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Determinants of high-growth firms:why do some countries have more high-growth firms than others?

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Determinants of high-growth firms: Why do some countries have more high-growth firms than others?

Mercedes Teruel (♣) and Gerrit de Wit (♦)

Abstract

High-growth firms have been shown to be a key factor for economic growth and structural change. This paper analyses the determinants of the number of high-growth firms in a country for 17 OECD countries between 1999 and 2005, using the Amadeus data set, the GEM data set, and others. The first contribution of this paper is that it is – as far as we know – the first empirical analysis of high-growth firms at the country level on the basis of actual measured growth. Second, we find indicative empirical evidence for three driving forces of high growth, viz. entrepreneurship, institutional settings, and opportunities for growth, all in accordance with theory and empirical findings in related fields of research. Third, the paper gives a tentative explanation of the differences in the average percentage of high-growth firms between countries. Finally, the paper gives some clues for policy makers how to promote high-growth firms.

Keywords: high-growth firms, fast growing firms, entrepreneurship, institutional obstacles, opportunities for growth

JEL Classifications: L11, L26, 025

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1 Introduction

High-growth firms have been shown to be a key factor for economic growth and structural change. They contribute to the economy via a variety of different channels. First, fast growing firms contribute to the dynamics of the economy. For instance, it is a stylized fact that the bulk of fast growing firms is extremely volatile (Delmar et al., 2003; Garnsey et al., 2006; Acs and Mueller, 2008; Hölzl, 2011). Falkenhall and Junkka (2009) stand out that this volatility causes a replacement effect of current fast growing firms by other future fast growing firms. Second, they facilitate the introduction of innovation and the growth of labour productivity. Empirical evidence shows that those firms often tend to have a potentially disruptive effect by accelerating the development of new technologies and products. In fact, Autio (2009) points out that high growth may have positive effects through "productivity-enhancing effects in the wider market context". Third, the small group of fast growing firms generate a large proportion of employment (Henrekson and Johansson, 2010; Falkenhall and Junkka, 2009; Schreyer, 2000). Finally, fast growing firms are believed to act as an inspiring role model for existing or nascent entrepreneurs. See Bosma et al. (2010) who provide initial empirical indications of the presence and importance of role models before and after firm start-up, the function of role models, and the relationship and similarity of characteristics between the (nascent) entrepreneur and the role model.

Because of the evident importance of high-growth firms to the economy these firms have drawn growing attention from policy makers as well as academics. Research in the field of fast growing firms has expanded fast over the past two decades (Storey, 1994; Birch et al., 1997; Schreyer, 2000; Audretsch, 2002; Delmar et al., 2003; Autio, 2007; Acs et al., 2008; Henrekson and Johansson, 2009, 2010; Hölzl, 2009; Coad and Rao, 2008). However, knowledge about these firms is still scattered and little knowledge is available regarding differences over countries. According to Henrekson and Johansson (2010, p. 230) the number of studies analysing fast growing firms is still surprisingly small. This can be partly attributed to methodological problems, a diversity of definitions of those "fast growing firms", different measures, and the lack of data.

Previous evidence points out that fast growing firms are found in all industries and in all regions of the countries (e.g. Schreyer, 2000; Hölzl, 2009). However, Schreyer (2000) highlights the importance of "appropriate institutional, legal and administrative framework conditions". Hence, one critical point is to shed light on these framework conditions which may erode the entrepreneur's motivation to grow. This will be done – to a certain extent - in this paper.

Adopting an eclectic approach, we will try to answer why some countries have more high-growth firms than others. Hence, the purpose of this paper is to analyse the determinants of the percentage of high-growth firms at the country level. Our database contains 17 different countries over a time period of 7 years (1999-2005) with information from the Amadeus data set, the Global Entrepreneurship Monitor, and others.

The first contribution of this paper is that it is – as far as we know – the first empirical analysis of high-growth firms at the country level on the basis of actual measured growth. Second, we find indicative empirical evidence for three driving forces of high growth, viz. entrepreneurship, institutional settings, and opportunities for growth, all in accordance with theory and empirical findings in related fields of research. Third, the paper gives a tentative explanation of the differences in the average percentage of high-growth firms between countries. Finally, the paper gives some clues for policy makers how to promote high-growth firms.

The paper is structured as follows. The second section is on theory: what sort of determinants are proposed in the literature? Subsequently, the third section describes the database, while the next presents the model to be estimated. In section 5 the empirical results are presented. The next section 6 presents some robustness checks on the standard errors of our results. Finally, section 7 sums up and discusses the policy relevance of the results of this paper.

2 Theory

The phenomenon of high-growth firms has been studied from a variety of perspectives such as: industrial organization, the resource-based view, the perspective of strategic adaptation, or the evolutionary economic perspective. First, in the field of industrial organization the phenomenon of firm growth is described as a gradual transitory process where firms tend to grow until achieving a specific 'optimal size' (Mansfield, 1979). This approach suggests a positive autocorrelation of growth rates. However, Coad (2007) finds the reverse. Second, the resource-based view emphasizes the differences in firms' resource endowments to explain differences in firm growth. For instance, Pettus (2001) and Pettus et al. (2009) propose a dynamic adaptation of the firms' resources in order to adapt to changes in the environment and achieve a continuous growth path. Third, the perspective of strategic adaptation considers the sequencing of strategic moves to be critical to firm growth and survival. Finally, the evolutionary economic perspective considers firm growth as a dynamic process where firms are submitted to a mechanism of selection (Bottazzi et al., 2001; Bottazzi and Secchi, 2003; Coad, 2007). This variety of theoretical perspectives has discouraged an integrated analysis of the firm growth process (Davidsson and Wiklund, 2000). Furthermore, each discipline has tended to ignore findings from other schools.

This is an explorative study in which we want to investigate all possible factors that could be of influence in explaining differences in high-growth firms between countries. Hence, we do not want to restrict ourselves to one theoretical perspective. If there would be available an integrated theory, that would be our natural starting point, but since such a theory is lacking we adopt an eclectic approach.
We group the determinants to be investigated into three categories: entrepreneurial environment, institutional obstacles, and opportunities to grow. For all determinants we discuss which influence we expect them to have on the percentage of high-growth firms in a country.

Entrepreneurial environment

A starting point for our empirical model is that the entrepreneurial environment may affect the percentage of high-growth firms in a country, because entrepreneurship exerts a positive impact on competitiveness and growth by creating knowledge spillovers, increasing diversity and competition (Audretsch and Thurik, 2004). Moreover, the link between entrepreneurial abilities and the growth of firms is obvious. Hence, the level of entrepreneurship in a country may in some way or other influence the percentage of high-growth firms. In this study we investigate three different channels in which the entrepreneurial environment may be of influence.

