). The regression is run for each year separately, i.e. no panel data is used since only four years have data and variance within these four years would be limited, leading to biased results. The dependent variables are transformed to logarithmic forms as argued below to deal with the misspecification assumption. This results in the following regression:

$$Ln\ GEI_{it} = \alpha + \beta_1 * Market\ size_{it} + \beta_2 * Innovation_{it} + \beta_3 * Institutions_{it} + \beta_4 * Infrastructure_{it} + \beta_5 * Higher\ Education_{it} + \beta_6 * Labor_{it} + \beta_7 * Financials_{it} + \beta_8 * Technology_{it} + \gamma_{it} + \varepsilon_{it}$$

The first assumption of the OLS estimator is that the linear regression model is linear in parameters. This means that the dependent variable Y (the GEI index) is a linear function of independent variables (X's) and the error term. In the regression run in this study, there are only linear parameters used and no different forms of parameters measured in cubic or higher powers.
The second assumption of the OLS regression is that observations are randomly sampled and that the error term is random. The number of observations taken in the sample for making the linear regression model should be greater than the number of parameters to be estimated. In this study, the number of observations exceeds in every regression more than one hundred observations. The error term of the regression is independently distributed and not correlated --residual plots show random error terms- which means that this assumption is not harmed.

Thirdly, the conditional mean should be zero. the distribution of error terms has mean equals zero and doesn't depend on the independent variables (X′s). Thus, there must be no relationship between the (X's) and the error term. When a constant term is included in the regression equation, this assumption will never be violated. Another assumption is that the conditional variance of the error term is constant in all X's and over time: the error variance is a measure of model uncertainty. Homoscedasticity implies that the model uncertainty is identical across observations. Whether the error variance is constant is tested by using Breusch-Pagan tests for each regression. The null hypothesis of this test is that there is a constant variance. The p-value of all tests was above the 5% significance level, so the null hypothesis of constant variance could not be rejected. This implies that there are constant error variances. So, there are no cases of heteroscedasticity: no robust standard errors needed to be used and moreover, there is reduced risk of omitted variables bias.

Other assumptions from the Gauss-Markov theorem are: no misspecification and no multicollinearity. These assumptions were harmed when the raw database was used and changes to the database had to be made. The OLS assumption of no multi-collinearity says that there should be no linear relationship between the independent variables. If in a country for example both primary, secondary, and tertiary education measures the educational level, including all three will cause problems. There is a strong correlation with all forms of education and the level of total education in a country. Dropping one of the three would help to get more reliable results. Since in this dataset some pillars have a high collinearity with each other, one of the highly correlated pillar pairs had to be dropped, as also argued at these pillars in the theoretical framework respectively. The choices are based on the hypotheses, for each of the two pairs there was one hypothesis where a positive or negative relationship was expected and for the other no expectations could be formed. Dropping one variable from these pairs resulted in no multicollinearity cases and thus the assumption was no longer harmed.

For the misspecification assumption, the RESET test first showed significant results indicating that the model was not correctly specified. This means that the linear form of the model was not correct for the observations in the variables. A solution for this misspecification was to transform the dependent variable into a logarithmic form. Implementing this transformed variable and using the RESET test ones more, resulted in an insignificant outcome of the test. Moreover, the transformation also resulted in stronger normally distributed error terms than without transforming the dependent variable. So, with the dependent variable in logarithmic form, the last assumption of the Gauss-Markov theorem was validated.

For the control variables, a small transformation had to be made for the sake of normality to the population proxy of a country. The total number of inhabitants showed some extreme cases. These extremes are minimized by taking the logarithmic form of the total number of inhabitants in a country. All other proxies used as controls showed normally distributed observations for the countries. Now that the regressions are correctly specified and assumptions satisfied, they are used to test the hypotheses formed in the theoretical framework and results of the regressions are analysed in the next section before a conclusion is drawn.

Results

Results are presented and analysed in this section, based on the created database and intermediate steps taken before regressions are run as is described in the methodology section above. Also, different dependent variables are used as another robustness check. However, these different dependent variables are only available for the years 2012 and 2015. Again, the most recent year is used, 2015, and findings will show that results are robust.

The first regression performed, is presented in the first column of Table 2. The dependent variable Ln GEI is regressed against the relevant pillars of competitiveness with country fixed effect controls included to rule out spurious effects for the year 2016. The number of countries in this regression is 125 and the model has an explanatory power of 78%. This means that 78% of all variance is explained by the model, which shows the strength of the model. Since this model is estimated using OLS, and the underlying assumptions are not violated as described in the methodology section, coefficients can be interpreted on both sign and size. The first pillar tested is the strength of Institutions within a country, expected was that when institutions are stronger this will benefit entrepreneurial activity. The model shows a positive significant coefficient. The coefficient is significant at the 1% significance level. The size of the effect is that when the institutions score increases by 1 point, the entrepreneurial activity score will increase by 19%. The first hypothesis is thus accepted, there is a positive association between Institutions and entrepreneurial activity.

