

## **Determinants of high-growth firms**

Why have some countries more high-growth firms than others?

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## **Determinants of high-growth firms**

### **Why have some countries more high-growth firms than others?**

#### **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, O25

# 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 example, 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). 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.

The purpose of this paper is to analyse the determinants of the percentage of high-growth firms at the country level. Why have some countries more high-growth firms than others? 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. In section 5 the empirical results are presented. Finally, section 6 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. This variety of theoretical perspectives has discouraged an integrated analysis of the firm growth process (Davidsson and Wiklund, 2000). Therefore, each discipline has tended to ignore findings from other schools.

Given that growth is a multifaceted process, below we focus on those determinants that we aim to investigate. These determinants may be grouped into three categories: entrepreneurship, institutional obstacles, and opportunities to grow. For all determinants we discuss which influence we expect for these determinants on the percentage of high-growth firms in a country.

### **Entrepreneurship**

According to Davidsson (1991), "the individual matters" to determine the entrepreneurs' growth motivation (p. 423). In particular, some of the entrepreneurs' characteristics that affect the firm performance are related with level of their education and motivations (Hessels et al., 2008). Hence, the level of entrepreneurship in a country must condition to some extent the percentage of high-growth firms.

More specifically, we expect a positive relationship between the education level in a country and the percentage of high-growth firms.

For, education may play a role in developing the individual's entrepreneurial abilities. 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. There are two main explanations. First, more educated entrepreneurs may be better prepared to identify market opportunities (Davidsson, 1991). Second, more educated entrepreneurs have more growth-oriented aspirations (Cassar, 2006, 2007; Stam et al., 2009) because the opportunity costs associated with the allocation of valuable human into an entrepreneurial venture would force the individual to pursue higher returns for her investment (Levie and Autio, 2008; Autio, 2009).

However, not only the level of entrepreneur's education affects positively on the firm performance, but also the average education level of the population. Recently, Stel et al. (2011) have shown 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.

With regard to the entrepreneur's attitude, we expect in countries with more motivated entrepreneurs a higher percentage of high-growth firms.

Entrepreneurs with higher growth-oriented ambitions may allocate more effort to pursue higher returns for their investment and thereby realise a higher growth. Even though ambition does not guarantee growth, absence of ambition almost certainly guarantees absence of growth (Autio, 2009). Empirical evidence on the influence of the entrepreneur's motivations and growth has been developed during the last years.

Davidsson (1991) defined a model where actual growth depends on growth motivation. His results show that the entrepreneur's needs affect the entrepreneur's growth motivation more than his/her ability to perceive an opportunity. Orser and Hogarth-Scott (2002) find that the entrepreneurs' ambitions to pursue growth are positively related to actual growth. Also, Wiklund and Shepherd (2003) report that growth aspirations are significantly and positively associated with growth expectancies. But which kinds of motivations are important for firm growth?

Authors such as Cassar (2007) show that income motivation is the most important factor that affects the entrepreneurial growth preferences. More recently, Hessels et al. (2008) find that there is a positive relationship between increase-wealth-motivated entrepreneurs and the high-job-growth. 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.

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 assume risky projects in order to expand their firm. Hence, we 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, the findings of Wiklund et al. (2003). They examined the relationship between expected growth and entrepreneur's attitude toward growth. They established that the importance that the entrepreneur places on non-economic concerns is crucial as a key determinant of overall attitude toward growth.

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 example, the results of Tominc and Rebernik (2007) suggest a positive relationship between the degree in which people think entrepreneurship is desirable and their growth aspirations.

### **Institutional obstacles**

The empirical literature related to firm growth also mentions a group of factors related to the country's institutional framework, which may have an impact on the growth of firms. We focus on two potential institutional obstacles, viz. the employment protection legislation in a country and the administrative burden that government imposes on firms.

We expect that the more a country's legal system protects employment the fewer high-growth firms there will be in that country.

First, a high employment protection is 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.