In first place, we consider the level of education in a country because it is thought to affect positively the entrepreneurs' motivations and firm performance (Hessels et al., 2008). For instance, in Lucas (1978) and Van Praag and Cramer (2001) education generates higher levels of (expected) entrepreneurial ability that, in turn, increases the levels of entrepreneurial performance (in terms of profit and firm size). More specifically, empirical evidence shows a positive relationship between the level of education and high-growth entrepreneurs because more educated entrepreneurs may be better prepared to identify market opportunities (Davidsson, 1991) and have more growth-oriented aspirations (Cassar, 2006, 2007; Stam et al., 2009) given that they will pursue higher returns for their investment (Levie and Autio, 2008; Autio, 2009). Furthermore, Stel et al. (2011) have shown recently that a higher level of education has a positive impact on the performance of the average entrepreneur. The main reasons of this positive impact are three. First, a higher education level of consumers will modify the demand function and, in turn, the entrepreneur's output. Second, a higher education level of employees will affect positively the productivity of the firm. Third, a higher education level may be a signal of the presence of universities, which may generate knowledge spillovers to the nearby firms. Therefore, we expect a positive relationship between the education level in a country and the percentage of high-growth firms.

In second place, the psychological research shows that entrepreneurs with higher growth-oriented ambitions may allocate more effort to pursue higher returns for their investment and thereby realise a higher growth[1]. For instance, Orser and Hogarth-Scott (2002) find that the entrepreneurs' ambitions to pursue growth are positively related to actual growth, and Wiklund and Shepherd (2003) show a positive relationship with respect to the expected growth. But which kinds of motivations are important for firm growth? On the one hand, income motivations may affect the entrepreneurial growth preferences (Cassar, 2007; Hessels et al., 2008). Hence, if a country has relatively many entrepreneurs that chose their profession to increase their own personal income, we expect a relatively high percentage of high-growth firms in that country. On the other hand, another reason to choose for entrepreneurship is the greater independence one has in this profession. We argue that entrepreneurs that created a firm in order to achieve a higher level of independence may not be as motivated to undertake risky projects in order to expand their firm. Hence, we

[1] Even though ambition does not guarantee growth, absence of ambition almost certainly guarantees absence of growth (Autio, 2009).

may expect in a country with relatively many entrepreneurs that chose their profession to obtain a greater independence, a relatively low percentage of high-growth firms. Note, however, Wiklund et al.'s (2003) findings show that the importance that the entrepreneur places on non-economic concerns is crucial as a key determinant of overall attitude towards growth.

In third place, if entrepreneurship is thought to be a desirable career choice in a country, we expect a relatively high percentage of high-growth firms in that country. The idea is that in such a country more people will try entrepreneurship, eventually leading to better entrepreneurs and more high-growth firms. For instance, Tominc and Rebernik's results (2007) suggest a positive relationship between the degree in which people think entrepreneurship is desirable and their growth aspirations.

Institutional obstacles

Whatever the leading force driving high growth may be, the diverse percentages of high-growth firms between countries are likely to be influenced by differences in policy and institutional settings. Hence, we argue that a country's institutional framework may have an impact on the growth of firms. The reason is simple. The more obstacles government imposes on firms, the less attractive and the more difficult running a business becomes. We focus on three potential institutional obstacles, viz. the employment protection legislation in a country, the administrative burden that government imposes on firms, and the development of the financial system.

With respect to the labour market conditions, a high employment protection represents an extra advantage for working as an employee. Hence, choosing for entrepreneurship becomes less attractive with respect to the alternative, working as an employee. This may result in fewer capable entrepreneurs trying for entrepreneurship leading to fewer fast growing firms. Furthermore, high growth firms need an easy access to the labour market in order to fuel their growth (Henrekson, 2007). Falkenhall and Junkka (2009) claim that in order to promote fast growing firms, countries should ensure low barriers to entry and contestable markets. As a consequence, we expect that the more a country's legal system protects employment the fewer high-growth firms there will be in that country.

Regarding the administrative burden, we consider that a higher administrative burden will diminish the entrepreneurial activity and the growth in a country (Djankov et al., 2002). In spite of this, Capelleras et al. (2005) find no significant differences on the subsequent growth of new enterprises in two different regulated countries, England and Spain. Nevertheless, we expect that the level of the administrative burden that government imposes on firms in a country influences the percentage of high-growth firms negatively.

Firm growth needs to be financed. Hence, the easier an entrepreneur has access to external finance, the more growth opportunities he may be able to realize (King and Levine, 1993; Demirgüç-Kunt and Maksimovic, 1998; Rajan and Zingales, 1998). Consequently, we think that countries with a higher developed financial system may have more high-growth firms.

Opportunities for growth

In line with Wiklund and Shepherd (2003), we think that the limitation of growth opportunities may moderate the impact of growth aspirations on actual growth. In fact, growth aspirations can only be materialized if there are sufficient market opportunities for entrepreneurs. In this paper we investigate the influence of five indicators of growth opportunities.

First, exporting to other countries presents extra difficulties that not all firms are able to face. Therefore, most firms will try first to sell in their domestic market. Hence, if there is a large domestic market, on average more firms will be able to size growth. This is also in accordance to Davidsson (1991, p.412) who notes that larger domestic markets may increase the firm growth opportunities. Hence, we expect countries with a large domestic market to have a higher percentage of high-growth firms.

Second, dynamic economies may enhance the opportunities for firms to grow fast. Previous studies (Bosma et al., 2009; Bowen and De Clercq, 2008) indicate that higher income countries offer more opportunities for growth and higher availability of necessary resources for growth entrepreneurship. Hence, we expect that there is a positive relationship between real GDP growth and the presence of high-growth firms. Note, on top of this, that the relationship between the presence of high-growth firms and GDP growth is two way. On the one hand one can argue that GDP growth will increase the opportunities for high growth, but on the other hand the presence of many high-growth firms can have a positive influence on GDP growth as well.

Third, the distance to the technological frontier of a country may be of influence to the growth opportunities in a country. We expect that the more a country is away from this technological frontier, the more growth opportunities there will exist in such a country, and thus the more high-growth firms there will be. Such a thought is in line with Stenholm et al.'s (2010) contribution, who find that in so-called transit economies – such as Poland, Hungary or the Czech Republic – which are far away from the technological frontier compared to Western European countries – growth expectations are higher compared to Western European countries. Hölzl (2010) shows that R&D plays a more important role on high-growth firms in countries close to the technological frontier. Also there is evidence that high-growth firms are able to increase the technological variety and to destroy the obsolete competences (Colombelli et al., 2011), to obtain higher returns to innovation (Coad and Rao, 2008) and invest more in R&D (Coad and Rao, 2010).

Fourth, it may be that the perception of good business opportunities affects the existence of high-growth firms in a country in two ways. First, it may be the case that this perception is actually true so that there are indeed more and better business opportunities so that more firms will actually manage to grow fast. Second, the general perception of profitability opportunities in the market, as seen by the people of the country themselves, may affect firm growth in itself (Reitan, 1997). For, the perception itself may encourage the creation of new firms and their performance (see, Davidsson, 1991; Tominc and Rebernik, 2007). As a consequence, our hypothesis is that the percentage of people that think that there are good

business opportunities in their country has a positive relation with the percentage of high growth firms in that country.