The second pillar –Infrastructure– has an insignificant coefficient in the model for 2016. The expectation was to find a negative and significant coefficient indicating that when Infrastructure is weak in a country, this will create opportunities for entrepreneurs to exploit, i.e. there is a negative correlation between the strength of the Infrastructure and entrepreneurial activity. Since the coefficient is insignificant, it will not be interpreted. For the year 2016, the hypothesis to find a negative correlation is therefore rejected. Also, the pillar for Higher education –Fifth pillar of competitiveness– has an insignificant coefficient. For this pillar, a positive association was expected. Theory described that when a country would have a higher educational level, this would have a positive association with entrepreneurial activity. However, in the robustness check other findings regarding the higher education pillar are found, indicating that the year 2016 might be an exception on the literature and theory formed before. The pillar for Labour market efficiency –seventh pillar of competitiveness– has a negative significant sign. It is significant at the 1% significance level. When the score of the labour market efficiency would drop 1 point, this will increase the entrepreneurial activity score by 28%. The theory regarding this pillar is supported by the results and the hypothesis that labour market efficiency and entrepreneurial activity have a negative association is accepted.

Table 2 – Global Entrepreneurship Index against pillars of competitiveness.

This table shows the GEI scores of 132 countries worldwide tested against relevant pillars of competitiveness as argued in the theoretical framework. The number of observations equals the number of countries included in a certain year, each country is at least present in two years in the dataset. Country fixed effect controls as unemployment rate, population, GDP per capita growth and number of days to start a business are included. Tested are the years 2016, 2015, 2013 and 2012, using an OLS estimator. Results are presented in columns one to four respectively.

	2016	2015	2013	2012
VARIABLES	Ln GEI	Ln GEI	Ln GEI	Ln GEI
Institutions	0.19***	0.10**	0.06	0.11***
	[0.07]	[0.05]	[0.06]	[0.04]
Infrastructure	0.02	-0.08*	-0.03	-0.11***
	[0.06]	[0.04]	[0.05]	[0.03]
Higher education	0.00	0.17***	0.17**	0.18***
	[0.07]	[0.04]	[0.07]	[0.04]
Labor	-0.28***	0.04	-0.16***	0.00
	[0.06]	[0.05]	[0.05]	[0.04]
Financials	-0.12**	-0.02	-0.00	0.00
	[0.06]	[0.04]	[0.05]	[0.03]
Technology	0.20***	0.11**	0.13*	0.10**
	[0.07]	[0.05]	[0.07]	[0.05]
Market size	0.18***	0.33***	0.06	0.35***
	[0.07]	[0.06]	[0.07]	[0.05]
Innovation	0.07	-0.06	0.05	-0.02
	[0.07]	[0.05]	[0.06]	[0.04]
Constant	4.68***	3.92***	3.30***	4.11***
	[0.62]	[0.53]	[0.71]	[0.46]
Country Fixed Effects included	Yes	Yes	Yes	Yes
Observations	125	123	114	115
R-squared	0.780	0.888	0.789	0.934

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

The Financial market development pillar –eights pillar of competitiveness— has a negative and significant coefficient on the 5% significance level. Theory and previous literature could not describe a one-sided expectation between the financial market development and entrepreneurial activity. The coefficient indicates that when the score of this pillar increases by 1 point, the entrepreneurial activity score will decrease by 12%. For both the Technological readiness and Market size pillar a positive, significant coefficient is found. Both coefficients are significant at the 1% significance level. The theoretical framework explains that when a country has a stronger technological readiness position, entrepreneurs have more opportunities to exploit and to make them a success. When the size of the market increases, also the amount of entrepreneurial activity will increase since there are for example more economies of scale to gain from. Both hypotheses that these pillars have a positive association with entrepreneurial activity are accepted.

The last hypothesis for the Innovation pillar tested in the model, must be rejected. Theory explained that when a country has a stronger competitive score on Innovation, entrepreneurs would benefit from the competitive advantage, i.e. a positive link is expected. The coefficient is positive but insignificant, it cannot be interpreted and the hypothesis cannot be approved. Another indication that the coefficient is not reliable is that the standard deviation has the same size as the coefficient itself. At last, the constant term is positive and significant, this means that each country starts with a certain score on the entrepreneurial activity instead that a country starts at zero and gains only points from the different pillars. If this would have been the case, biased coefficient would be found since no country has zero entrepreneurial activity and coefficients would be overestimated.

Robustness of results – Different years

Now that all hypotheses are tested for the year 2016, with the dependent variable being Ln GEI, several robustness checks are performed to see if results will deviate when different years or different dependent variables are used. The first robustness check performed is to investigate if coefficients of the model change when different years are used. This is presented in columns two to four of Table 2. For the years 2015, 2013 and 2012 the selected countries deviate slightly from the main year of investigation. In the last two years, a sample of 114 and 115 countries is included respectively. All models have a stronger explanatory power than the model of 2016 and country fixed effect controls are included in all models. Similar signs are found for the coefficients of the different models, however some deviate in size and significance from the first model. The Institutions coefficient is significant and of the same sign as in 2016. Only the year 2013 has no significant coefficient. The hypothesis that there is a positive association is still accepted when different years are used. For the infrastructure pillar, where a negative sign and significant coefficient was expected but not found in the first model, in two out of three robustness check years a significant and negative effect is present. In both the years 2015 and 2012, the hypothesis can be accepted that entrepreneurial activity has a negative correlation with the strength of infrastructure in a country. Since this hypothesis is confirmed in two years but in another two years no significance was found, the hypothesis cannot be approved.