Second, high growth firms need an easy access to the labour market. The more flexible the labour market is, the better it is for fast growing firms. According to Falkenhall and Junkka (2009), "*fast growing firms and economic players necessary for generating and commercial-*

*ising new knowledge appear to be particularly dependent on the incentives created by institutional settings. [...]Labour market legislation and the social insurance system should not be allowed to create unnecessary barriers to this mobility".* Those authors claim that in order to promote fast growing firms, countries should ensure low barriers to entry and contestable markets. Employment protection legislation diminishes the capacity of firms to accede to the labour market (Henrekson, 2007). The main conclusion is that high growth firms can flourish best if they can hire employees without extra risks because of employment protection legislation.

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.

The reason is simple, the more obstacles government imposes on firms, the less attractive and the more difficult running a business becomes. Hence, an expected result is 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.

### **Opportunities for growth**

Wiklund and Shepherd (2003) observe that there are still other factors affecting growth performance than the ones discussed so far. Their results signal that the limitation of opportunities to grow moderate the impact of growth aspirations on actual growth. Below, we discuss five indicators of growth opportunities in a country.

First, we expect countries with a large domestic market to have a higher percentage of high-growth firms.

The reason for this is that exporting to other countries presents extra difficulties that not all firms are able to face. Hence, if there is a large domestic market, on average more firms will be able to size growth opportunities and the chance of high growth increases. This is also in accordance to Davidsson (1991, p.412) who notes that larger domestic markets may increase the firm growth opportunities.

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, we expect a higher percentage of high-growth firms in the so-called transit economies, such as Poland, the Czech Republic, and Hungary in our data set. The main reason is that those countries usually have to start a process of convergence towards those of the more developed neighbouring countries. In this process, they may benefit from catch-up effects. In this context we may highlight Stenholm et al.'s (2010) contribution, who find indeed higher growth expectations in transit economies in comparison with those economies that are not.



Fourth, we expect 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.

We have two reasons. First of all, it may be that the perception of people 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, e.g., Davidsson (1991) and Tominc and Rebernik (2007).

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 prophecies.

### 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 variables). Third, the World Bank statistical database (2 variables). Fourth, the World Bank Doing Business database, the IMF World Economic Outlook Database, the CEPOECD Institutions Data Set, and Eurostat (all 1 variable).

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.<sup>1</sup>

#### **Dependent 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 firm at the beginning of the three year period of growth. The OECD considers firms only as high growth firms if their size at the beginning of the period is 10 or more employees. Due to data availability we have a somewhat stricter focus: we look at firms in the size range of 50-1000 employees at the beginning of the period of growth.

Our dependent variable - labelled *high growth* - then is the percentage of firms with a starting 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 from the Amadeus database.

<sup>1</sup> 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.

We divide our independent variables into three groups according to their data availability<sup>2</sup>:

- independent variables with information for the whole period of investigation 1999-2005
- independent variables with information for the period 2002-2005
- time invariant independent variables.

Table 1 gives some descriptive statistics on the variables in our study.<sup>3</sup> More detailed country specific details are available in Table A.1 in the Annex.

	<b>Mean</b>	<b>Min.</b>	<b>Max.</b>
<b>high growth</b>	20	2	46
<b>tertiary education</b>	58	26	92
<b>employment protection</b>	2.0	0.2	3.0
<b>population size</b>	24.5	21.8	28.1
<b>GDP growth</b>	2.8	-0.3	10.7
<b>transit economy</b>	0.18	0	1
<b>business opportunities</b>	31	5	66
<b>growth expectation</b>	0.6	0.0	1.6
<b>income motive</b>	29	16	46
<b>independence motive</b>	58	41	73
<b>desirable career choice</b>	57	25	80
<b>start-up procedures</b>	7	3	11

*Source: own elaboration*

#### **Independent variables with information for the whole period**

For five independent variables we have information for the whole period of investigation.

