Erasmus University Rotterdam

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Bachelor Thesis

The Impact of Entrepreneurship

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1. Introduction

For decades, economists have been trying to establish a clear view of what the determinants of economic growth are and what the magnitude of their impact is. These determinants may come from within the field of economics but can also be factors that we usually do not consider economic factors such as the climate. For example, Bleaney and Nishiyama (2002) enumerate a vast number of determinants of economic growth both with a negative and positive effects. Economic factors include inflation rate and the saving ratio. They also describe non-economic factors such as the geological factor of whether a country is landlocked and the sociologic factors of the levels of democracy and rule of law.

Entrepreneurship is often linked with innovation which improves the level of technological progress which is another determinant of growth. “The critical driving force of economic growth is not the super normal profits that technological change generates but rather the continuous creation of opportunities for further technological development.” (Carlaw and Lipsey 2003). So, if one assumes that indeed the creation of opportunities for technological development is vital for economic growth, one might suspect that a healthy entrepreneurial climate is beneficial for economic growth as entrepreneurship often births innovation by introducing new products or production methods. (Acs and Audretsch 1990).

However, the impact of entrepreneurship on economic growth has some ambiguity, as entrepreneurship can be productive, unproductive and even destructive (Baumol, 1996) depending on the rules of the games set by society such as the rule of law. It seems that economists debate about the precise impact of entrepreneurship on economic growth but most agree that there certainly is an impact. However, for a long time, entrepreneurship has been

left out of the models of economic growth. A reason for entrepreneurship being absent from empirical research concerning economic growth for so long might be that economists have had difficulties with defining entrepreneurship and finding reliable data concerning entrepreneurship.

The difficulties mentioned above have been tackled by the start of the Global Entrepreneurship Monitor (GEM). Since 1999 GEM has been gathering reliable data on entrepreneurship. In their first year GEM gathered data from 10 different countries, ever since 115 countries have participated in GEM's research. In 2005, van Stel, Carree & Thurik published an article using GEM's data. With this data they tried to establish the relationship between entrepreneurship and economic growth by using the dependent variable Total Entrepreneurship Activity (TEA). In their paper, van Stel Carree & Thurik (2005) found that there is indeed an impact of TEA on economic growth. Furthermore, their results showed that there seems to be a discrepancy between the effect of TEA on economic growth of countries with relatively high levels of GNIC and those with relatively low levels of GNIC. This would imply that the effect of TEA on economic growth is not continuous but differs across different stages of economic development. However, van Stel, Carree & Thurik (2005) must admit that their data can't eradicate doubt as their dataset only contains data of 36 countries in total.

This paper aims to empirically reproduce and strengthen the claims made by van Stel, Carree & Thurik. GEM has greatly increased the amount of data the gather since the publication of the paper of van Stel, Carree & Thurik. Furthermore, economies have greatly changed since then. The world is more globalized than ever, and the digital world has made its advance into modern day economies. This paper will use data of 45 different countries from around the world. Also, it will use more recent in order to determine whether the effect van Stel, Carree & Thurik (2005) found is still present in today's economies. This paper will thus try, by a

statistical analysis, to determine whether a relationship between entrepreneurship and economic growth is present between 2009 and 2019. This will be done with a sample size of 45 countries, using cross-sectional data of countries participating in GEM's research.

Furthermore, this paper will try to determine whether a difference in the relationship exists between countries in different stages of economic development. These stages of economic development are defined as: Factor-driven economies, efficiency-driven economies and innovation-driven economies. According to GEM, factor-driven economies are dominated by agricultural and extraction businesses, while heavily relying on unskilled labor. Efficiency-driven economies are defined by efficient production process increased product quality. Lastly, innovation-driven economies are knowledge-intensive and have an expansive service sector (https://www.gemconsortium.org/wiki/1367).

In the following section the theoretical framework and previous research around the relationship between entrepreneurship and GDP will be discussed, as well as the most important variables. In section 3 the model and data are introduced. In section 4 the results of our regression are shown and discussed. Finally, in the last sector the implications of the results and how the results fit within the literature is discussed.

