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Financing and Obstacles of High Growth Enterprises: the European case

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Abstract

This paper investigates the links between alternative growth phases of firms and barriers to financing and investment using firm-level information for a representative sample of EU companies. We propose a novel classification of corporates: high growth (HGEs), stable and declining enterprises. We find that during the phase of high growth, firms are on average more financially constrained. To match their needs for external finance, HGEs are more likely to apply for equity financing. Furthermore, we identify firms with high growth potential. Using survey data, we investigate the barriers to investment activities faced by actual and potential HGEs. Our findings suggest that the most stringent obstacles for actual HGEs are the availability of skilled staff and business regulations, while potential HGEs are blocked by uncertainty about the future.

Keywords: High growth enterprises, financing conditions, bank financing, equity financing, obstacles to investment.
JEL Classification: D22, G01, G20, G32

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1. Introduction and related literature

High growth enterprises (HGEs) are of interest to researchers and policymakers because of their important role in contributing to economic growth and job creation (Birch, 1987). However, there is no consensus in the literature about the exact definition of HGEs, leading to different and in most of the cases contradictory results on their characteristics. As an example, most studies argue that HGEs are mainly innovative scale-up SMEs, but others dismiss the perception that these companies are generally smaller, younger and technology-based companies.

This study relies on a novel survey-based dataset, the EIB Group Survey on Investment and Investment Finance (EIBIS 2016-2017) of a representative sample of non-financial firms in the EU 28 countries. The survey collects information on different external and internal financial sources, reasons for not getting external financing and types of investment barriers. We match the surveyed firms with financial variables from balance sheets and profit and loss statements derived from the BvD ORBIS database for the period 2003-2016. Our study relies on around 152.000 firm-years.[1]

We check alternative definitions of HGEs from the existing literature and we orient our focus to the one that captures best the scale-up SMEs. In fact, a first analysis of our dataset shows that a significant share of HGEs could be identified as young and innovative scale-up SMEs.[2] This signal from the data is important as scale-up companies have been often the target of EU-wide policy initiatives.[3] These firms are considered to be job-creating champions, although they are rare. For example, out of all start-ups, only 3% go to scale-up phase.[4] These companies report very often that access to finance is one of the main obstacles when conducting their businesses.[5] It has also been shown that their rapid expansion involves major risks and liquidity shortages that may end in insolvency (Delmar et al., 2013).

Having this in mind, we develop a novel classification by identifying not only HGEs but also firms with stable and declining growth in order to better understand how the different firms' growth phases evolve over time and over the business cycle, paying particular attention to the 2008-2009

[1] The EIBIS is an EU-wide survey that gathers qualitative and quantitative information on investment activities by both small businesses (5-250 employees) and larger corporates (>250 employees). Our initial unbalanced sample comprises 19,963 enterprises. Using a stratified sampling methodology, the sample is designed to be representative at the EU and country level; and, for most countries, the sector group level (manufacturing, services, construction and infrastructure) as well as firm sizes class level (micro, small, medium and large). As a result of the matching of the survey data with the financial statements, we obtain a sample of 279,137 firm-years. Then based on availability of the firm-level data of our key variables (turnover, number of employees) to define HGEs, the final sample includes around 152.000 firm-years (see Table A1-A3).

[2] Although the use of terminology may vary, we distinguish scale-up companies are those who have an average annualized return of at least 20% in the past 3 years with at least 10 employees in the beginning of the period (Eurostat-OECD Manual on Business Demography Statistics, 2007).

[3] Over recent years, the European Commission has proposed a number of policies to benefit start-ups and scale-ups in Europe, such as the Entrepreneurship 2020 Action Plan, the Start-up and Scale-up initiative, the Capital Markets Union, the Single Market Strategy, and the Digital Single Market. In particular, the Start-up and Scale-up initiative launched in 2016 proposes to remove barriers for startups to scale-up in the Single Market, to create better opportunities for partnership, commercial opportunities and skills, to facilitate the access to finance.

[4] Source: European Commission: Europe's next leaders: the Start-up and Scale-up Initiative, https://ec.europa.eu/growth/content/europes-next-leaders-start-and-scale-initiative-1_en.

[5] European Commission: Public consultation under the Start-up Initiative http://ec.europa.eu/growth/content/public-consultation-under-start-initiative-0_en

financial crisis period. We also contribute to the literature by shedding light on the particularities of alternative definitions of HGEs and explaining in this way the contradictory conclusions of previous literature in terms of size and industry concentration.