Finally, we expect that the growth expectations of the entrepreneurs themselves will be positively related to the percentage of high growth firms in a country. Again there are two mechanisms. First of all, the growth expectations can be based on really better prospects, and secondly, they can act as self fulfilling prophesies.

3 Data

This paper uses a wide variety of empirical data sources. First, the Amadeus data base to obtain the information on fast growing firms. Second, the Adult Population Survey (APS) data collected in the Global Entrepreneurship Monitor (GEM) study (5 independent variables). On top of this other data bases are used for gathering information on our other independent variables, such as the World Bank statistical database, the IMF World Economic Outlook Database, the World Bank Doing Business database, the CEPOECD Institutions Data Set, and Eurostat.

We have information on 17 countries for 7 consecutive years in the period 1999 - 2005. The countries included in the database are Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Japan, Netherlands, Poland, Spain, Sweden, United Kingdom and United States. In total we have 112 observations.[2]

Table 1 introduces the variables of our study together with some descriptive statistics.[3] More detailed country specific details are available in Table A.1 in the Annex.

High growth variable

In accordance with the OECD definition we label a firm as a fast growing firm if it has realized an average growth of 20% per year over the last three years. In this context growth is measured most often in terms of turnover or employment. In this paper we focus on turnover growth.

It is also usual to impose a restriction on the size of the high-growth firm. The OECD considers firms only as high growth firms if their size at the beginning of the growth period is 10 or more employees. Due to data availability we have a somewhat different size criterion. We only look at firms that have a size of 50-1000 employees at the *end* of the period of growth.

2 We do not have observations for the dependent variable in 2002 for Austria, Czech Republic, Poland, Spain and Sweden. For Hungary, there are not observations for 2002 and 2003.

3 Actually, we investigated the influence of some more independent variables including the enrolment in secondary education, the development of the financial system, the level of export barriers, among others. Because these variables did not appear to have significant influence, we do not describe them in this section and do not include them in the final regression models of section 5.

Our dependent variable – labelled *high growth* – then is the percentage of firms with a size of 50-1000 employees that have realized an average turnover growth of 20% per year over the last three years.

Our source of these data are Snel et al. (2010) and Timmermans et al. (2009), who generate their data for most countries from the Amadeus database.[4] See Table 1 and Table A.1 in the Annex for some descriptive statistics. Note that we find relatively large percentages high-growth firms compared to e.g. Anyadike-Danes and Hart (2011). This is due to a combination of the following factors:

- The percentage of high-growth firms is taken from the set of firms with a size of 50-1000 employees *at the end of the* period. By implication, firms that have not survived in the past three years are not taken into account.
- By implication our analysis restricts itself to firms that have reported on their turnover at the start and the end of the three year growth period. This may lead to an overrepresentation of well doing firms.[5]
- This paper focuses on turnover growth, while e.g. Anyadike-Danes and Hart (2011) focuses on employment growth.

Table 1.
Descriptive statistics. Mean, maximum and minimum values.

	Mean	Min.	Max.
high growth	20	2	46
tertiary education	58	26	92
income motive	29	16	46
independence motive	58	41	73
desirable career choice	57	25	80
employment protection	2	0	3
start-up procedures	7	3	11
population size	24,5	21,8	28,1
GDP growth	3	0	11
technological development	1,9	0,9	6,6
business opportunities	31	5	66
growth expectation	0,6	0,0	1,6

Source: own elaboration

Variables characterizing the entrepreneurial environment

The entrepreneurial environment is characterized by four variables in our study:

- *Tertiary education* refers to the gross enrolment rate in tertiary education in a country. More specifically, it measures the number of students in tertiary education as a percentage of the population in the age 18-23. Note that because of this definition it is possible to arrive at very high percentages if there are many students older than 23. In

[4] For the 15 European countries the data are from the Amadeus data set, for the USA from Standard & Poors, for Japan from the Oriana data set. We distinguish three sectors in these data sets: manufacturing, trade, and services. These sectors are not represented equally well in these datasets. Hence, we take a weighted average over these three sectors to arrive at the right percentage of high-growth firms. Finally, turnover figures from countries outside the Euro zone are translated for each year into Euros on the basis of purchasing power parity.

[5] We have no reason to believe that this potential overrepresentation will be different across countries or across time. Hence, we think it will leave our results unbiased.

theory it would even be possible to arrive at a percentage above 100%, although that does not occur in our data set. Source: The World Bank statistical database.[6] This variable serves as the measure of the country's education level in this paper.

- *Income motive* measures the percentage of early-stage entrepreneurs[7] that declare that their motive to become entrepreneur was to increase their personal income. Source: GEM Adult Population Survey. The country specific value of this variable corresponds to 2005.[8] We assume in this study that the motives of early-stage entrepeneurs in a country can be used a proxy for the motives of all entrepreneurs in a country.
- *Independence motive* measures the percentage of early-stage entrepreneurs that declare that their motive to become entrepreneur was to obtain a greater independence. Source: GEM Adult Population Survey. The country specific value of this variable corresponds to 2005.
- *Desirable career choice* measures the percentage of inhabitants of a country that think that most people in their country consider starting a new business a desirable career choice. Source: GEM Adult Population Survey. The country specific value of this variable corresponds to 2006.

Variables indicating institutional obstacles

Two different institutional obstacles are investigated in our study:

- *Employment protection* measures the strictness of employment protection legislation in a country, where higher values correspond to increasing strictness of employment protection. This index is taken from the CEPOECD Institutions Data Set (1960-2004).
- *Start-up procedures* measures the number of different procedures that a start-up has to comply with in order to obtain a legal status, i.e., to start operating as a legal entity. A procedure is defined as any interaction of the company founder with external parties (government agencies, lawyers, auditors, notaries). Source: World Bank Doing Business. The country specific value of this variable corresponds to 2005. This variable is an example of the administrative burden that government imposes on firms in a country. We take it as a proxy for the whole administrative burden in a country, including the legislation that burdens fast growing firms.

Variables indicating opportunities for growth

Five variables indicate opportunities for growth in our study:

- *Population size* measures the number of inhabitants in a country. We take the logarithm (with base 2) of this number because in our analysis we are interested in the influence of *relative* differences in population size. Source: The World Bank statistical database. We take population size as a proxy for the size of the domestic market in this paper
- *GDP growth* is measured as the percentage of the annual change of gross domestic product at constant prices. Source: International Monetary Fund, World Economic Outlook Database.

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[6] For Germany we used the Eurostat database because information on this country was not available in the World Bank database.

[7] Early-stage entrepreneurs are defined as adults (18-64 years of age) that are actively involved in setting up a new business (so-called nascent entrepreneurs) and/or currently own and manage a business that is less than 3.5 years old (so-called young business entrepreneurs).