2. Entrepreneurship, competitiveness and growth

The relationship between entrepreneurship and economic growth has been researched before, but empirical research on state level is scarce. Before the paper of van Stel, Carree & Thurik (2005), Blachflower (2000) and Carree et al (2002) studied the relationship between self-employment on economic performance. However, whether self-employment is a sufficient measurement of entrepreneurial activity is debatable. Van Stel, Carree & Thurik (2005) were the first to research whether start-up activity influences a country's economic performance.

This was done by using the variable TEA, as this paper will. In the modern world large companies have become more focused on their core business instead of differentiated activities and in manufacturing industries large amounts of jobs have been lost due to automation following technological innovations. Modern economies would thus benefit from a healthy entrepreneurial climate.

Economies have been shifting towards an 'entrepreneurial economy' rather than an 'managed economy' as has been shown by Audretsch and Thurik (2001). A managed economy an economy which is dominated by large scale production where competitive advantage is gained by production factors capital and labor. An 'entrepreneurial economy', however, is an economy in which competitive advantage is gained by production factors knowledge and knowledge spillovers accommodated by entrepreneurial activity. The shift from 'managed economies' towards 'entrepreneurial economies' can be explained in 'Schumpeterian' terms as well. In 1934 Schumpeter called entrepreneurship a primary cause of economic development. Innovating entrepreneurs challenge incumbent firms via creative destruction which is the main characteristic of what is called the Schumpeter Mark I regime. Later, in Schumpeter (1950), the focus was turned towards the innovational activities held by large firms. Through a positive feedback-loop of R&D and innovation (creative accumulation) large firms can outperform small firms. As creative destruction is the main characteristic of the Schumpeter Mark I regime, is creative accumulation the main characteristic of the Schumpeter Mark II regime. Which of the two regimes is dominant in a certain economy, period or industry is dependent on various factors. These factors include the institutional climate, the relevancy of economies of scale and the variety of demand.

By which of the regimes an economy is dominated should thus have implications for the entrepreneurial climate provided by governments and institutions. In a Schumpeter Mark I regime (entrepreneurial economy) an economy would likely benefit from a high level of

entrepreneurial activity. A Schumpeter Mark I regime namely generates innovation from new entrepreneurs challenging incumbent (large) firms. Governments will likely benefit their economies in such a situation by stimulating entrepreneurship through various channels. Contrary, in a Schumpeter Mark II regime dominated economy innovation is predominantly generated by large established firms and would thus likely not benefit from a high level of entrepreneurial activity. Governments should thus not greatly stimulate entrepreneurship as most innovation is generated by large established firms through creative accumulation. Wennekers et al. (2005) shows this empirically that the relationship between GDP per capita and nascent entrepreneurship is characterized as a U-curve. When GDP per capita is very low, which indicates a factor-driven economy, the entrepreneurship rate is relatively high. When economies then shift towards a mediocre level of GDP per capita (efficiency-driven stage) the rate of nascent entrepreneurship declines, only to rise when GDP per capita becomes relatively high (innovation-driven stage).

The influence of entrepreneurial activity on economic growth may thus vary by the stage of economic development an economy is in. Therefore, it might not be appropriate to compare the levels of entrepreneurial activity of countries in different stages of development. Human capital levels might highly vary between relatively rich and poor countries, which would differentiate the levels of human capital in entrepreneurs. A Schumpeterian entrepreneur, who increases efficiency through creative destruction, is more beneficial to a country's economy than a shopkeeper. A Schumpeterian entrepreneur may grow to become a large company which adds great value to a country's economy. Furthermore, in relatively poor countries a high entrepreneurial rate is not necessarily a sign of innovations but might also indicate a large informal sector. In their 2009 Global Report GEM distinguishes three types of economies. The first type of economy is the factor-driven economy with countries like Uganda and Venezuela. The second type is the efficiency-driven economy with countries like

Russia and Brazil. The final type the differentiate is the innovation-driven economy with countries like the USA and Japan. This paper argues that entrepreneurship has a different relationship with economic growth for countries in different stages of economic development. Like in the paper of van Stel, Carree & Thurik (2005), a positive effect of entrepreneurship on economic growth is expected for countries with a relatively high GDP per capita. For developing countries, with a relatively low GDP per capita, an ambiguous effect is expected as it is uncertain what a high level of entrepreneurship represents.