Next, the higher education and training pillar has a positive and significant coefficient for all robustness years. This could indicate that in the main year of investigation, 2016, some other factors are associated with the educational level of the workforce. The hypothesis that a positive link between the level of higher education and entrepreneurial activity can however be accepted for all other years. Moreover, all years' show similar sizes of the effect that when the score rises by 1 point, the entrepreneurial activity score rises by 17%.

The Labour market efficiency pillar and Financial market development pillar showed significant in the base year. However, in the robustness years no significant results are found except for the year 2013 where the labour market efficiency pillar has a similar coefficient as before. This indicates that conditions labour and financial market conditions could have been different and countries could not gain competitive advantage on these pillars regarding the entrepreneurial activity. This could be explained by the time it takes for economies to heal from a financial crisis, which was present in the years 2007-2011.

The last three pillars tested in this study, Technological readiness, Market size and Innovation, have similar results as in the base year. For the first two pillars, positive and significant results are found. The latter has, just as in the base year, no significant coefficients for all years. The conclusions for the hypotheses stay thus the same. In general, the base year 2016 has shown robust results except for the higher educational pillar and infrastructure pillar which were insignificant at first but significant in other years.

Robustness of results – Different dependent variables

Next to using different years as robustness checks, also different dependent variables are used. Different dependent variables are used since it could happen that the entrepreneurial activity measure from the GEI includes some aspects which cause the coefficients to be biased in a certain way. The different dependent variables are the following as also described before: ABT, ATT and ASP. The base year for this robustness check is 2015 and not 2016, since no data was available for the different dependent variables for that year. Results of the different models are presented in Table A3 in the Appendix. The first column shows the base year 2015 which will be checked for robustness as the previous part showed that 2016 and 2015 are similar. Columns two to four show the different dependent variables, all models include country fixed effect controls. The sample of all models consist of the same 123 countries, so results will only deviate because of the use of a different dependent variables.

When the ATT index is used, which is presented in the second column of Table A3, almost all coefficients show significant signs. Moreover, it is the first and only model in this robustness check where the Innovation pillar, Infrastructure pillar and Labour market efficiency pillar have significant and negative signs. The significant negative coefficient of the Innovation pillar can be called interesting since the theory explained the association between Innovation competitiveness and entrepreneurship to be positively related. However, the result that the hypothesis is rejected stays similar in both cases. For the Infrastructure pillar the negative, significant pillar confirms the hypothesis and is in line with previous findings in different years when the GEI index was used as dependent variable. The same counts for the Labour market efficiency pillar, which was also significant and negative in other years.

If the ABT index and the ASP index are used as dependent variables, the results are similar to the model where the GEI index is used as dependent variable. These indexes are presented in columns three and four respectively of Table A3. Since results are like the base model, this model can be called robust; the findings do not deviate significantly when different dependent variables are used. The tests for the hypotheses result in the same outcomes as in the main model when the year 2016 was used and the dependent variable was the Ln GEI. Since all models are tested on the assumptions of the OLS estimator, and the use of different years or different dependent variables do not change the outcome of hypotheses, the results are robust.

Lastly, a check is performed by splitting the countries in the dataset into different stages of development as indicated by the GCI. The division over the five different stages is given in Table A1 in the Appendix and is copied from the GCI (Sala-i-Martin et al., 2014). One could argue that within a stage of development different explanations could be given to the different pillars of competitiveness. However, as defended by the GCI in the process of giving scores: different weights are distributed to different pillars and measures based on the different stages of development. Table A4 in the Appendix shows that within each stage, hardly any significant results are found. This indicates that pillars of competitiveness matter between stages of development but less within a stage. It shows that this study found significant results between stages of development and that these different stages explain most of the results found. Knowing this limitation, conclusions how competitiveness is associated with entrepreneurial activity in a country can now be drawn from the robust model in the next section.

Conclusion

This study investigates how the competitiveness of a country is associated with the level of entrepreneurial activity across countries. The study is performed on the year 2016 with robustness checks for other years, and different dependent variables, over 130 countries are included in the dataset. Twelve different pillars measure competitiveness, these are derived from the Global Competitiveness Report. For entrepreneurship, the Global Entrepreneurship Index is used, which measures entrepreneurship as opportunity-entrepreneurship: a person with the vision to see an innovation and the ability to bring it to market. First, a theoretical framework is made to form hypotheses and argue which pillars are correlated to the level of entrepreneurial activity and which are irrelevant or cause multicollinearity problems. Next, country fixed effect controls such as the unemployment rate, GDP per capita growth and population are included to prevent spurious effects. Hypotheses are tested and different dependent variables are used to check the robustness of the model. This study is with such an approach the first to link pillars of competitiveness to the entrepreneurial activity within a country.