[8] Because for the Czech Republic no information for 2005 was available for the motive variables we took the value of 2006.

- *Technological development* measures the distance to the technological frontier of a country, where the United States of America serve as the benchmark. Hence, it is defined in this study by the ratio of the overall productivity (added value per worker at constant prices and expressed in US$) of the USA and the country under consideration. Source: International Monetary Fund and International Labour Organisation/Euromonitor International. Note that especially for the so-called transit economies in our sample – the Czech Republic, Hungary and Poland - this measure is particularly high compared to the other countries indicating that these specific countries are relatively far away from the technological frontier.
- *Business opportunities* measures the percentage of inhabitants of a country that think that in the next 6 months there will be good opportunities for starting a business in the area where they live. Source: GEM Adult Population Survey.
- *Growth expectation* measures the percentage of early-stage entrepreneurs that expect to have over 19 employees in five years. Source: GEM Adult Population Survey. We assume in this study that the growth expectations of early-stage entrepreneurs in a country are a good proxy for the growth expectations of all entrepreneurs in the country.

Table 2 displays the correlation matrix among the variables included in our empirical analysis. We should stand out that several of the correlation coefficients among the variables are above significantly high (with a value over 0.5), which may arise problems of multicollinearity when estimating our regressions. E.g., *start-up procedures* is negatively correlated with *tertiary education*. Also, *growth expectation* shows a significant negative correlation with *employment protection*. GDP growth has a positive and significant correlation with the percentage of high-growth firms. Finally – not surprisingly - the motive variables (*income motive* and *independence motive*) display the highest (negative) correlation. In order to analyse the existence of multicollinearity, we follow Hessels et al. (2008) and apply the variance inflation factor (VIF). Our results do not show a value of VIF above 10 (the highest VIF that we find is 1.97), indicating that multicollinearity is not a concern.

Table 2.
Correlation matrix.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1. high growth	1											
2. tertiary education	0.20	1										
3. income motive	**0.57**	0.08	1									
4. independence motive	**-0.46**	-0.00	**-0.65**	1								
5. desirable career choice	0.19	**-0.32**	0.08	**-0.47**	1							
6. employment protection	**-0.46**	**-0.25**	**-0.38**	**0.33**	0.15	1						
7. start-up procedures	-0.21	**-0.61**	0.06	0.06	0.13	**0.33**	1					
8. population size	0.04	-0.06	**0.30**	-0.20	-0.11	**-0.26**	**0.48**	1				
9. GDP growth	**0.55**	-0.03	0.18	-0.09	0.20	-0.12	-0.21	**-0.33**	1			
10. technological development	**0.34**	**-0.45**	0.21	-0.09	0.12	0.06	**0.33**	-0.12	0.23	1		
11. business opportunities	0.18	**0.49**	-0.08	-0.04	0.23	-0.12	**-0.59**	**-0.45**	0.20	**-0.29**	1	
12. growth expectation	**0.34**	0.04	**0.35**	**-0.43**	0.24	**-0.60**	**-0.30**	0.16	0.16	-0.10	**0.40**	1

In bold: correlations significant at 1%.

Unfortunately we have not for all variables full information available. According to data availability our variables can be divided into three groups[9]:

- variables for which we have full information for the whole period of investigation 1999-2005, viz. high growth, tertiary education, employment protection, population size, GDP growth, and technological development.
- variables for which we have information for the period 2002-2005, viz. business opportunities and growth expectation. For these variables we lack information for the first three years (1999-2001) of our period of investigation (1999-2005). This obliges us to infer the information available for 2002 to previous years. Hence, we assume that these variables remain constant in the initial period.[10]
- time invariant variables, viz. income motive, independence motive, desirable career choice, and start-up procedures. For these variables we have only information for one year at the end of the period of investigation. We assume that this country information for one year is indicative for this country for the whole period.

4 Model

This study focuses on the analysis of the determinants of high-growth firms at the country level. Our dependent variable ($HG_{i,t}$) is a vector of dimension NxT that contains observations of a country (i) in a year (t). We aim to investigate to what extent the entrepreneurial environment, institutional obstacles, and growth opportunities affect the percentage of high-growth firms in a particular country. Therefore, our model uses the following expression:

$$HG_{i,t} = \alpha + \beta_1 X_{1i,t} + \beta_2 X_{2i} + u_{i,t}$$

where $HG_{i,t}$ denotes the percentage of high-growth, $X_{1i,t}$ the time dependent variables, X_{2i} the time invariant variables, and u_{it} the error term for which we assume that they are independent and identically distributed. See, however, section 6 where we relax this assumption.

Our dependent variable, $HG_{i,t}$, is defined as a percentage. Therefore, it is bounded between zero and one and is a fractional response form. As a result, the application of OLS estimation may not be a suitable econometric tool given that the OLS fitted values are not between zero and one. In such a case Papke and Wooldridge (1996) propose the Fractional Logit Regression Model (FLRM) using Quasi-Maximum Likelihood Estimation (QMLE). The FLRM model uses the logistic distribution function and maximizes the Bernoulli log-likelihood function:

[9] In a few cases there is no information available for a specific variable for a specific country. See Table A.1 in the Annex for which variables and countries this is the case. In the regression analysis we use the average over the other countries in such a case.

[10] For Austria we only have information for 2005. So we put the values of other years equal to the 2005 value. For Poland we have only information for 2002 and 2004. So we took for 2003 the average of the 2002 and 2004 values, and we took for 2005 the 2004 value.

$$\underset{\beta_i}{Max} \ln L = \sum \ln L_{i,t} = \sum \left[HG_{it} \ln G(\beta_1 X_{1i,t}, \beta_2 X_{2i}) + (1 - HG_{it}) \ln\left(1 - G\left(\beta_1 X_{1i,t}, \beta_2 X_{2i}\right)\right)\right]$$

Following Papke and Wooldridge (1996), the estimated coefficients β_1 and β_2 are consistent using QMLE.[11]

Our data have a double dimension: time x country. Therefore, we could have estimated our model with fixed effects by introducing country dummies. However, because we are primarily interested in explaining country differences in this paper, we did not want to introduce country dummies.

High growth is a phenomenon over a three year period. We adopt the convention here that $HG_{i,t}$ denotes the percentage of high-growth firms that experienced high growth between the year *t-1* and the year *t+1*. As a consequence, in our model we assume that independent variables of year *t* have influence on the percentage of high-growth firms in the period between *t-1* and *t+1*.[12]

Because high growth is a phenomenon over a three-year period, one could argue that there is an inherent dependence between consecutive observations because of the two overlapping years. For instance, the percentages of high-growth firms in the periods 2002-2004 and 2003-2005 might be correlated because they share two overlapping years (2003 and 2004). We have studied in the data. Fortunately, this does not appear the case. In practice, most of the high-growth firms in one period are not any more high-growth in the consecutive period. Indeed, in practice high growth appears to be a highly volatile phenomenon at the individual firm level.