- *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 many students older than 23. In 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.<sup>4</sup> This variable serves as the measure of the country's education level in this paper.
- *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).
- *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.

<sup>2</sup> 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.

<sup>3</sup> Actually, we investigated the influence of more independent variables including the percentage of R&D expenditure over GDP, the enrolment in secondary education, corporate taxes, 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.

<sup>4</sup> For Germany we used the Eurostat database because information on this country was not available in the World Bank database.

- *Transit economy* is a dummy variable that indicates whether or not the country is a so-called transit economy. In our data set the Czech Republic, Hungary and Poland are identified as transit economies.

### **Independent variables with information for the period 2002-2005**

For two 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.<sup>5</sup>

- *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*.

### **Time invariant independent variables**

For four 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.

- *Income motive* measures the percentage of early-stage entrepreneurs<sup>6</sup> 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.<sup>7</sup>
- *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.
- *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.

<sup>5</sup> 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.

<sup>6</sup> 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).

<sup>7</sup> Because for the Czech Republic no information for 2005 was available for the motive variables we took the value of 2006.

**Table 2.**  
**Correlation matrix.**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<b>1. high growth</b>	1											
<b>2. tertiary education</b>	0.20	1										
<b>3. employment protection</b>	<b>-0.46</b>	<b>-0.25</b>	1									
<b>4. population size</b>	0.04	-0.06	<b>-0.26</b>	1								
<b>5. GDP growth</b>	<b>0.55</b>	-0.03	-0.12	<b>-0.33</b>	1							
<b>6. transit economy</b>	<b>0.41</b>	<b>-0.40</b>	0.01	-0.13	<b>0.26</b>	1						
<b>7. business opportunities</b>	0.18	<b>0.49</b>	-0.12	<b>-0.45</b>	0.20	<b>-0.29</b>	1					
<b>8. growth expectation</b>	<b>0.34</b>	0.04	<b>-0.60</b>	0.16	0.16	-0.09	<b>0.40</b>	1				
<b>9. income motive</b>	<b>0.57</b>	0.08	<b>-0.38</b>	<b>0.30</b>	0.18	0.24	-0.08	<b>0.35</b>	1			
<b>10. independence motive</b>	<b>-0.46</b>	-0.00	<b>0.33</b>	-0.20	-0.09	-0.11	-0.04	<b>-0.43</b>	<b>-0.65</b>	1		
<b>11. desirable career choice</b>	0.19	<b>-0.32</b>	0.15	-0.11	0.20	0.09	0.23	0.24	0.08	<b>-0.47</b>	1	
<b>12. start-up procedures</b>	-0.21	<b>-0.61</b>	<b>0.33</b>	<b>0.48</b>	-0.21	<b>0.30</b>	<b>-0.59</b>	<b>-0.30</b>	0.06	0.06	0.13	1

*In bold: correlations significant at 1%.*

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 *business opportunities*. Also, *growth expectation* shows a significant negative correlation with *employment protection*. 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.

## 4 Model

Our econometric estimations follow the regression model in Baltagi (2001) and Mátyás and Sevestre (1996):

$$y_{it} = \alpha + \beta_1 X_{1it} + u_{it} \quad (i = 1, \dots, N; t = 1, \dots, T) \quad (4)$$

The dependent variable ( $y_{it}$ ) is a vector of dimension  $N \times T$  that contains observation of individual ( $i$ ) in one calendar year ( $t$ ) and  $X_{it}$  is the vector of independent variables. We assume that the explanatory variables are independent of the disturbances, and observations have been extracted from the same population,  $u_{it} \sim \text{i.i.d.}(0, \sigma^2)$ .

Given that our data has a double dimension (time x country), we could introduce a fixed effects panel data. However, as it has been previously commented, some of our variables are time-invariant. Furthermore, we are not only interested in explaining differences over time, but also in explaining differences between countries. Hence, we apply an Ordinary Least Square estimation.