The results show that the hypotheses formed in the theoretical framework for the following pillars of competitiveness are accepted: the strength of institutions, level of higher education and training, technological readiness and market size have a positive association with the entrepreneurial activity within a country. When institutions are stronger, this is associated with more entrepreneurial activity in a country, the same counts for when the size of the market increases, when a country has a higher level of technological readiness and when the level of higher education and training is higher. On the other hand, when the labour market efficiency is weaker in a country it will benefit entrepreneurs i.e. there is a negative correlation. Entrepreneurs could gain more from opportunities created by themselves when labour cannot transfer easily to normal wage jobs for example.

The hypotheses for the infrastructure, financial market development and innovation pillars, were not supported by the results. The infrastructure pillar showed only negative associations with entrepreneurship in half of the years and at only one alternative dependent variable. The financial market development was only in one year significant and when an alternative dependent variable was introduced in the robustness checks. Entrepreneurial activity in a country is thus not significantly dependent on the financial market development and the competitiveness of innovations. The previously named five pillars of competitiveness thus contribute to explain the level of entrepreneurial activity in a country.

Countries could create attractive conditions for entrepreneurs by increasing their strength of institutional powers for example. They could invest in higher education and training to create a better educated workforce. Together with investments in higher education and institutions, potentially an upward spiral is created which results in an increase in the technological readiness. To increase the market size, there is not much a country can do next to providing an attractive investment climate. When they have created an attractive investment climate, more investments will be made eventually resulting in a larger market and more economic growth. Lastly, when the labour market is not working too efficiently this will help entrepreneurs finding and keeping talented employees. Focusing on these pillars helps a country to become a perfect country for entrepreneurship to thrive in combination with the country's competitiveness.

Relevance, limitations and future studies

One of the limitations of this study is the number of years for which data concerning the GEI index is available. The other databases used, have a longer time span of data available. Also, not all countries are observed in every year and the included countries differ per database so some countries had to be dropped to form a consistent dataset. Some interesting results could therefore not be investigated. Another limitation of this study is the absence of significant results within different stages of economic development. The results indicate that the variance in the regressions between entrepreneurship and the pillars of competitiveness comes from the difference between the different stages of development. Within each stage of development different factors could influence the relationship between the competitiveness of a country and the level of entrepreneurial activity, however since this is beyond the scope of this study it is not researched. Also, some other effects could be present in the dataset which are not investigated by this study. Recall that the educational pillar was not significant in the main year of investigation in contrast to significant results in all other robustness checks. This could indicate that in the main year of investigation, 2016, some other factors influence the educational level of the workforce.

Future studies could go more in-depth why 2016 showed different results, moreover they could split the models for different stages of economic development with different proxies for each stage to control for appropriate factors influencing those different stages. Another future study possibility is to investigate the competitiveness of countries to the firm-level, combining actual firm values with competitiveness indicators could show which pillars matter to create enterprise value growth. Also, different definitions for entrepreneurship and how it is measured could lead to different results regarding which pillars are more influential than others. And lastly, not for every pillar literature was found for the link between entrepreneurship and competitiveness, studies could potentially show that these pillars matter when different controls are used. For example, for the pillar concerning the goods market efficiency, no direct link is present in current literature. A study focusing on this pillar could in fact proof that it in fact has a positive or negative association with entrepreneurship in respect to a countries' competitiveness.

For the discussion in literature what determines entrepreneurship and competitiveness, this study has shown which pillars are superior, have a positive or negative association, and/or which pillars have a mutual effect on entrepreneurial firms. With this knowledge, competitiveness can be used as an indicator for the entrepreneurial activity within countries and is one of the factors driving economic growth. Socially, this study could help governments showing which aspects in their policies are favourable for opportunity entrepreneurship and what encourages entrepreneurs to thrive in an economy. Also for entrepreneurs, this study is of importance since it shows which aspects in an economy matter. They learn which competitiveness pillars are in general more important for entrepreneurship to thrive from this study. With this knowledge, they can increase their understanding of the world economy and exploit more opportunities in countries of different stages of development and competitiveness levels.

References

Acs, Z. J., & Audretsch, D. B. (1987). Innovation, market structure, and firm size. The review of Economics and Statistics, 567-574.

Acs, Z. J., & Stough, R. R. (2008). Public policy in an entrepreneurial economy: creating the conditions for business growth (Vol. 17). Springer Science & Business Media.

Acs, Z. J., Szerb, L., Autio, E. & Lloyd, A. (2017). The Global Entrepreneurship Index 2017. Springer International Publishing.

Acs, Z. J., & Szerb, L. (2007). Entrepreneurship, economic growth and public policy. Small business economics, (Vol. 28(2-3)), 109-122.

Acs, Z. J., Szerb, L., & Autio, E. (2016). The global entrepreneurship and development index. In Global Entrepreneurship and Development Index 2015. Springer International Publishing, 11-31.

Aghion, P., Bloom, N., Blundell, R., Griffith, R., & Howitt, P. (2005). Competition and innovation: An inverted U relationship. The Quarterly Journal of Economics, (Vol. 120(2)), 701-728.