Finally, note that our sample is relatively small: 112 observations. This has two consequences. First, the significance levels of our results should be interpreted as only indicative and not taken too strict. Second, we are not able to include many independent variables simultaneously in our regression analysis.

5 Results

In our first model we restrict ourselves to the five independent variables for which we have information for the whole period of investigation. The advantages of this approach are twofold:

- We do not have to make extra assumptions for missing values, which may bias our results.
- Using relatively few independent variables is an advantage because of the relatively small sample size (112 observations).

Results are shown as model (1) in Table 3.

[11] We have also estimated the models simply by OLS. This produces exactly the same results as the fractional logit regression model. Results are available on request.

[12] Because of the small sample size we do not experiment with a more complicated lag structure with respect to our independent variables.

The influence of all variables appears to be significant with the expected sign and with a low level of dispersion since the Pearson χ^2 test is equal to 0.0179 which indicates that the level of dispersion is low (a value superior to 1 indicates that the model is incorrect).
The quality of entrepreneurship in a country seems to matter. For, as we explained in section 2, a higher enrolment in *tertiary education* can be associated with a better potential for entrepreneurship in a country, which may give rise to more high growth. More specifically, we find that a 1 percent point higher enrolment rate leads to approximately 0.2 percent point more high-growth firms.
We find also evidence that institutional obstacles may play a negative role with respect to the percentage of high growth firms. Indeed, employment protection appears to have the expected negative influence on high growth. As we explained in section 2, there are two ways in which *employment protection* may inhibit high growth:

- fewer people will opt for becoming an entrepreneur if the alternative – becoming an employee – is relatively attractive because of a high employment protection,
- high growth firms can flourish best if they can hire employees without extra risks because of employment protection legislation.

More specifically, we find that a 1 point increase in the index of employment protection legislation (it varies between 2.2 and 3.3 in our data set) leads to approximately 3.3 percent point fewer high growth firms.

In section 2 we explained why a larger domestic market may lead to more high growth. Indeed, we find if *population size* - our proxy for the size of the domestic market - doubles, this is associated with approximately 0.7 percent point more high growth firms.[13]

In the theoretical review, we argued that high *GDP growth* is associated with more high growth firms. Actually, this relationship is two way: a higher GDP growth leads to more growth opportunities for firms, while the other way around more high growth firms may lead to higher GDP growth. Hence, the positive relationship that we find for GDP growth and high growth firms should not be interpreted as causal. Therefore, GDP growth merely plays the role of control variable[14]. We find that a higher GDP growth of 1 percent point is associated with approximately 2.1 percent point more high growth firms.

There appears to be much more opportunities for high growth in those countries far from the technological frontier. On average, if a country is 1 percent point farther away from the technological frontier, this is associated with 2.3 percent point more high-growth firms.

In our second model we try to incorporate as many independent variables as possible, while taking care to avoid multicollinearity. The advantages of this approach are:

- In this way we use as much information as possible so that we can investigate the influence of more interesting variables.

[13] This holds true because population size is measured by the logarithm with base 2.

[14] One way of disentangling this two-way causal relationship would be to introduce various lagged GDP growth rates into our model. We refrain from such an exercise in our paper because (i) this is not the primary aim of our paper and (ii) because of the sample size we want to restrict ourselves to a minimum of independent variables. Nevertheless, we have experimented with it. The results are available upon request.

– We can check in this way the extent to which our results of model (1) are robust.

In this approach, we first tried all eleven independent variables at once. Subsequently, we dropped the least significant variable successively until all remaining variables were significant. What resulted was model (2) in Table 3.

Table 3.
Explaining the percentage of high-growth firms in a country. Marginal effects of Fractional Logit Regression Model[15].

	(1)	(2)	(3)	(4)	(5)
Entrepreneurship					
tertiary education	0.22***	0.23***	0.22***	0.18***	0.23***
	(0.04)	(0.05)	(0.04)	(0.05)	(0.04)
income motive		0.23***			
		(0.06)			
independence motive			-0.30***		
			(0.06)		
desirable career choice		0.17***			
		(0.05)			
Institutional obstacles					
employment protection	-3.27***	-2.28***	-2.23***	-3.02***	-2.37***
	(0.70)	(0.74)	(0.65)	(0.69)	(0.85)
start-up procedures		-0.38*			
		(0.26)			
Opportunities for growth					
population size	0.67**	0.59*	0.37	1.01***	0.65**
	(0.31)	(0.36)	(0.30)	(0.32)	(0.32)
GDP growth	2.06***	1.62***	1.96***	1.98***	1.98***
	(0.30)	(0.28)	(0.28)	(0.29)	(0.31)
technological development	2.31***	2.26***	2.18***	2.53***	2.43***
	(0.42)	(0.40)	(0.36)	(0.41)	(0.40)
business opportunities				0.10**	
				(0.05)	
growth expectation					2.48
					(0.00)
Pearson χ^2	0.0179	0.0139	0.0152	0.0176	0.0179
AIC	0.7883	0.8369	0.8029	0.8055	0.8058
BIC	-49814	-484.54	-493.79	-493.50	-493.46
number of observations			112		

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

It appears that all results of model (1) are robust. Not only the signs and significance of the results remain the same in model (2) but even the order of magnitude of the estimated coefficients. In addition, the Pearson χ^2 test and the BIC statistic obtain the lowest value in model (2) but the AIC statistic shows a slightly higher value than model (1). Hence, in spite of the increase in the AIC statistic there seems that model (2) is the most well-specified.

The overall ambition of entrepreneurs in a country seems to influence high growth. For, if more early-stage entrepreneurs declare that their motive to become entrepreneur was to

[15] The estimated coefficients from the FLRM are shown in Table A-2 in the Annex.

increase their personal income, this is associated with more high growth. More specifically, if the *income motive* variable increases with 1 percent point, this leads to approximately 0.2 percent point more high growth firms.
Furthermore, the status of entrepreneurship – as measured by the percentage of people that think that most people in their country consider starting a new business a *desirable career choice* - seems to matter also. More specifically, we find that if this variable increases with 1 percent point, this leads to approximately 0.17 percent point more high growth firms.
Finally, we find influence of the administrative burden in a country, as proxied by the number of different procedures that a start-up has to comply with in order to obtain a legal status. We find that a higher administrative burden leads to fewer high growth firms.

Because of multicollinearity we had to leave out three of our independent variables in model (2). In models (3) –(5) of Table (3) we inserted these variables separately one by one in model (1).
Again the results of model (1) appear to be robust, if we compare them with models (3) – (5). On top of this we find the following.
One reason to choose for entrepreneurship is to obtain a greater *independence*. If many entrepreneurs in a country are motivated for entrepreneurship in this way, one expects relatively few high growth firms, as explained in section 2. We indeed find this in model (3).