Our main findings are threefold. First, we find evidence that HGEs are mainly mid-sized companies with a relatively strong innovative profile. These firms created an important share of new jobs (43%) and turnover (30%) out of total jobs and turnover in our sample. During the financial crisis the contribution of HGEs to employment and turnover proved to be resilient, while stable companies show a stronger cyclical pattern, with their number of employees and turnover dropping over this period.

We then explore the asymmetric role of financing constraints for HGEs. We investigate whether the high growth phase is accompanied by financial rationing due to the associated higher risk profile, especially in terms of bank financing. It is well known that banks tend to be more focused on the risk profile of the company than on their returns: once a certain threshold of leverage is reached, the profitability of future projects has less importance in providing new financing. Contrary to this, stock market investors tend to be less risk averse and prefer high growth and high return companies. As final beneficiaries of firms' growth and profitability, equity investors can enjoy the benefits of a successful project through higher share prices.

We contribute to the literature that focuses on identifying firms' financial features with respect to ability to grow. In this perspective, Beck et al. (2005) identified firms' perceptions on access to finance obstacles directly from using survey data. Furthermore, Coluzzi et al. (2012) show that financial obstacles can be relevant in explaining firm growth. While plenty of studies have considered the financing as a barrier to growth faced by firms in general, few have considered financing constraints of HGEs specifically. Several studies analysed high growth firms' dynamics in a within country perspective (Lee (2014), Bos and Stam (2013), Lopez-Garcia and Puente (2012), Mason and Brown (2013) and Guillamon et al. (2017)) while cross-country analyses are still relatively scarce (Fernandez et al. (2017) for the euro area).

Our second group of results indicates that during the phase of high growth companies are on average financially constrained. However, HGEs invest more and are able to generate a higher than average cash flow than the other firms. Among the spectrum of external financing instruments, HGEs rely more than average on debt financing, as reflected by higher than average leverage ratio. Nevertheless, bank financing seems to be not sufficient for their business activities. Equity financing, either in the form of private equity or listed shares, plays an important role in matching their high demand for financing but also in balancing their debt to equity ratio, and, in this way, in improving their absorption capacity for additional debt financing. For stable enterprises, grants and bond issuance appear to be more important than other sources of financing, while declining firms the reliance on external financing is significantly lower than for stable and HGEs. Knowing what type of finance HGEs use and what type of obstacles they encounter is important to shape targeted policies for enabling firms to achieve their full potential.

Previous literature has also pointed out the importance of accessing a range of alternative financing instruments. Industries that are more dependent on external finance grow relatively faster in countries with more developed financial markets (Bravo-Biosca et al. (2016), Rajan and Zingales (1998), Aghion et al. (2007) and Klapper et al. (2006)). Nevertheless, in many EU countries, there are limited alternatives to traditional debt for most enterprises (OECD, 2015).

Our third group of results focuses on another relevant question from a policy point of view which is about the obstacles that hold back firms to become HGEs, especially those that would

have the potential to grow. For this purpose, we use a propensity score model to identify firms that are as profitable and productive as HGEs but are actually growing less. In line with the empirical approach of Lee (2014) to distinguish between actual HGEs and potential HGEs, we identify the barriers that both groups of firms face in their investment decisions. Consequently, we can identify some policy approaches that could be implemented to boost potential HGEs and to sustain HGEs. We find that uncertainty about the future appears to be the main impediment for potential HGEs firms to become actual HGEs.

The rest of the paper is organized as follows: section 2 describes our novel classification of HGEs and the construction of the financing constraints indicator. Section 3 presents the empirical specification as well as the results related to the financing conditions of HGEs, stable and declining companies. Focusing on the investment decisions of firms, section 4 analyses the obstacles that both actual and potential HGEs face. Finally, section 5 concludes.

2. How should we define HGEs and what are their characteristics

There are several definitions of HGEs that have been used in previous studies. According to the standard OECD-Eurostat definition (Petersen and Ahmad (2007)), a HGE is an enterprise with an average annualized turnover growth greater than 10% (or alternatively 20%) per year over the past three years and having at least 10 employees at the beginning of the growth period. In our novel classification we slightly modify this definition by considering a firm as HGE if it is growing fast even in the first and second year of the fast growing period. So we need a minimum of three consecutive years of fast growth (regardless if it is in previous or following years).