Alesina, A., E. Spolaore, & R. Enrico. (2005). "Trade, Growth and the Size of Countries." In P. Aghion and S. Durlauf, eds., Handbook of Economic Growth, 1st edition, (Vol. 1), 1499–1542.

Almeida, R., & P. Carneiro, (2009). "Enforcement of Labor Regulation and Firm Size." Journal of Comparative Economics, (Vol. 37 (1)), 28–46.

Aschauer, D. A. (1989). "Is Public Expenditure Productive?". Journal of Monetary Economics, (Vol. 23(2)), 117–200.

Audretsch, D. B. (1995). Innovation, growth and survival. International journal of industrial organization, (Vol. 13 (4)), 441-457.

Banerjee, A. V., & Newman, A. F. (1993). Occupational choice and the process of development. Journal of political economy, (Vol. 101(2)), 274-298.

Barro, R. J., & Sala-i-Martin, X. (2003). Economic Growth, (Vol. 1), MIT Press Books.

Baumol, W. (1996). Entrepreneurship: Productive, unproductive and destructive. Journal of Business Venturing, (Vol. 11(1)), 893-921.

Baumol, W. J. (1993). Formal entrepreneurship theory in economics: Existence and bounds. Journal of business venturing, (Vol. 8(3)), 197-210.

Becker, G. S. (1993). Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, 3rd edition. Chicago: University of Chicago Press.

Bregger, J. E. (1996). Measuring self-employment in the United States. Monthly Labor Review, (Vol. 119), 3-9.

Canning, D., M. Fay, and R. Perotti. (1994). Infrastructure and Economic Growth. New York: MacMillan, 285-310.

Carlino, G. A., Chatterjee, S., & Hunt, R. M. (2007). Urban density and the rate of invention. Journal of Urban Economics, (Vol. 61(3)), 389-419.

Carlsson, B. (1992). The Rise of Small Business: Causes and Consequences, in W. J. Adams (ed.), Singular Europe, Economy and Policy of the European Community after 1992, Ann Arbor, MI: University of Michigan Press, 145–169.

Carree, M. A., A. van Stel, A. R. Thurik, & A. R. M. Wennekers. (1999). Business Ownership and Economic Growth: An Empirical Research, Research Report 9809/E, Zoetermeer: EIM.

Ciccone, A. (2002). Agglomeration effects in Europe. European Economic Review, (Vol. 46(2)), 213-227.

Ciccone, A., & Hall, R. E. (1993). Productivity and the density of economic activity (No. w4313). National Bureau of Economic Research. Cambridge.

Cohen, B., & Winn, M. I. (2007). Market imperfections, opportunity and sustainable entrepreneurship. Journal of Business Venturing, (Vol. 22(1)), 29-49.

De Clercq, D., Sapienza, H. J., & Crijns, H. (2005). The internationalization of small and medium firms. Small Business Economics, (Vol. 24(4)), 409-419.

Drucker, P. (2014). Innovation and entrepreneurship. Routledge.

Easterly W. & R. Levine. (1997). Africa's Growth Tragedy: Policies and Ethnic Divisions. Quarterly Journal of Economics CXII: 1203–1250.

EIM (1996), The European Observatory for SMEs; fourth annual report, Zoetermeer.

EIM (1997), The European Observatory for SMEs; fifth annual report, Zoetermeer.

Eisenberg, R. S. (1996). Public research and private development: Patents and technology transfer in government-sponsored research. Virginia Law Review, (Vol. 82(8)), 1663-1727.

Gavron, R., Cowling, M., Holtham, G., & Westall, A. (1998). The Entrepreneurial Society, Institute for Public Policy Research, London.

Feyrer, J. (2009). Trade and Income: Exploiting Time Series in Geography. NBER Working Paper No. 14910. Cambridge.

Fischer, S. (1993). The Role of Macroeconomic Factors in Growth. Journal of Monetary Economics, (Vol. 32(3)), 485–512.

Frenkel, J. & D. Romer. (1999). Does Trade Cause Growth? American Economic Review, (Vol. 89(3)), 379–399.

Gilbert, B.A., McDougall, P.P., & Audretsch, D.B. (2008). Clusters, knowledge spillovers and new venture performance: an empirical examination. Journal of Business Venturing, (Vol. 23(4)), 405-422.

Grossman, G. & E. Helpman. (1991). Innovation and Growth in the World Economy. Cambridge, MA: MIT Press. Chapters 3 and 4.

Hall, B. H., Jaffe, A., & Trajtenberg, M. (2005). Market value and patent citations. Journal of economics, (Vol. 36(1)), 16-38.

Helsley, R. W., & Strange, W. C. (1991). Agglomeration economies and urban capital markets. Journal of Urban Economics, (Vol. 29(1)), 96-112.

Hunt, S. D. (1999). A general theory of competition: Resources, competences, productivity, economic growth. Sage Publications.

Iyigun, M., & Owen, A. L. (1997). Risk, entrepreneurship and human capital accumulation Board of Governors of the Federal Reserve System Finance and Econ. Disc., 97-137.