Since we aim to capture this time-invariant effects directly related with the institutional context, here we will analyse country factors affecting the presence of high-growth firms i.e. to what extent do entrepreneur's characteristics, entrepreneurial environment, growth opportunities and institutional environment on the existence of high-growth firms in a particular country. Therefore, our model uses the following expression:

$$HG_{i(t+1,t-1)} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2i} + \mu_{it}$$

where  $HG_{sit}$  is the percentage of fast growing entrepreneurial firms in the country " $i$ " in between year " $t-1$ " and year " $t+1$ ". Although the dependent variable has a double dimension, all the explanatory variables are not.  $X_{1it}$  are time variant variables while  $X_{2i}$  are time invariant variables. The sample comprises 112 observations for each variable.

With respect to the dependent variable, we should stand out that it corresponds to the percentage of fast growing entrepreneurial firms by a period of three years. Hence, we have a problem of overlapping years. For instance, the percentage of fast growing firms between 2002 and 2004 and 2003 and 2005 present two overlapping years (2003 and 2004). We have studied this in the data. In practice, this overlap appears not to be a big problem given that fast growth appears largely to be a temporary phenomenon (the group of fast growing firms is highly volatile). Finally, we must say that for the year 1999 the percentage of fast growing firms for the period 1998-2000, for the year 2000 it corresponds to the pe-

riod 1999-2001, and so on. Hence, those independent variables with time dimension show a one-year lag.

The empirical part of this study has a number of limitations. First, the sample size is small. Hence, the significance levels are indicative and not to be taken very strict because of the relatively small sample and the high correlations between country variables. Second, although there may exist other determinants on the existence of high-growth firms, we could not introduce more variables in the analysis because the relatively few number of observations in the data base.

## 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 two-fold:

- 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.

The influence of all variables appears to be significant with the expected sign, while 65% of the variance of the dependent variable is explained.

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.

Employment protection appears to have the expected negative influence on high growth. We find also evidence that institutional obstacles may play a negative role with respect to the percentage of high growth firms. 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 0.2 and 3.0 in our data set) leads to approximately 3.1 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 0.9 percent point more high growth firms.<sup>8</sup>

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

<sup>8</sup> This holds true because population size is measured by the logarithm with base 2.

growth firms should not be interpreted as causal. Therefore, GDP growth merely plays the role of control variable. We find that a higher GDP growth of 1 percent point is associated with approximately 2.1 percent point more high growth firms.

**Table 3.**  
**Explaining the percentage of high-growth firms in a country**

	(1)	(2)	(3)	(4)	(5)
<b>Entrepreneurship</b>					
tertiary education	0.22*** (0.04)	0.20*** (0.05)	0.23*** (0.04)	0.18*** (0.04)	0.24*** (0.04)
income motive		0.22*** (0.06)			
independence motive			-0.28** (0.06)		
desirable career choice		0.14*** (0.03)			
<b>Institutional obstacles</b>					
employment protection	-3.10*** (0.75)	-1.92** (0.78)	-2.17*** (0.71)	-2.78*** (0.74)	-1.94** (0.92)
start-up procedures		-0.57** (0.28)			
<b>Opportunities for growth</b>					
population size	0.93*** (0.30)	1.10*** (0.36)	0.72** (0.28)	1.36*** (0.34)	0.93*** (0.30)
GDP growth	2.14*** (0.29)	1.68*** (0.26)	2.03*** (0.27)	2.04*** (0.29)	2.04*** (0.29)
transit economy	10.55*** (1.53)	10.46*** (1.47)	9.88*** (1.39)	11.71*** (1.55)	11.25*** (1.54)
business opportunities				0.12*** (0.05)	
growth expectation					3.31** (1.53)
Constant	-16.68*** (9.39)	-31.04*** (9.24)	2.95 (9.40)	-28.99*** (10.25)	-22.09** (9.57)
R-squared	0.65	0.75	0.71	0.67	0.66
number of observations	112	112	112	112	112

*Standard errors in parentheses*

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

There appear to be much more opportunities for high growth in *transit economies*. On average, in transit economies there appear to be approximately 10.5 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.
- 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.