An alternative definition often used in the literature is based on the Birch-Schreyer indicator (Schreyer (2000) and Birch (1987)). It combines both relative and absolute growth, allowing to a time-variant definition and defines as HGEs those firms that exceed (generally) the top 10% of the indicator. This index does not require the constraint in the number of employees at the beginning of the reference year.

The choice of the definition is important as firms could end up in different focus groups. This might partly explain the apparent contradictory results evidenced in the literature regarding the characteristics of the HGEs. Studies focusing on measures of relative growth tend to introduce a bias towards small firms, while measures based on absolute growth tend to oversample larger firms. Moreover, the relative measures are time invariant and the overall number of selected firms is highly sensitive to changes in the business cycle as more companies are growing fast in booming than in recession periods. Alternatively, relying on the time-variant methods, the share of top growing companies is kept the same even during recessions. In this way, we select enterprises that might be below the 10% growth threshold as they are still top growing for a given time and a given country.

Having these caveats in mind, we apply these two alternative definitions of HGEs: the Birch-Schreyer indicator in terms of number of employees and the OECD-Eurostat definition based on the relative growth of turnover.

The Birch-Schreyer indicator combines both absolute and relative growth as follows:

$$BSt = \left(L_{i,t} - L_{i,t-k}\right) \times \frac{L_{i,t}}{L_{i,t-k}}$$

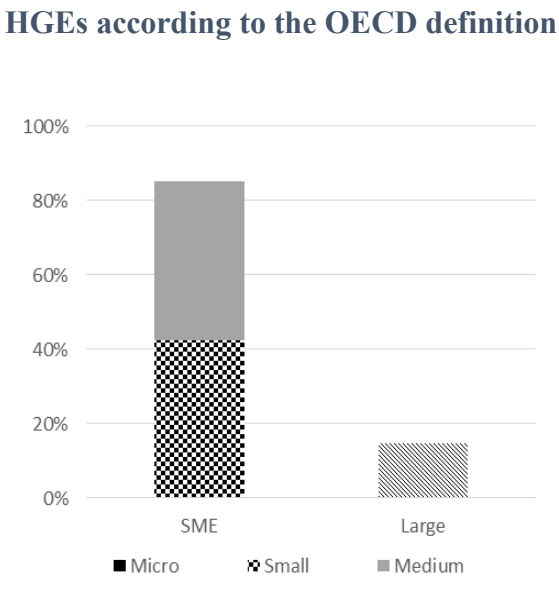
where $L_{i,t}$ and $L_{i,t-k}$ is the average number of employees reported by firm i at time t and t-k respectively, where k=2. In line with most national studies of HGEs using Birch measures, we focus on the top 5% of firms. Moreover, in order to be able to capture the continuity in the growth dynamics, as the selection is based on 3 consecutive years of growth, whenever a firm fulfils the criteria and it is considered as a HGE, then we consider it as HGE for the previous two calendar years as well. In this way, the overall share of HGEs from our sample is 10%.

To decide which methodology to choose we compare the size distribution of HGEs that we obtain applying the two alternative definitions.

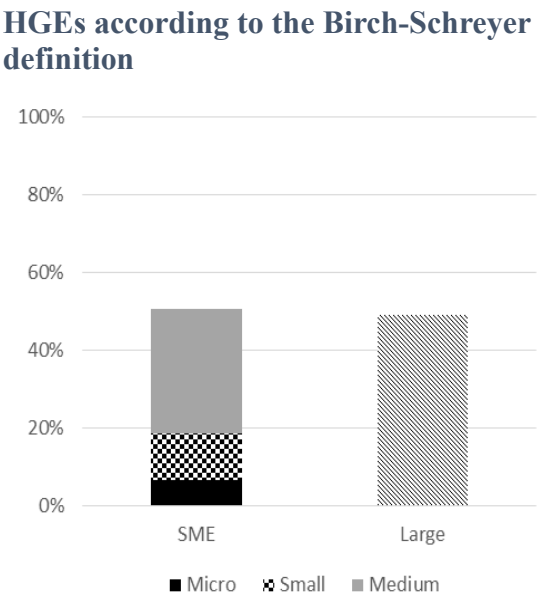
According to the Birch-Schreyer indicator, in our sample 49% of the selected HGEs are actually large firms. This result is in line with Berr (2008) and Henrekson and Johansson (2010). By using the OECD-Eurostat definition of the HGEs, there is a higher concentration of small and medium sized companies (85% of all HGEs) and just 15% of large companies (micro companies are excluded in our sample) (see Figure 1).