Jeremic, V., Radojicic, Z. & Dobrota, M. (2016). Emerging Trends in the Development and Application of Composite Indicators. IGI Global.

Kaplan, D. (2009). Job Creation and Labor Reform in Latin America. Journal of Comparative Economics, (Vol. 37(1)), 91–105.

Kaufmann, D. & T. Vishwanath. (2001). Toward Transparency: New Approaches and their Application to Financial Markets. World Bank Observer, (Vol. 16(1)), 41–57.

Ketels, C. (2016). Review of Competitiveness Frameworks. National Competitiveness Council. Dublin.

King, R. G., & Levine, R. (1993). Finance, entrepreneurship and growth. Journal of Monetary economics, (Vol. 32(3)), 513-542.

King, R. G., & Levine, R. (1993). Finance and growth: Schumpeter might be right. The quarterly journal of economics, (Vol. 108(3)), 717-737.

Kourilsky, M. L., & Esfandiari, M. (1997). Entrepreneurship education and lower socioeconomic black youth: An empirical investigation. The Urban Review, (Vol. 29(3)), 205-215.

Kremer, M. (1993). The O-Ring Theory of Economic Development. Quarterly Journal of Economics, (Vol. 108(3)), 551–575.

Krugman, P. (1980). Scale economies, product differentiation, and the pattern of trade. The American Economic Review, (Vol. 70(5)), 950-959.

Kuznets, S., & Murphy, J. T. (1966). Modern economic growth: Rate, structure, and spread. New Haven: Yale University Press, (Vol. 2), 1-529.

Lucas, R. E. (1988). On the Mechanics of Economic Development. Journal of Monetary Economics, (Vol. 22(1)), 3–42.

Reynolds, P. D., Hay, M., & Camp, S. M. (1999). Global entrepreneurship monitor.

Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions rule: the primacy of institutions over geography and integration in economic development. Journal of economic growth, (Vol. 9(2)), 131-165.

Sachs, J. & A. Warner. (1995). Economic Reform and the Process of Economic Integration. Brookings Papers on Economic Activity 1995, (Vol. 1), 1–118.

Sachs, J. (2001). Macroeconomics and Health: Investing in Health for Economic Development: Report of the Commission on Macroeconomics and Health. Geneva: World Health Org.

Sala-i-Martín, X. & A. Subramanian. (2003). Addressing the Natural Resources Curse: An Illustration from Nigeria. NBER Working Paper No. 9804. Cambridge.

Sala-i-Martín X., et al. (2014). The Global Competitiveness Index 2014–2015: Accelerating a Robust Recovery to Create Productive Jobs and Support Inclusive Growth. World Economic Forum, 1-49.

Sala-i-Martin, X., Blanke, J. & Paua, F. (2004). The Growth Competitiveness Index: Analyzing Key Underpinnings of Sustained Economic Growth. Global Competitiveness Report, 3-29.

Sala-i-Martín, X., G. Doppelhoffer, & R. Miller. (2004). Cross-Sectional Growth Regressions: Robustness and Bayesian Model Averaging. American Economic Review, (Vol. 94(4)).

Sato, Y., Tabuchi, T., & Yamamoto, K. (2012). Market size and entrepreneurship. Journal of Economic Geography, (Vol. 12(6)), 1139-1166.

Soto, H. (2000). The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else. New York: Basic Books.

Soto, H. & J. Abbot. (1990). The Other Path: The Economic Answer to Terrorism. New York: Harper Perennial.

Sowell, T. (2015). Say's Law: An historical analysis. Princeton University Press.

Schumpeter, J. (1942). Capitalism, Socialism and Democracy. New York: Harper & Row.

Schultz, T. W. (1990). Restoring economic equilibrium: human capital in the modernizing economy. Oxford: Blackwell.

Shleifer, A. & R. Vishny. (1997), A Survey of Corporate Governance. Nobel Symposium on Law and Finance, August 1995. Journal of Finance, (Vol. 52(2)), 737–783.

Swan, T. W. (1956). Economic Growth and Capital Accumulation. Economic Record, (Vol. 32(2)), 334–361.

Van Praag, C. M. (1999). Some classic views on entrepreneurship. De economist, (Vol. 147(3)), 311-335.

Verheul, I., Wennekers, S., Audretsch, D., & Thurik, R. (2002). An eclectic theory of entrepreneurship: policies, institutions and culture. In Entrepreneurship: Determinants and policy in a European-US comparison, Springer US, 11-81.

Wennekers, S., & Thurik, R. (1999). Linking entrepreneurship and economic growth. Small business economics, (Vol. 13(1)), 27-56.

Woolridge, A. (2009). Global heroes: A special report on entrepreneurship. The Economist, 1–19.

World Economic Forum. (2017). The Global Competitiveness Report 2016-2017. Geneva.

World Economic Forum. (2014). The Global Competitiveness Index 2014–2015: Accelerating a Robust Recovery to Create Productive Jobs and Support Inclusive Growth. Geneva.

Appendix

Table A1 – Division of countries over stages of development.