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. Furthermore, the explanatory power of the model is increased from 65% to 75%. On top of this we find the following extra results.

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 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 0.14 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 (13% above average) and Japan the smallest (13% 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, 3.6 percent point of the US percentage of high growth firms is explained by the above 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 12.5 percent point of the 13%, 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**

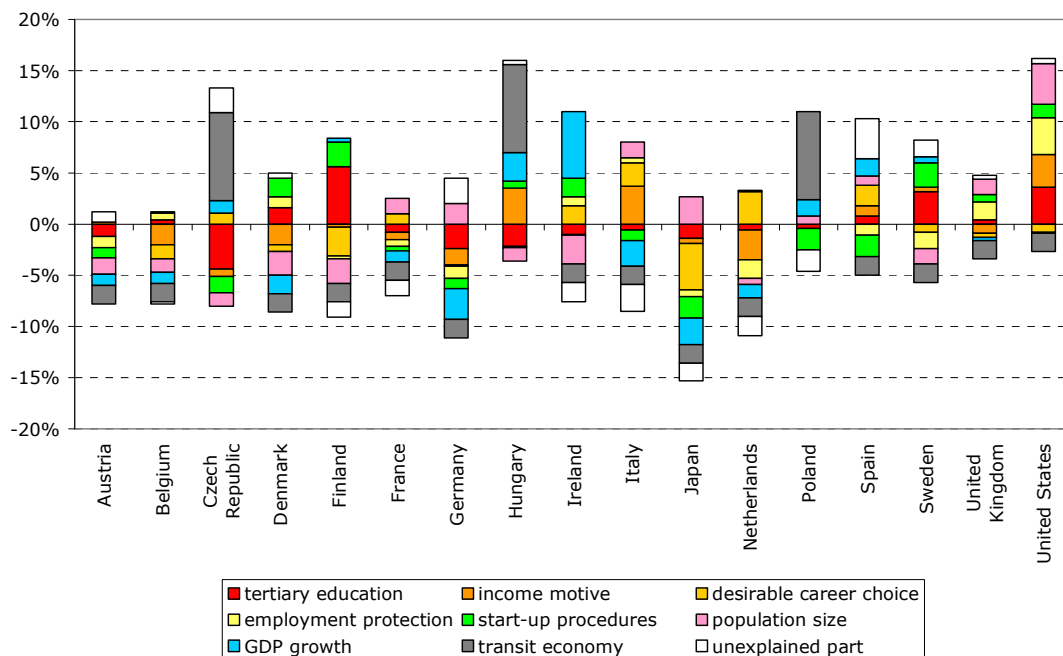
	part of the deviation that is explained by differences in:									unexplained part
	Entrepreneurship			Institutional obstacles			Opportunities for growth			
	deviation from average	tertiary education	income motive	desirable career choice	employment protection	start-up procedures	population size	GDP growth	transit economy	
<b>Austria</b>	-7%	-1.2%	0.2%		-1.1%	-1.0%	-1.6%	-1.1%	-1.8%	1.0%
<b>Belgium</b>	-7%	0.4%	-2.0%	-1.4%	0.7%	0.1%	-1.3%	-1.1%	-1.8%	-0.2%
<b>Czech Republic</b>	5%	-4.4%	-0.7%	1.1%		-1.6%	-1.3%	1.2%	8.6%	2.4%
<b>Denmark</b>	-4%	1.6%	-2.0%	-0.7%	1.1%	1.8%	-2.3%	-1.8%	-1.8%	0.5%
<b>Finland</b>	-1%	5.6%	-0.3%	-2.8%	-0.3%	2.4%	-2.4%	0.4%	-1.8%	-1.5%
<b>France</b>	-5%	-0.8%	-0.7%	1.0%	-0.7%	-0.4%	1.5%	-1.1%	-1.8%	-1.5%
<b>Germany</b>	-7%	-2.4%	-1.6%	-0.1%	-1.2%	-1.0%	2.0%	-3.0%	-1.8%	2.5%
<b>Hungary</b>	12%	-2.2%	3.5%	-0.1%		0.7%	-1.3%	2.8%	8.6%	0.4%
<b>Ireland</b>	3%	-1.0%	-0.1%	1.8%	0.9%	1.8%	-2.8%	6.5%	-1.8%	-1.9%
<b>Italy</b>	-1%	-0.6%	3.7%	2.3%	0.5%	-1.0%	1.5%	-2.5%	-1.8%	-2.6%
<b>Japan</b>	-13%	-1.4%	-0.5%	-4.5%	-0.7%	-2.1%	2.7%	-2.6%	-1.8%	-1.7%
<b>Netherlands</b>	-8%	-0.6%	-2.9%	3.2%	-1.8%	0.1%	-0.6%	-1.3%	-1.8%	-1.9%
<b>Poland</b>	6%	-0.4%				-2.1%	0.8%	1.6%	8.6%	-2.1%
<b>Spain</b>	5%	0.8%	1.0%	2.0%	-1.1%	-2.1%	0.9%	1.7%	-1.8%	3.9%
<b>Sweden</b>	2%	3.2%	0.4%	-0.8%	-1.6%	2.4%	-1.5%	0.6%	-1.8%	1.6%
<b>United Kingdom</b>	1%	0.4%	-0.9%	-0.4%	1.8%	0.7%	1.5%	-0.3%	-1.8%	0.4%
<b>United States</b>	13%	3.6%	3.2%	-0.8%	3.6%	1.3%	4.0%	-0.1%	-1.8%	0.5%