As the Birch-Schreyer indicator selects the large growing companies, 10% of companies captures 89% of job creation and 69% of the increase in value added. For studies that would focus on enterprises with the highest impact on the economy as a whole, this definition would fit the best.

Figure 1: Size composition of HGEs under alternative definitions.



Source: BvD ORBIS and authors' calculation.



Source: BvD ORBIS and authors' calculation.

As our focus is on the behaviour of smaller companies, which represent the largest group of enterprises in the European economy, we prefer to follow the definition of HGEs proposed by the OECD-Eurostat approach but we add some additional elements.

Our classification includes then three alternative growth phases:

1. *High growth enterprises*: enterprises with an annual growth of turnover more than 10% over a minimum three-year period and having at least 10 employees at the beginning of the growth period;

2. *Stable enterprises*: enterprises that report either annual turnover growth for three or more consecutive years below 10% or increases in turnover above 10% for a period of less than three consecutive years. In this category, enterprises might record also declines in turnover growth in the same time span but not more than two consecutive years;

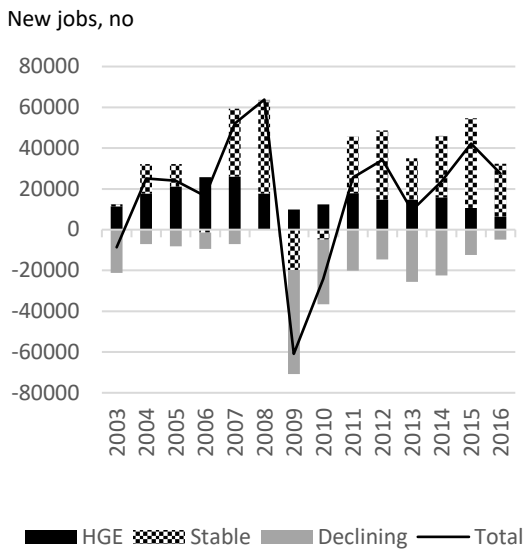
3. *Declining enterprises*: enterprises that report a decline in turnover for at least three consecutive years.

The resulting share of HGEs is 8%, declining enterprises account for 21% of the sample and the remaining 71% are stable enterprises. According to our classification, a company can change its status through time among these three types of growth phases as we will show below. The size composition of these three alternative growth phases is presented in Table A2.

The contribution of HGEs to job creation and turnover growth is high and relatively more resilient compared to the stable firms during the economic downturns (see Figure 2). Of the total new job creation between 2003 and 2016, 44% is taking place among HGEs. They generate also one third (29%) of the turnover growth of all firms in the sample.

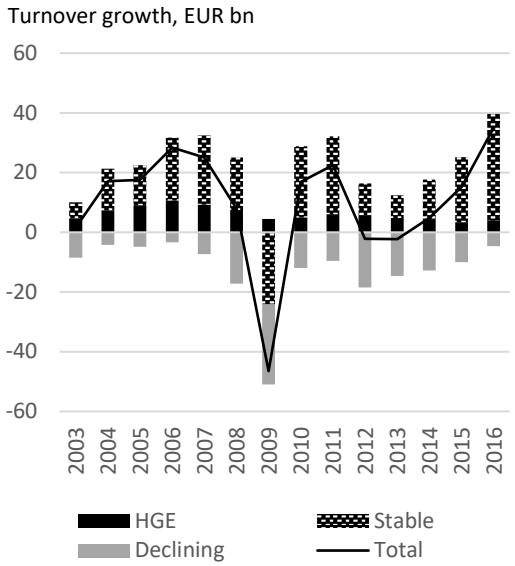
Figure 2. New jobs and turnover growth generated by HGEs, Stable and Declining firms.

Contribution to job creation



Source: BvD ORBIS and authors calculation.
Note: Total job creation varies annually between +4% (2007 and 2008) and -3% (2009) of the total number of 1.6 million jobs of all firms in the sample.

Contribution to turnover growth



Source: BvD ORBIS and authors calculation.
Note: Turnover value expressed in constant prices (2010=100). Turnover growth varies annually from +8% (in 2006) to -11% (in 2009) from the average of EUR 413 bn annual turnover of all firms in the sample.