This table shows the classification of countries into stages of development by the WEF (2014). By indicating in which development stage a country currently is, different weights can be applied to those areas that are becoming more important for a country's competitiveness as the country develops to strengthen its competitiveness score.

Stage 1: Factor-driven	Transition from stage 1 to stage 2	Stage 2: Efficiency-driven	Transition from stage 2 to stage 3	Stage 3: Innovation-driven
Bangladesh	Algeria	Albania	Argentina	Australia
Benin	Azerbaijan	Armenia	Barbados	Austria
Burundi	Bhutan	Bosnia	Chile	Bahrain
Cambodia	Bolivia	Brazil	Costa Rica	Belgium
Cameroon	Botswana	Bulgaria	Croatia	Canada
Chad	Brunei	Cape Verde	Hungary	Cyprus
Congo	Gabon	China	Latvia	Czech Republic
Côte d'Ivoire	Honduras	Colombia	Lebanon	Denmark
Ethiopia	Kazakhstan	Dominican Republic	Lithuania	Estonia
Gambia	Kuwait	Ecuador	Malaysia	Finland
Ghana	Mongolia	Egypt	Mauritius	France
India	Nigeria	El Salvador	Mexico	Germany
Kenya	Philippines	Georgia	Oman	Greece
Kyrgyz Republic	Russian Federation	Guatemala	Panama	Hong Kong
Lao	Ukraine	Indonesia	Poland	Iceland
Lesotho	Venezuela	Iran	Saudi Arabia	Ireland
Liberia	Vietnam	Jamaica	Slovak Republic	Israel
Madagascar		Jordan	Turkey	Italy
Malawi		Macedonia	Uruguay	Japan
Mali		Montenegro		Korea Rep
Mauritania		Morocco		Luxembourg
Moldova		Namibia		Malta
Mozambique		Paraguay		Netherlands
Nepal		Peru		New Zealand
Nicaragua		Romania		Norway
Pakistan		Serbia		Portugal
Rwanda		South Africa		Qatar
Senegal		Sri Lanka		Singapore
Sierra Leone		Thailand		Slovenia
Tajikistan		Tunisia		Spain
Tanzania				Sweden
Uganda				Switzerland
Yemen				Taiwan
Zambia				UAE
Zimbabwe				United Kingdom
				United States

Table A2 – Overall score Global Competitiveness Index

This table shows the overall GCI score for 132 countries in the year 2016. Recall from previous tables that each country has scores available in at least two years in the dataset. For some countries, this means that they do not have a score in 2016, but will be present in different years.

Country	GCI	Country	GCI	Country	GCI	Country	GCI
Albania	3.93	Egypt	3.66	Luxembourg	5.20	Sierra Leone	3.06
Algeria	3.97	El Salvador	3.87	Macedonia	4.28	Singapore	5.68
Angola		Estonia	4.74	Madagascar	3.32	Slovakia	4.22
Argentina	3.79	Ethiopia	3.74	Malta	4.39	Slovenia	4.28
Armenia	4.01	Finland	5.45	Mauritania	3.03	South Africa	4.39
Australia	5.15	France	5.13	Mauritius	4.43	Spain	4.59
Austria	5.12	Gabon	3.83	Mexico	4.29	Sri Lanka	4.21
Azerbaijan	4.50	Gambia	3.48	Moldova	4.00	Suriname	
Bahrain	4.52	Georgia	4.22	Mongolia	3.81	Swaziland	3.40
Bangladesh	3.76	Germany	5.53	Montenegro	4.20	Sweden	5.43
Barbados		Ghana	3.58	Morocco	4.16	Switzerland	5.76
Belgium	5.20	Greece	4.02	Mozambique	3.20	Syria	
Belize		Guatemala	4.05	Myanmar	3.32	Taiwan. China	5.28
Benin	3.55	Guinea	2.84	Namibia	3.99	Tajikistan	4.03
Bhutan	3.80	Guyana	3.56	Nepal	3.85	Tanzania	3.57
Bolivia	3.60	Haiti	3.18	Netherlands	5.50	Thailand	4.64
Bosnia	3.71	Honduras	3.95	Ne Zealand	5.25	Timor-Leste	
Botswana	4.19	Hong Kong	5.46	Nicaragua	3.75	Trinidad and Tobago	3.94
Brazil	4.08	Hungary	4.25	Nigeria	3.46	Tunisia	3.93
Brunei		Iceland	4.83	Norway	5.41	Turkey	4.37
Bulgaria	4.32	India	4.31	Oman	4.25	Uganda	3.66
Burkina Fas		Indonesia	4.52	Pakistan	3.45	Ukraine	4.03
Burundi	3.11	Iran	4.09	Panama	4.38	United Arab Emirates	5.24
Cambodia	3.94	Ireland	5.11	Paraguay	3.60	United Kingdom	5.43
Cameroon	3.69	Israel	4.98	Peru	4.21	United States	5.61
Canada	5.31	Italy	4.46	Philippines	4.39	Uruguay	4.09
Cape Verde	3.70	Jamaica	3.97	Poland	4.49	Venezuela	3.30
Chad	2.96	Japan	5.47	Portugal	4.52	Vietnam	4.30
Chile	4.58	Jordan	4.23	Puerto Rico		Yemen	
China	4.89	Kazakhstan	4.48	Qatar	5.30	Zambia	3.87
Colombia	4.28	Kenya	3.85	Romania	4.32	Zimbabwe	3.45
Costa Rica	4.33	Korea. Rep.	4.99	Russia	4.44		
Côte d'Ivoire	3.93	Kuwait	4.59	Rwanda	4.29		
Croatia	4.07	Kyrgyz	3.83	Saudi Arabia	5.07		
Cyprus	4.23	Lao PDR	4.00	Senegal	3.73		
Czech Rep	4.69	Latvia	4.45	Serbia	3.89		
Denmark	5.33	Lebanon	3.84	Seychelles	3.86		
Dominican	3.86	Lesotho	3.70				
Ecuador	4.07	Liberia	3.37				