Finally, if people in a country see more *business opportunities* or early-stage entrepreneurs *expect more growth* then you would expect more high growth firms in that country. Models (4) and (5) confirm these expectations.

With the above models it is possible to give a tentative explanation of the differences in the average percentage of high-growth firms between countries. We will do such a tentative exercise on the basis of our richest model, viz. model (2). This is not to say that this is our "best" model, but we only had to make a choice to save space. Furthermore, because of the robustness of our results an analysis on the basis of a different model would not work out very differently.

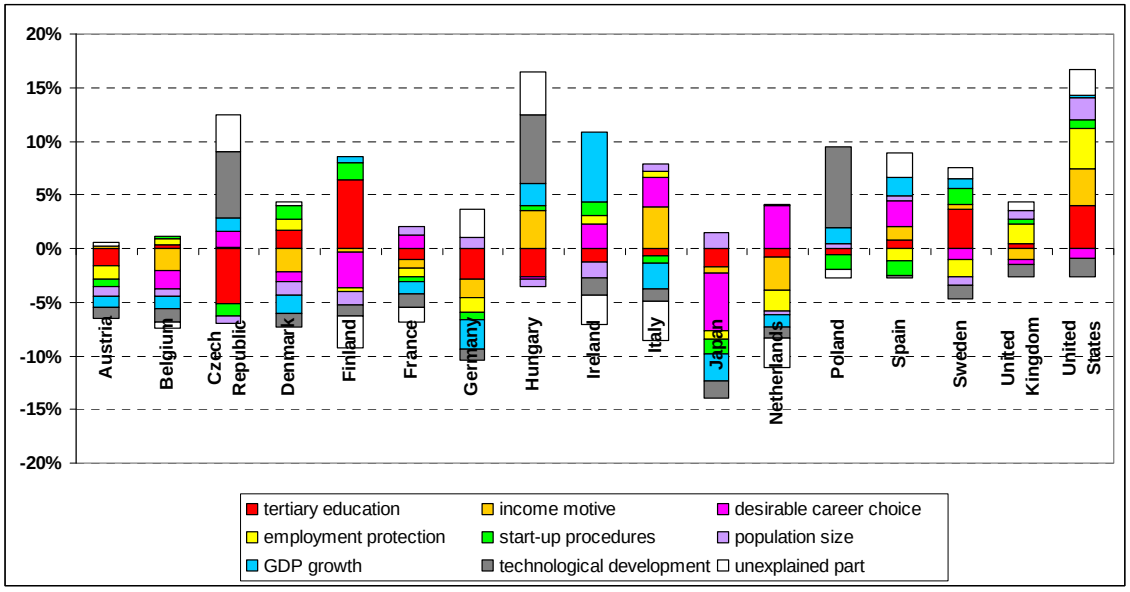
The second column in Table 4 gives for each country the difference between the country's percentage of high growth firms and the average over all countries. Note that in the period of investigation (1999-2005) the United States of America had the largest percentage of high growth firms (14% above average) and Japan the smallest (12% below average).
The next eight columns in the table give the percentage points that are explained by the variable in the head of the column. For example, 4.0 percent point of the US percentage of high growth firms is explained by the average enrolment of tertiary education in the US.
The final column gives the percentage points that are not explained by our model. For example, for the US the eight variables of model (2) explain up to 13.5 percent point of the 14%, leaving only 0.5 percent point unexplained.

Table 4.
Explaining the average percentage of high-growth firms between countries on the basis of model (2) from table 3

		part of the deviation that is explained by differences in:								
		Entrepreneurship			Institutional obstacles		Opportunities for growth			unexplained part
	deviation from average	tertiary education	income motive	desirable career choice	employment protection	start-up procedures	population size	GDP growth	technological development	
Austria	-6%	-1.6%	0.2%		-1.2%	-0.7%	-0.9%	-1.0%	-1.1%	1.0%
Belgium	-6%	0.3%	-2.1%	-1.7%	0.6%	0.2%	-0.7%	-1.1%	-1.3%	-0.2%
Czech Republic	5%	-5.2%	0.1%	1.5%		-1.1%	-0.7%	1.3%	6.2%	2.4%
Denmark	-3%	1.7%	-2.2%	-0.9%	1.1%	1.2%	-1.3%	-1.7%	-1.3%	0.5%
Finland	-1%	6.4%	-0.3%	-3.3%	-0.3%	1.6%	-1.3%	0.6%	-1.0%	-1.5%
France	-5%	-1.0%	-0.8%	1.3%	-0.8%	-0.5%	0.8%	-1.1%	-1.3%	-1.5%
Germany	-7%	-2.8%	-1.7%	-0.1%	-1.3%	-0.7%	1.1%	-2.7%	-1.1%	2.5%
Hungary	13%	-2.7%	3.6%	-0.2%		0.4%	-0.7%	2.0%	6.4%	0.4%
Ireland	4%	-1.3%	0.0%	2.2%	0.9%	1.2%	-1.5%	6.5%	-1.5%	-1.9%
Italy	-1%	-0.7%	3.9%	2.7%	0.5%	-0.7%	0.8%	-2.4%	-1.1%	-2.6%
Japan	-12%	-1.8%	-0.5%	-5.3%	-0.8%	-1.5%	1.4%	-2.5%	-1.6%	-1.7%
Netherlands	-7%	-0.8%	-3.0%	4.0%	-2.0%	0.1%	-0.3%	-1.1%	-1.0%	-1.9%
Poland	7%	-0.6%				-1.3%	0.4%	1.6%	7.5%	-2.1%
Spain	6%	0.8%	1.2%	2.4%	-1.1%	-1.3%	0.5%	1.7%	-0.2%	3.9%
Sweden	3%	3.7%	0.4%	-1.0%	-1.6%	1.6%	-0.8%	0.9%	-1.3%	1.6%
United Kingdom	2%	0.4%	-1.0%	-0.5%	1.9%	0.4%	0.8%	0.0%	-1.1%	0.4%
United States	14%	4.0%	3.5%	-0.9%	3.7%	0.8%	2.1%	0.3%	-1.7%	0.5%

The second column gives the difference between the country's percentage of high growth firms and the average over all countries.

Figure 1. Explaining the average percentage of high-growth firms between countries on the basis of model (2) from table 3



Source: own elaboration

Results in Table 4 are too rich to discuss all separately. We just pick out some results that caught our eyes and that they stand out from Figure 1:

- For most countries our model (2) explains the average percentage of high-growth firms quite well. For the Czech Republic, Hungary, Italy, and Spain it performs relatively poorly.
- The United States have on average the highest percentage of high growth firms. The most important determinants are (i) a relatively high enrolment in tertiary education, (ii) the presence of relative many entrepreneurs that chose entrepreneurship to obtain a higher income, (iii) a relatively low degree of employment protection, and (iv) a relatively large domestic market (proxied by population size).
- Japan has the lowest percentage of high-growth firms. Nearly all distinguished variables contribute to this. The two most important determinants are: (i) the fact that relatively few Japanese think that entrepreneurship is a desirable career choice, and (ii) the relatively low GDP growth in the period of investigation.