In the paper of van Stel, Carree & Thurik (2005), countries in similar stages of economic development have great discrepancy in the level of entrepreneurial activity. In the data used for this paper, however, the levels of entrepreneurial activity of countries in a high stage of economic development are akin. Countries in a high stage of economic development like the USA, France, the UK and Switzerland all have relatively low levels of TEA. Countries in a relatively low stage of economic development show big differences in levels of TEA. Countries like Uganda, Yemen and Peru have very high TEA levels while countries like Romania and Bosnia and Hercegovina are low on the list of TEA level. If we find that entrepreneurial activity is indeed vital for economic growth, one expects countries with a relatively low GDP and a relatively high TEA to be the biggest growers in terms of GDP. Similarly, countries with high levels of GDP and low levels of TEA are expected to grow moderately. For the remaining part of this section our two most important variables, TEA and GCI, will be discussed.

TEA

The data on TEA has been taken from GEM's Adult Population Survey 2009. The GEM Adult Population Survey (APS) is a survey used in order to adequately measure entrepreneurial levels and characteristics around the world. Each participating country (54 in

2009) has a national GEM team which administers the survey in order to gather a representative sample of at least 2000 respondents (https://www.gemconsortium.org/wiki/1141). TEA represents the percentage of the total population between 18-64 who are either a nascent entrepreneur or owner-manager of a new business (https://www.gemconsortium.org/wiki/1154). In order to qualify as a nascent entrepreneur, one must have been trying (alone or with others) to start a business, which they will at least partly own, and have conducted concrete activities in the last 12 months. To qualify as an owner-manager of a new business, one must be the owner-manager of a firm that has not existed for more than 3,5 years starting from the payment of the first wages. In 2009 TEA rates of participating countries varied from 3.26 in Japan to 33.67 in Uganda. The TEA rates and distribution in all distinguished stages of development are very similar to 2008. The data shows that TEA rates are very high in factor-driven economies. When a factor-driven economy shifts towards an efficiency-driven economy the TEA rate drops. This might be due to the large benefits of economies of scale in efficiency driven economies. When an economy makes the final shift towards an innovation-driven economy the TEA rises again, which might be due to the Schumpeter Mark I regime prevailing.

GCI

The Growth Competitiveness Index (GCI) is a variable taken from the Global Competitiveness Report 2009 of the World Economic Forum (WEF). The GCI is an index which captures the microeconomic and macroeconomic foundations of competitiveness of a country. These foundations are vital for an economies opportunity to grow and secure future prosperity. The GCI is composed by a weighted average of many different components which are captured in the twelve pillars of competitiveness. These pillars are then placed within 3 different subindexes: Basic requirements, Efficiency enhancers and Innovation and

sophistication factors. The basic requirements subindex comprises of four pillars. The first basic requirements pillar is Institutions. Institutions are defined as the legal and administrative framework in which individuals, governments and firms can operate in order to generate income and wealth. Secondly, the Basic requirements comprises the pillar of Infrastructure. Infrastructure is the modes of transport for goods, people and services which enable entrepreneurs to get their goods and services on the market in a secure and timely manner. The third pillar in the subindex is Macroeconomic stability as a government does not function properly if it must pay high interest costs on past debts. The fourth and final pillar in this subindex is Health and primary education. A healthy workforce is vital for productivity and basic education is necessary in order to increase efficiency.

The second subindex GCI is built upon is Efficiency enhancers. This subindex has six pillars, the first being Higher education and training. This pillar measures enrollment in the secondary and tertiary education systems as well as the quality of education offered by firms. In today's globalized economies a well-educated workforce in needed in order to adapt to an ever-changing business environment. The second pillar is named Goods market efficiency. A well-functioning goods market is needed for business to operate efficiently. A high goods market efficiency is achieved by promoting healthy market competition without much government intervention. Also, this pillar depends on customer orientation and buyer satisfaction. Like the goods market, an efficient labor market, which is the third pillar in this subindex, is a condition for maximizing economic growth. Labor market efficiency is defined as the ability to shift workers from one economic activity to another rapidly, allowing for wage fluctuations. The fourth pillar in Efficiency enhancers is financial market sophistication, which requires a trustworthy, transparent banking sector and the appropriate regulation to protect investors. This is needed for the ability to economically grow as an efficient financial sector makes sure resources can be allocated to their most productive uses.