Table A3 – Different dependent variables against pillars of competitiveness.

This table shows the GEI scores of 132 countries worldwide tested against relevant pillars of competitiveness as argued in the theoretical framework. The number of observations equals the number of countries included in a certain year, each country is at least present in two years in the dataset. Moreover, different dependent variables as ATT, ABT and ASP are used, these indexes are explained in the data section of this study. Country fixed effect controls as unemployment rate, population, GDP per capita growth and number of days to start a business are included. The year 2015 is used as test year since only for 2012 and 2015 data was available, an OLS estimator is used.

	GEI	ATT	ABT	ASP
VARIABLES	Ln GEI	Ln ATT	Ln ABT	Ln ASP
Institutions	0.10***	0.22***	0.16**	0.22**
	[0.04]	[0.06]	[0.06]	[0.10]
Infrastructure	-0.08	-0.20***	-0.02	-0.10
	[0.05]	[0.05]	[0.05]	[0.07]
Higher education	0.17***	0.23***	0.12**	0.10
	[0.04]	[0.05]	[0.05]	[0.08]
Labor	0.04	-0.17**	0.01	-0.07
	[0.05]	[0.07]	[0.07]	[0.10]
Financials	-0.02	0.07	-0.09**	-0.03
	[0.03]	[0.04]	[0.04]	[0.06]
Technology	0.11**	0.17***	0.16***	0.21**
	[0.05]	[0.06]	[0.05]	[0.09]
Market size	0.33***	0.38***	0.16**	0.41***
	[0.06]	[0.07]	[0.07]	[0.11]
Innovation	-0.06	-0.20***	-0.06	-0.17
	[0.05]	[0.07]	[0.06]	[0.10]
Constant	3.92***	4.54***	3.37***	4.34***
	[0.59]	[0.61]	[0.53]	[1.08]
Country Fixed Effects Included	Yes	Yes	Yes	Yes
Observations	123	123	123	123
R-squared	0.888	0.852	0.834	0.788

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A4 – Global entrepreneurship index against pillars of competitiveness for different stages of development

This table shows the GEI scores of 132 countries worldwide tested against relevant pillars of competitiveness as argued in the theoretical framework. Countries are grouped for their stage of development as indicated by the GCI and presented in Table 4 in the Appendix. The number of observations equals the number of countries included in a certain year, each country is at least present in two years in the dataset. Country fixed effect controls as unemployment rate, population, GDP per capita growth and number of days to start a business are included. The year 2016 is used as test year since this is the most recent year, an OLS estimator is used as regressor.

	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
VARIABLES	Ln GEI	Ln GEI	Ln GEI	Ln GEI	Ln GEI
Institutions	0.40*	0.72	0.01	0.78**	0.11
	[0.20]	[0.47]	[0.20]	[0.23]	[0.10]
Infrastructure	0.09	-0.08	0.23	-1.18**	-0.08
	[0.16]	[0.45]	[0.22]	[0.45]	[0.11]
Higher education	0.17	0.21	0.23	-0.50	0.09
	[0.15]	[0.95]	[0.18]	[0.43]	[0.12]
Labor	-0.35**	-0.15	0.10	-0.03	0.05
	[0.14]	[0.37]	[0.20]	[0.29]	[0.11]
Financials	-0.34*	0.07	0.10	-0.14	-0.05
	[0.19]	[0.94]	[0.17]	[0.20]	[0.09]
Technology	0.10	0.17	-0.42	0.53	0.19
	[0.19]	[0.70]	[0.24]	[0.50]	[0.13]
Market size	-0.04	-0.16	1.12	0.87	-0.16
	[0.12]	[0.56]	[0.72]	[0.48]	[0.22]
Innovation	0.20	-0.97	-0.36	-0.00	0.10
	[0.23]	[1.83]	[0.30]	[0.39]	[0.09]
Constant	2.50	1.89	9.02	7.62	0.54
	[1.65]	[4.76]	[5.71]	[4.17]	[1.55]
Country Fixed Effects Included	Yes	Yes	Yes	Yes	Yes
Observations	31	15	27	18	34
R-squared	0.666	0.848	0.638	0.791	0.768

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1