Looking at the dynamics over time, HGEs continued to generate new jobs during the crisis period compared to other firm classes. In fact, 6% of companies kept the HGEs status during the 2009 economic downturn compared to the 10% in booming period and they maintained their positive contribution to the job creation. Stable enterprises display a more pro-cyclical pattern over

time in terms of turnover and job creation, turning from a positive (hiring) to a negative contribution (firing) during the first full-year impact of the financial crisis in 2009.

Declining enterprises, by definition, registered a drop in turnover, which was accompanied by a reduction of the workforce. In 2009, stable rather than declining companies reported the strongest negative impact on turnover. Moreover, in the after-crisis period, the negative contribution of declining enterprises was persistently stronger compared to pre-crisis period, while 2015 is the first year of improvement.

When looking at the sample distribution of HGEs, there is a higher share of HGEs among high-tech knowledge intensive services, SMEs and younger companies (2 to 10 years) (see Table A3). SMEs might grow faster due to their relative size, as for a small company it is easier to double its turnover relative to a large company.

If we zoom into the industries classified according to their technological intensity, not surprisingly the highest share of HGEs is concentrated in industries of high-tech knowledge intensive services and high technology manufacturing just as the knowledge-intensive market services (12% and 9%, respectively compared to other industries that have 6% of HGEs). Regarding firm age, the highest share of HGEs is among companies between 2 and 10 years old (13%) while much lower shares of companies are managing to grow fast if they are less than 2 years (2%) or above 20 years old (4%).

As a next step in our empirical investigation, we test the resilience of HGEs through time by looking at the probability of changing their growth-phase after three years (see Table A4). The break-through from stable to high growth enterprise is hard. According to the probability of changing status of companies in our sample, only 4% are able to do so, while the change from declining to HGEs is even smaller (3%). Around 27% of firms that are HGEs keep the status for more than three years.[6] The probability for HGEs to stop growing fast and become stable companies is around 56% while 16% start to strongly reduce their growth and become declining companies. The calculated probability of changing status of HGEs shows that despite the higher risk associated with high growth, HGEs are resilient, more likely to keep the strong growth and/or to get to a stable growth phase than to fail.

Survey based financing constraints index

Relying on the EIB survey replies on the availability of external finance, we derive an index of financial constraints at firm level, based on four different types of constraints: when firms are dissatisfied with the amount of finance obtained (received less), or they sought external finance but did not receive it (rejected) and they did not seek external finance because they thought borrowing costs would be too high (too expensive) or they thought they would be turned down (discouraged). These four indicators are then aggregated in order to obtain a binary variable that takes the value 1 when a firm is financially constrained in one dimension and 0 otherwise.

Following the methodology of Ferrando et al. (2015) and Ferrando and Wolski (2018), the probability of being constrained for firms in the survey is regressed on a set of indicators of their financial situation (profitability, growth opportunities, financial leverage and cash holding) as well as on sector and country dummies. In the procedure we use the 2016 and 2017 EIBIS vintages. We

[6] HGEs are keeping their status for a minimum of three years by definition. Consequently, probabilities of changing status are checked with 2 years lag.

choose a set of financial ratios, which are, according to the literature, relevant to describe the financial position of firms.

The first is financial leverage (*Fin.Lev*) which is defined as the sum of short-term loans and long-term debt over total assets and it shows the level of indebtedness but also whether the company is equity or debt-financed. The expected relation between leverage and financing constraint is positive as a high level of debt on the balance sheet might make it difficult or costly for the firm to find new debt. The second is Cash holdings (*Cash*), which is computed as cash and cash equivalents over total assets and represents the liquidity position of firms. Higher amounts of cash increase the probability to obtain credit, hence the expected relation between cash holdings and financing constraint is negative.

Then we consider the ratio of cash flows to total assets (*Cash Flow*) which shows the profitability of a business. Positive cash flow indicates that a company is able to fulfil its payment obligation towards its debtors and shareholders and it is also is able to reinvest in its business, and to construct a buffer against future financial challenges. The expected relation between cash flow and financing constraint is negative. We use the logarithm of total assets as a proxy for the size of the firm. Based on the evidence in the literature and our descriptive statistics, the expected sign of the relation is negative. The set of control variables includes: sectoral dummies and country dummies.