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

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 Spain, Italy, and the Czech Republic it performs relatively poor.
- 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) relative many early-stage 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.

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



Source: own elaboration.

## 6 Summary and policy implications

This paper gives some insights about the driving forces of the number of fast growing 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 sound theoretical basis and the plausibility of our findings.

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	transit economy	Business opportunities	growth expectation
<b>Austria</b>	14	52	30	63		2.6	9	23.0	2.2	0	29	0.6
<b>Belgium</b>	14	60	20	53	47	1.7	7	23.3	2.2	0	23	0.2
<b>Czech Republic</b>	26	36	26	59	65		10	23.3	3.6	1		
<b>Denmark</b>	17	66	20	64	52	1.5	4	22.4	1.8	0	51	0.9
<b>Finland</b>	20	86	28	71	37	2.2	3	22.3	3.1	0	48	0.4
<b>France</b>	16	54	26	61	64	2.4	8	25.8	2.2	0	13	0.3
<b>Germany</b>	14	46	22	58	56	2.7	9	26.3	1.1	0	18	0.7
<b>Hungary</b>	33	47	45	51	56		6	23.3	4.5	1	11	0.5
<b>Ireland</b>	24	53	29	57	70	1.6	4	21.9	6.7	0	41	1.0
<b>Italy</b>	20	55	46	41	73	1.8	9	25.8	1.4	0	34	1.0
<b>Japan</b>	8	51	27	73	25	2.4	11	26.9	1.3	0	8	0.2
<b>Netherlands</b>	13	55	16	61	80	3.0	7	23.9	2.1	0	43	0.5
<b>Poland</b>	27	56					11	25.2	3.8	1	20	0.5
<b>Spain</b>	26	62	34	57	71	2.6	11	25.3	3.9	0	40	0.3
<b>Sweden</b>	23	74	31	51	51	2.9	3	23.1	3.2	0	43	0.5
<b>United Kingdom</b>	22	60	25	65	54	1.1	6	25.8	2.7	0	31	0.8
<b>United States</b>	34	76	44	44	51	0.2	5	28.1	2.8	0	35	1.5
<b>Average</b>	20	58	29	58	57	2.0	7	24.5	2.8	0.18	31	0.6

*Source: Own elaboration.*

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