6 Robustness checks on standard errors

We perform several checks on the robustness of the standard errors reported in section 5. One of the main econometric problems in our estimation procedure may be caused by the fact that the observations of our variables *within* a country are highly correlated. This fact itself does not constitute a problem as long as we feel comfortable with the assumption that we made in section 4 that the error terms in equation [1] are independent and identically distributed, i.e., $u_{it} \sim$ i.i.d.$(0, \sigma^2)$. However, if we relax this assumption – e.g. because we

suspect that there are unobserved country effects – the normal OLS procedure will lead to too small standard errors. See Angrist and Pischke (2009) who address this problem neatly and also suggest a number of ways how to correct the standard errors in such a case. In the following we will undertake three different ways of correcting the standard errors, if we relax the assumption of independent standard errors *within* the country observations.
First, we correct the standard errors by using the so-called Moulton factor. Second, we make such a correction by repeating the main analysis while clustering the standard errors by country. Third, we correct the standard errors by bootstrapping the distribution of the empirical data with clustered data at the country level. Table 6 shows the resulting standard errors with each of these three methods.

Moulton factor

Moulton implements an OLS standard error correction for clustering. Moulton (1986) factors are estimated from the data and used to scale the conventional OLS standard errors. The Moulton factor (Angrist and Pischke, 2009) is given by:

$$\frac{V(\hat{\beta})}{V_c(\hat{\beta})} = 1 + \left[\frac{V(n_i)}{\overline{n}} + \overline{n} - 1\right]\rho_X \rho_\varepsilon$$

Where $V(\hat{\beta})$ denotes the correct sampling variance, $V_c(\hat{\beta})$ is the conventional OLS variance, $V(\overline{n})$ is the variance of the average group size, $\overline{n}$ is average group size, ρ_X and ρ_ε are the cluster correlation or intraclass correlations[16]. It appears that the intraclass correlations of our explanatory variables must be substantial in order to get a substantial correction. Table 5 shows that this indeed is the case.

Table 5.
Intraclass correlations of the explanatory variables.

Entrepreneurship	
tertiary education	0.8026
income motive	1.0000
independence motive	1.0000
desirable career choice	1.0000
Institutional obstacles	
employment protection	0.9895
start-up procedures	0.9770
Opportunities for growth	
population size	0.9999
GDP growth	0.4830
technological development	0.9015
business opportunities	0.7940
growth expectation	0.6868

Note: a value equal to 1 denotes a perfect correlation between the observations of a variable in a country, while a value near 0 denotes that the observations are independent.
Source: own elaboration

[16] The commands to estimate the Moulton factor have been developed by Angrist and Pischke (2009) and they are available in econ-www.mit.edu/faculty/angrist/data1/mhe/brl

Clustering standard errors

Clustering standard errors enables us to relax the assumption of independence of all observations. Clustered errors keep the assumption of zero correlation across clusters, but allow the within-group correlation to be anything at all. However, the estimator of the standard errors in this procedure is only unbiased if the number of countries is relatively large. Since we have only 17 countries in our analysis we cannot exclude that the resulting standard errors in these procedure are a bit biased.

Bootstrapping standard errors

In general, bootstrap inference uses the empirical distribution of the data by resampling. However, in this case we must take into account that our data are clustered at the country level. Hence, we bootstrap our OLS estimations clustering by countries.

Conclusions on corrected standard errors

In Table 6 standard errors are shown that result from each of our three correction methods. Our main conclusions are:

- If we do not assume away correlation within countries, standard errors increase substantially as our three correction methods show. However, most of the results that are significant in our main analysis remain significant in the three correction methods.
- Correcting the standard errors by the Moulton factor or by clustering standard errors lead to somewhat sharper standard errors than bootstrapping. This latter method leads to the highest standard errors and – thus – to the fewest significant results.
- Our results on the influence of tertiary education, employment protection, and GDP growth are the most robust. They are more or less unaffected by any of the three corretion methods.
- Also our results on the influence of the motive variables, desirable career choice, and technological development are fairly robust. They lose only significance when bootstrapping.
- Our result on the influence of population size becomes a bit doubtful in the light of the correction methods. In some variants it remains significant, in others it does not.
- Our results on the other variables become insignificant in all three correction methods and we conclude that there is serious doubt whether these results indeed are valid.

Table 6.
Explaining the ratio of high-growth firms in a country. Robustness checks.

	Moulton factor					Clustered standard errors					Bootstrapped regressions (1000 repetitions)				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
Entrepreneurship															
tertiary education	0.22***	0.20***	0.23***	0.19***	0.24***	0.22***	0.20***	0.23***	0.19**	0.24***	0.22**	0.20**	0.23***	0.19**	0.24***
	(0.07)	(0.06)	(0.05)	(0.07)	(0.06)	(0.07)	(0.06)	(0.04)	(0.07)	(0.07)	(0.09)	(0.09)	(0.07)	(0.08)	(0.09)
income motive		0.24***					0.24**					0.24			
		(0.07)					(0.09)					(0.17)			
independence motive			-0.28***					-0.28***					-0.28**		
			(0.08)					(0.07)					(0.12)		
desirable career choice		0.13***					0.13***					0.13			
		(0.04)					(0.04)					(0.08)			
Institutional obstacles															
employment protection	-3.36***	-2.29**	-2.40**	-3.13***	-2.36*	-3.36***	-2.29**	-2.40***	-3.13***	-2.36**	-3.36**	-2.29	-2.40**	-3.13**	-2.36
	(1.26)	(0.94)	(0.98)	(1.19)	(1.42)	(1.10)	(0.86)	(0.73)	(0.98)	(1.06)	(1.51)	(2.05)	(1.22)	(1.50)	(1.55)
start-up procedures		-0.44					-0.44					-0.44			
		(0.34)					(0.36)					(0.69)			
Opportunities for growth															
population size	0.90*	0.93**	0.68*	1.24**	0.89*	0.90	0.93**	0.68	1.24**	0.89*	0.90	0.93	0.68	1.24*	0.89
	(0.51)	(0.44)	(0.39)	(0.54)	(0.46)	(0.54)	(0.41)	(0.42)	(0.48)	(0.48)	(0.72)	(0.69)	(0.56)	(0.68)	(0.69)
GDP growth	2.21***	1.77***	2.10***	2.14***	2.14***	2.21***	1.77***	2.10***	2.14***	2.14***	2.21***	1.77***	2.10***	2.14***	2.14***
	(0.40)	(0.29)	(0.32)	(0.38)	(0.38)	(0.37)	(0.39)	(0.37)	(0.35)	(0.39)	(0.42)	(0.43)	(0.40)	(0.39)	(0.41)
technological development	2.38***	2.22***	2.21***	2.56***	2.51***	2.38***	2.22***	2.21***	2.56***	2.51***	2.38*	2.22	2.21	2.56*	2.51
	(0.60)	(0.42)	(0.460)	(0.58)	(0.56)	(0.75)	(0.50)	(0.62)	(0.72)	(0.74)	(1.43)	(2.08)	(1.67)	(1.54)	(1.94)
business opportunities				0.10					0.097					0.10	
				(0.07)					(0.07)					(0.08)	
growth expectation					2.89					2.89					2.89
					(2.17)					(1.94)					(2.44)
Constant	-18.54	-29.97***	1.52	-28.41*	-23.34	-18.54	-29.97***	1.52	-28.41*	-23.34	-18.54	-29.97*	1.52	-28.41	-23.34
	(16.04)	(11.41)	(13.27)	(16.69)	(15.17)	(15.82)	(10.17)	(16.41)	(14.79)	(13.56)	(21.31)	(17.64)	(21.75)	(21.21)	(20.12)
R-squared	0.65	0.75	0.71	0.67	0.66						0.62	0.72	0.69	0.64	0.64
Observations	112														