Next, the fifth pillar of Efficiency enhances. This pillar measures to what extend an economy can adopt existing technologies in order to increase productivity. Lastly, the sixth pillar in this subindex is Market size. Market size is a relevant condition for economic growth as it allows for the usage of economies of scale.

The third and final subindex of pillars is Innovation and sophistication factors which consists of two pillars. The first pillar is Business sophistication. Business sophistication is the quality of an economy's business networks and as well as the quality of individual firms' strategies and operations. Business sophistication is measured by the quantity and quality of local suppliers and their interaction. When firms of a certain sector are clustered efficiency and opportunities for innovation are increased, thus creating possibilities for economic growth. The last pillar is Innovation. This last pillar might be the most important one as the other pillars have to deal with diminishing returns at some point. In the long run, innovation is what improves standards of living. In GCI innovation is measured by investment in research and development, the presence of scientific institutions, collaboration between universities and industries, and the protection of intellectual property.

GCI considers which stage of development a country is in and weights the pillars accordingly. In their global report, WEF distinguishes 3 stages of development: Factor-driven, efficiency-driven and innovation-driven economies. For factor-driven countries, the pillars in the Basic requirements are most critical for establishing economic growth in the future. Likewise, efficiency enhancers are most critical for efficiency driven countries. Innovations and sophistication factors weigh heaviest for innovation driven countries.

GCI has been empirically shown to have a significantly positive influence on economic growth for the period 1992-2000 by McArthur and Sachs (2002). They controlled for the catch-up effect, which is defined as typically poorer countries showing high growth rates by

swiftly adopting advanced technology and capital of rich countries. This paper, like the paper of van Stel, Carree & Thurik, uses GCI to explain future growth while McArthur and Sachs (2002) explained past growth.

3. Model & Data

This section discusses the data that is used for this paper and presents the model. Data from the Global Entrepreneurship Monitor, the World Bank and the World Economic Forum is used. Our basic variables are briefly discussed below.

Total Entrepreneurial Activity (TEA)

Data on Total Entrepreneurial Activity are taken from the GEM Adult Population Survey 2009. The variable was discussed in the previous section

Δ Real Gross Domestic Product per Capita(ΔGDP)

Data of Real Gross Domestic Product of 2009 and 2019 is taken from the World Bank, is in US dollars and uses the year 2015 as benchmark. The ΔGDP was calculated by subtracting GDP2009 from GDP2019 and dividing that term by GDP2009. Per capita real GDP was used instead of real GDP to account for population growth.

Δ Lagged Real Gross Domestic Product per Capita(ΔGDP)

Data of Real Gross Domestic Product of 1999 and 2009 is taken from the World Bank, is in US dollars and uses the year 2015 as benchmark. The ΔGDP was calculated by subtracting GDP1999 from GDP2009 and dividing that term by GDP1999. Per capita real GDP was used instead of real GDP to account for population growth.

Real Gross National Income per Capita (GNIC)

The Real Gross National Income per Capita 2009 was taken from the World Bank, is in US dollars and uses the year 2015 as the benchmark.

Growth Competitiveness Index (GCI)

Data for the Growth Competitiveness Index was taken from the Global Competitiveness Report 2009-2010 by the World Economic Forum. The variable was discussed in the previous section.

Education Index (EDI)

The Education Index is a component of the Human Development Index (HDI) which is made by the United Nations Development Programme. It is defined as an average of the mean years of schooling and the expected years of schooling. Data for the 2009 EDI was taken from the datacenter of the United Nations Development Programme.

Financial Development Index (FDI)

The Financial Development Index is an index made by the International Monetary Fund and is an aggregate of the Financial Markets Index (FMI) and the Financial Institutions Index (FII). The FMI and FII are on their turn aggregates of the depth, access and efficiency of respectively financial markets and financial institutions. Data on the 2009 FDI was taken from the database of the IMF.

This paper aims to show that entrepreneurial activity is a determinant of economic growth. It tries to do so while controlling for other determinants in the model. The variables added to the model as well as entrepreneurship are likely structural determinants of growth. This paper thus aims to express the determinants in the long term rather (10 year period) than the short term. In 2002, McArthur and Sachs tried to explain growth by the GCI and the initial income (catch-up effect). In 2005 van Stel, Carree & Thurik added the TEA to that model as an

additional determinant. As said earlier, this paper tries to replicate the results of van Stel, Carree & Thurik (2005). In order to do so, first we test the model with only GCI added to it. Also, a lagged GDP growth variable is added in order to reduce the risk of reversed causality. Which will make model 1 look like this:

$$\Delta GDP_{i,t} = a + bLog(GNIC_{i,t-1}) + cGCI_{i,t-1} + d\,\Delta GDP_{i,t-1} + \varepsilon_{i,t}$$

To that model the TEA, EDI and FDI will be added to in order to find out whether TEA is indeed a determinant of economic growth. EDI and FDI are added to the model in order to avert omitted variable bias. That will make model 2:

$$\Delta GDP_{i,t} = a + bLog(GNIC_{i,t-1}) + cGCI_{i,t-1} + dTEA_{i,t-1} + eEDI_{i,t-1} + fFDI_{i,t-1} + g\Delta GDP_{i,t-1} + \varepsilon_{i,t}$$

The hypothesis here is that *d* is significantly positive, so that TEA has indeed a positive effect on economic growth. In this paper we assume, like explained in earlier sections, that the relationship between entrepreneurial activity and economic growth is different for different stages of economic development. This paper uses two methods to test that hypothesis. The first method of testing the hypothesis that TEA impacts growth differently in different stages of economic development is by creating a dummy variable for both relatively rich and relatively poor countries. Those dummy variables will then be interacted with TEA in order to see what the respective effect of TEA is for both relatively poor and relatively rich countries. To make a distinction of relatively poor and rich countries, the first idea was to use the definitions of the World Bank for low-income and high-income countries based on GNIC. However, in that distinction, only one country (Uganda) in the observations would classify as poor. So, instead of that approach, the mean of GNIC of the countries that participated in GEM's adult population survey was taken and the distinction was based off that mean. If a country has a GNIC of less than 50% of the mean, it classifies as poor. Likewise, if a country

has a GNIC of more than 150% percent of the mean, it classifies as rich. Model 3 will then look as follows:

$$\Delta GDP_{i,t} = a + bTEA_{i,t-1} + cTEA_{i,t-1}*DPOOR + dTEA_{i,t-1}*DRICH + eLog(GNIC_{i,t-1}) + fGCI_{i,t-1} + gEDI_{i,t-1} + hFDI_{i,t-1} + i\,\Delta GDP_{i,t-1} + \varepsilon_{i,t}$$

Here DPOOR is the dummy that is 1 for countries defined as poor and DRICH is the dummy that is 1 for countries defined as rich. Here the hypothesis is that the coefficient for the TEA of the poor countries will be larger than the coefficient for the TEA of the rich countries

The second approach in order to test whether the effect of TEA differs in stage of development is to divide the countries into stages of development as GEM has in their Global Report and create a dummy variable for each of the three stages respectively. Like in Model 3, those dummy variables are then interacted with TEA to see what the effect of TEA is in the different stages distinguished in GEM's Global Report. Model 4 will then look as follows:

$$\Delta GDP_{i,t} = a + bTEA_{i,t-1}*DFACTOR + cTEA_{i,t-1}*DEFFICIENCY + dTEA_{i,t-1}*DINNOVATION + eLog(GNIC_{i,t-1}) + fGCI_{i,t-1} + gEDI_{i,t-1} + hFDI_{i,t-1} + i\Delta GDP_{i,t-1} + \varepsilon_{i,t}$$

Here DFACTOR is the dummy in which countries that classify as countries in the factor-driven stage have a value of 1. Likewise, DEFFICIENCY and DINNOVATION are the dummy variables for respectively countries in the efficiency-driven stage and the innovation-driven stage. C are countries in the factor-driven stage. Here the hypothesis is that the effect of TEA is highest in innovation-driven economies and that the effect in factor-driven economies is higher than in efficiency-driven economies.