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

7 Summary and policy implications

This paper gives some insights about the driving forces of the number of high-growth firms in a country. First of all, it is important to note that the empirical analysis leading to these insights had to be done on the basis of a relatively small data set. On top of this we had to cope with the problem that for a number of variables we had incomplete information for the period of investigation. As a result, this study should be seen as explorative and our results should be taken only as indicative. However, we do think that the paper makes a valuable contribution because of the plausibility of our findings with respect to theory and other empirical findings in the literature.

The first contribution of this paper is that it is – as far as we know – the first empirical analysis of high growth at the country level on the basis of actual measured growth. The second contribution is that we find indicative empirical evidence for three driving forces of high growth, viz. entrepreneurship, institutional settings, and opportunities for growth, all in accordance with theory and empirical findings in related fields of research. Third, on the basis of the findings of this paper it is possible to give a tentative explanation of the differences in the average percentage of high-growth firms between countries. For example, the high percentage of high growth firms in the USA, the low percentage of high growth firms in Japan, and the percentage of high growth firms of all countries in between, can be explained tentatively in terms of the identified driving forces of high growth.

For those policy makers that seek to stimulate high growth in their country, the paper has a number of suggestions. First of all, the paper suggests that entrepreneurship has a positive influence on high growth. The paper suggests three specific channels to stimulate entrepreneurship directly or indirectly:

- to stimulate the enrolment into tertiary education which may lead to a higher quality of entrepreneurship
- to stimulate the ambition of entrepreneurs (as measured by their motive for becoming entrepreneur)
- to promote the notion that entrepreneurship is a desirable career choice.

Second, the paper suggests that institutional obstacles play a negative role as far as high growth is concerned. The paper provides tentative evidence that the following two strategies might be fruitful in this context:

- to lower the degree of employment protection legislation thereby (i) making the choice for entrepreneurship more attractive compared to working as an employee and (ii) lowering the risks when attracting employees for the high growth firm
- to lower the administrative burden for firms.

Finally, the paper suggests that the size of the domestic market influences high growth positively. This suggests that the creation of common markets with other countries may be a good strategy to stimulate high growth.

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Table A.1
Means of values

		Entrepreneurship				Institutional obstacles			Opportunities for growth			
	high growth	tertiary education	income motive	independence motive	desirable career choice	employment protection	start-up procedures	population size	GDP growth	technological development	Business opportunities	growth expectation
Austria	14	52	30	63		2.6	9	23.0	2.2	1.3	29	0.6
Belgium	14	60	20	53	47	1.7	7	23.3	2.2	1.2	23	0.2
Czech Republic	26	36	26	59	65		10	23.3	3.6	5.0		
Denmark	17	66	20	64	52	1.5	4	22.4	1.8	1.2	51	0.9
Finland	20	86	28	71	37	2.2	3	22.3	3.1	1.4	48	0.4
France	16	54	26	61	64	2.4	8	25.8	2.2	1.2	13	0.3
Germany	14	46	22	58	56	2.7	9	26.3	1.1	1.3	18	0.7
Hungary	33	47	45	51	56		6	23.3	4.5	5.1	11	0.5
Ireland	24	53	29	57	70	1.6	4	21.9	6.7	1.1	41	1.0
Italy	20	55	46	41	73	1.8	9	25.8	1.4	1.3	34	1.0
Japan	8	51	27	73	25	2.4	11	26.9	1.3	1.1	8	0.2
Netherlands	13	55	16	61	80	3.0	7	23.9	2.1	1.4	43	0.5
Poland	27	56					11	25.2	3.8	5.6	20	0.5
Spain	26	62	34	57	71	2.6	11	25.3	3.9	1.8	40	0.3
Sweden	23	74	31	51	51	2.9	3	23.1	3.2	1.2	43	0.5
United Kingdom	22	60	25	65	54	1.1	6	25.8	2.7	1.3	31	0.8
United States	34	76	44	44	51	0.2	5	28.1	2.8	1.0	35	1.5
Average	20	58	29	58	57	2.0	7	24.5	2.8	1.9	31	0.6

Source: own elaboration

Table A-2.
Explaining the percentage of high-growth firms in a country. Fractional Logit Regression Model.

	(1)	(2)	(3)	(4)	(5)
Entrepreneurship					
tertiary education	1.38***	1.46***	1.44***	1.14***	1.47***
	(0.28)	(0.30)	(0.26)	(0.29)	(0.29)
income motive		1.48***			
		(0.36)			
independence motive			-1.93***		
			(0.39)		
desirable career choice		1.09***			
		(0.33)			
Institutional obstacles					
employment protection	-0.21***	-0.15***	-0.14***	-0.19***	-0.15***
	(0.045)	(0.05)	(0.04)	(0.04)	(0.05)
start-up procedures		-0.02*			
		(0.02)			
Opportunities for growth					
population size	0.043**	0.04	0.02	0.06***	0.041**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
GDP growth	13.08***	10.39***	12.49***	12.60***	12.61***
	(1.91)	(1.79)	(1.82)	(1.82)	(1.95)
transit economy	0.15***	0.14***	0.14***	0.16***	0.15***
	(0.03)	(0.03)	(0.02)	(0.03)	(0.02)
business opportunities				0.65**	
				(0.32)	
growth expectation					15.77
					(9.97)
Constant	-3.49***	-4.35***	-2.04***	-4.12***	-3.72***
	(0.61)	(0.62)	(0.69)	(0.64)	(0.57)
Pearson χ^2	0.0179	0.0139	0.0152	0.0176	0.0179
AIC	0.7883	0.8369	0.8029	0.8055	0.8058
BIC	-498.14	-484.54	-493.79	-493.50	-493.46
number of observations			112		

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