4. Results

In Table 1, the results of the regressions of model 1 and 2 are shown. Data from the 54 countries participating in GEM in 2009 is used, excluding Hong Kong SAR, Iceland, Iran,

Lebanon, Syria, Tonga, Venezuela, West Bank and Gaza, and Yemen. The countries that participated in GEM 2009 are listed in Appendix 1. Like stated before, TEA is the variable used to describe the level of entrepreneurship. All models use a lagged GDP variable and initial income as control variables. In Model 1 only GCI is added to these base variables in order to replicate McArthur and Sachs' (2002) explanation of economic growth (catch-up effect) by using initial income and GCI. As expected, the coefficient of the initial income is negative, this would confirm the catch-up effect shown by McArthur and Sachs. Unlike in the model of McArthur and Sachs, the GCI coefficient is negative, although very small. However, the coefficients are not significant. In model 2 TEA, EDI and FDI are added to the regression. Like the results of van Stel, Carree and Thurik (2005) TEA shows to have a negative effect on GDP growth. This coefficient would mean that whenever TEA rate increases by 1% the GDP growth over 10 years would decrease by 0.196%, the coefficient is however not significant. Because the results are not significant there is, however, no way to determine whether TEA has an impact on GDP growth.

TABLE 1
Estimation results of Model 1 and 2 over period 2009-2019

	Model 1	Model 2
Constant	-0.326	-0.630
	(0.269)	(0.499)
TEA		-0.196
		(0.457)
EDI		0.037
		(0.323)
FDI		-0.287
		(0.199)
log (GNIC)	-0.092	-0.147
	(0.116)	(0.197)
GCI	-0.014	0.034
	(0.078)	(0.087)
lag GDP	0.493*	0.502*
	(0.128)	(0.139)
R^2	0.4065	0.4386

The value between brackets is the robust standard error. TEA is the Total Entrepreneurial Rate, GNIC is the Gross National Income per Capita, GCI is the Growth Competitiveness

Index, EDI is the Education index, FDI is the Financial Development Index and lag GDP is the GDP growth over the period 1999-2009. N=45
* Significant at 0.05 level

In Table 2, the results of models 3 and 4 are shown. Countries in the data that have a GNIC value lower than 9.694 US dollars were classified as "poor". Countries that had a GNIC value of over 29.084 were classified as "rich". The countries classified in both categories are listed in Appendix 2. The coefficient of the TEA for countries that are classified as poor is, as expected larger than the coefficient for rich countries. These estimations would mean that conditional on being classified as rich, increasing your TEA by 1% would decrease your 10-year GDP growth by 1.8%. The coefficient for the TEA of the rich countries is significant on a 10% confidence level. The result for countries that were defined as poor can't be interpreted as the coefficient is not significant. The hypothesis can thus not be confirmed. In model 4, a division in stage of economic development was made. This division was made according to the division made by GEM in their 2009 Global Report. The division made by GEM and the countries in the respective stages of economic development are listed in the Appendix. Contrary to expectation expected, the value of the coefficient for TEA in factor-driven economies is lower than that coefficient for efficiency-driven economies. Also, the coefficient for innovation-driven countries is not higher than the coefficient for efficiency-driven economies. However, also in this model the results lack in significance. Only the TEA coefficient of innovation-driven economies is significant on a 10% confidence level. These results would indicate that by increasing TEA with 1% innovation-driven economies would decrease their 10-year GDP growth by 2.374%. With these results it is impossible to compare the impact of TEA on GDP growth of countries in different stages of development.

The hypothesis that there is a discrepancy in the effect of TEA on GDP growth between economies in different stages of economic development can thus not be confirmed.

TABLE 2
Estimation results of Model 3 and 4 over period 2009-2019

	Model 3	Model 4
Constant	-1.429	-1.379
	(0.750)	(0.670)
Poor*TEA	0.337	
	(0.456)	
Rich*TEA	-1.838*	
	(1.064)	
Factor*TEA		0.063
		(0.504)
Efficiency*TEA		0.402
		(0.504)
Innovation*TEA		-2.374*
		(1.178)
log(GNIC)	0.334	0.359
	(0.252)	(0.224)
GCI	0.057	0.035
	(0.092)	(0.071)
EDI	-0.038	-0.164
	(0.346)	(0.328)
FDI	-0.343	-0.223
	(0.206)	(0.179)
lag GDP	0.517**	0.518**
	(0.117)	(0.114)
R^2	0.4677	0.5298

The values between brackets are the robust standard errors. The interaction terms are the effects of TEA conditional on being classified as rich, poor, factor-driven, efficiency driven or Innovation-driven. N=45.
* Significant at 0.1 level
** Significant at 0.05 level

Contrary to what van Stel, Carree and Thurik (2005) concluded in their paper, it is impossible to draw conclusions about a discrepancy of the effect in different stages of development. There is no opportunity to draw a definitive conclusion about this subject. The number of observations in each stage of development has increased since the paper of van Stel, Carree and Thurik (2005), because of the great efforts made by GEM. However, the results should still be interpreted carefully as the number of observations in the factor and innovation-driven stages is small and the results lack in significance. A much lower TEA coefficient for

efficiency-driven economies would be expected due to the importance of economies of scale in efficiency driven economies. Economies in this stage are characterized by large companies that manufacture products or provide basic services. In order to be able to compete at large markets efficient production must take place (Acs, Desai & Hessels 2008). The prevalence and need of these large efficient firms would be expected to lead to a lower desirable rate of entrepreneurship. This effect is not found in this paper.

5. Discussion

Entrepreneurship and its impact on economic growth is still underexposed in economic research today. This is likely due to the lingering difficulties in defining and measuring entrepreneurship adequately. However, the establishment and research of GEM has enabled a great leap forward in understanding entrepreneurship and its impact on economic growth. Van Stel, Carree and Thurik (2005) were quick to test whether TEA indeed was a determinant of economic growth while installing competing variables. They concluded that there was indeed an effect of TEA on economic growth. However, they showed that the effect is not straightforward and not linear. There seemed to be large differences in the effect in different types of economies. This paper tried to replicate their findings with new and extended data. The claim that TEA influences economic growth was mildly strengthened with this paper. This paper did however not succeed in showing the discontinuity of the effect of TEA in different stages of development. The results of this paper contradict the findings of van Stel, Carree and Thurik (2005) in the sense that the highly positive impact of TEA in highly developed countries they claimed, is not found in the results of this paper. In fact, this paper finds a negative impact for countries classified as rich and countries classified as innovation-driven, which would indicate that highly developed countries suffer from high levels of entrepreneurship. Also, the negative effect van Stel, Carree and Thurik (2005) found in factor-driven countries is not found in this paper. In their paper van Stel, Carree and Thurik

(2005) argued that the negative effect they found for developing countries in their results might be since human capital is smaller in developing countries. Another possible explanation was that not enough large firms were present in these countries. Large firms play a vital role in the development of an economy as they often complement small firms (Rothwell 1983) and train employees to become more productive. The positive impact shown in this paper might be a sign that over the years, the level of human capital and presence of large firms has changed for the better in developing countries. However, the lacking significance indicates that also this result should be interpreted with great care. The level of human capital is not measured in TEA which hinders interpretation. The quality of entrepreneurship however exceeds the scope of this paper. The results in some of the models lack greatly in significance, which is likely due to the small number of observations. Furthermore, one should be careful making hard conclusion due to the specific period researched in this paper. Despite the remarks on the results, this paper once again shows that entrepreneurship is relevant. More light should be casted upon the role of entrepreneurship in the conditions in which economic growth can take place. For the future of research on the topic of entrepreneurship it would be highly valuable if GEM keeps expanding the number of countries participating in their annual survey.

Appendix

In Table A.1 the countries that participated in GEM are listed. Hong Kong SAR, Iceland, Iran, Lebanon, Syria, Tonga, Venezuela, West Bank and Gaza, and Yemen were left out of the regression because not all variables were attainable for these countries.

TABLE A.1
Countries participating in GEM 2009, with values for TEA in 2009 (alphabetical)

1. Algeria	16.68
2. Argentina	14.68

3. Belgium	3.51
4. Bosnia and Herzegovina	4.43
5. Brazil	15.32
6. Chile	14.79
7. China	18.84
8. Colombia	22.57
9. Croatia	5.58
10. Denmark	3.64
11. Dominican Republic	17.53
12. Ecuador	15.82
13. Finland	5.17
14. France	4.35
15. Germany	4.10
16. Greece	8.79
17. Guatemala	19.2
18. Hong Kong	3.64
19. Hungary	9.13
20. Iceland	11.45
21. Iran	12.08
22. Israel	6.07
23. Italy	3.72
24. Jamaica	22.73
25. Japan	3.26
26. Jordan	10.24
27. Korea, Republic	7.01
28. Latvia	10.51
29. Lebanon	14.98
30. Malaysia	4.41
31. Morocco	15.75
32. The Netherlands	7.19
33. Norway	8.53
34. Panama	9.59
35. Peru	20.93
36. Romania	5.02
37. Russia	3.88
38. Saudi Arabia	4.66
39. Serbia	4.90
40. Slovenia	5.36
41. South Africa	5.92
42. Spain	5.10
43. Switzerland	7.72
44. Syria	8.46
45. Tonga	17.39
46. Tunisia	9.43
47. Uganda	33.67
48. United Arab Emirates	13.25
49. United Kingdom	5.74
50. United States	7.96
51. Uruguay	12.16

52. Venezuela	12.16
53. West Bank and Gaza	8.59
54. Yemen	24.01

The countries listed in Table A.2 were divided into the classification by solely judging them on their Gross National Income per capita in 2009. Countries classified as poor had a GNI per capita lower than 9.694$ while countries classified as rich had a GNI per capita greater than 29.084$.

TABLE A.2
Countries listed by rich/poor division used in Model 3

Countries classified as poor
Algeria, Bosnia and Herzegovina, Brazil, China, Colombia, Dominican Republic, Ecuador, Guatemala, Iran, Jamaica, Jordan, Lebanon, Malaysia, Morocco, Panama, Peru, Serbia, South Africa, Tunisia, Uganda, West Bank and Gaza
Countries classified as rich
Belgium, Denmark, Finland, France, Germany, Israel, Italy, Japan, The Netherlands, Norway, Switzerland, United Arab Emirates, United Kingdom, United States
Countries excluded from division due to missing data
Hong Kong SAR, Iceland, Syrian Arab Republic, Tonga, Venezuela, Yemen

In Table A.3 the countries participating in GEM 2009 are listed by their respective stage of economic development, as grouped by GEM in their 2009 Global Report. The classification is based upon the level of GDP per capita and to which extent countries are factor-driven in terms of the share of primary goods in their total exports.

TABLE A.3

Countries participating in GEM 2009 listed by stage of economic development

Factor-driven
Algeria*, Guatemala*, Jamaica*, Lebanon*, Morocco, Saudi Arabia*, Tonga, Uganda, Venezuela*, West Bank and Gaza, Yemen
Efficiency-driven
Argentina, Bosnia and Herzegovina, Brazil, Chile*, China, Colombia, Croatia*, Dominican Republic, Ecuador, Hungary*, Iran, Jordan, Latvia*, Malaysia, Panama, Peru, Romania*, Russia*, Serbia, South Africa, Tunisia, Uruguay*
Innovation-driven
Belgium, Denmark, Finland, France, Germany, Hong Kong, Iceland, Israel, Italy, Japan, Republic of Korea, The Netherlands, Norway, Slovenia, Spain, Switzerland, United Kingdom, United Arab Emirates, United States

*Country in transition to more advanced stage

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