Equation 1 includes all determinants and the dependent variable is the survey-derived financing constraints dummy:

$$Fin.Constr. = \hat{\alpha} + \beta_1 * Fin.Lev. + \beta_2 * Cash + \beta_3 * Cash\ Flow + \beta_4 * Size\ Asset + \beta_5(Sector) + \beta_6(Country) + \varepsilon \quad \text{(Eq. 1)}$$

We then obtain the estimated probability of being financially constrained for all firm-years in the 2003-2016 period based on the estimated coefficients obtained on the survey sample. Table A5 shows the characteristics of the financing constraint index relying on the sample with the period between 2003 and 2016. We can see that smaller and younger firms tend to be more financially constrained compared to the large firms.

Interestingly, the financial constraints score reflects clearly the effect of the financial crisis (see Figure A1). Indeed, our indicator follows the expected dynamics: it is overall stable until 2009 (accounting on average for 8.8%) when the economic environment was stable and access to finance was relatively easy. The financing constraints index increased during the economic downturn reaching its highest level in 2013 and 2014 and then turning down due to improving economic conditions.

3. Financing conditions of HGEs and type of financing for alternative growth phases

We examine empirically the link between financing constraints and the probability of being HGEs. Given their nature, HGEs may be more inclined to report access to finance as one of the main obstacles when doing business. Their rapid expansion involves major risks and liquidity shortages that may end up in insolvency (Delmar et al., 2013). Such risks are closely monitored by banks and may be the reason of rejection in providing additional loans. We test the hypothesis that HGEs face

more difficulties in their access to finance by checking the significance of financing constraints for enterprises under each growth phase: high growth, stable and declining. We explore this relationship without inferring any causality. If the financing constraint indicator is positively and more strongly linked to the high growth status than to stable and declining phase, we deduct the presence of an unrealised growth, despite the already achieved high growth rate. Consequently, from a policy perspective, the highest positive impact on economic growth can be achieved by alleviating the financing impediments of HGEs and unblocking their growth potential.

We assume that, depending on their nature as well as demand conditions, firms are not affected symmetrically by financing constraints. To test this proposition, we use a non-linear probability model. Formally, our dependent variable y_{it} can be written as:

$$y_{it} = \begin{cases} 1 \; if \; HGEs \; or \; Stable \; or \; Declining \\ 0 \; otherwise \end{cases}$$

We estimate three alternative probit models with y^*_{it} being a dummy variable for HGEs, stable and declining, alternatively. The explanatory variables are the indicator of financing constraints (FC) and an interaction term with the crisis dummy. As control variables γ we use size, country and sector fixed effects and ε_{it} is the error term.

We denote alternatively the unobserved propensity of firms to be HGEs, stable and declining by $y^*$and estimate the following probit model:

$$y^*_{it} = \alpha + \beta_0 \mathrm{FC}_{i,t-1} + \beta_1 \mathrm{Crisis} * \mathrm{FC}_{i,t-1} + \gamma ControlVariables_{i,t-1} + \varepsilon_{it} \qquad \text{(Eq. 2)}$$

Table 1 shows the results of the estimated model for each dependent variable: HGEs, stable and declining respectively. Marginal effects at mean are presented. The correlation between our measure of growth phases and the financing constraint index (*FC*) is statistically significant at 1% level. Moreover, we can observe a strong positive coefficient for HGEs, while there is a negative correlation between the financing constraints and the probability of being in a "declining" phase.

Looking at the interaction between our index and the crisis dummy (*FC X Crisis dummy*), it can be seen that the effect of the financing constraints during the financial crisis is stronger for declining companies.

Results might be interpreted as HGEs are financially constrained more often than enterprises in stable or declining growth-phases. However, during the financial crisis, HGEs were less affected. This might be explained by the pro-cyclicality of their investments. On the one hand, the demand for external finance of HGEs during economic downturn is low. Investment projects are cancelled under worsening market conditions and internal financial sources are sufficient for their working capital. On the other hand, HGEs increase investments whenever market conditions are improving and demand is high. For this reason, they also need external financing but, by applying more for loans, they are more likely to be rejected or to be offered limited bank products in terms of quantity or prices (i.e. lower volumes, higher interest rates).

The declining enterprises have been the most affected by the financing constraints during the financial crises. Nevertheless, they are less likely to be financially constrained overall, as they are not demanding any additional financing under better economic conditions. They use their cash-flow to deleverage.

Table 1: Probit model on financing constraints of HGEs, Stable and Declining enterprises. Marginal Effects at mean

	(1)	(2)	(3)
VARIABLES	**HGEs**	**Stable**	**Declining**
FC	0.58***	0.14**	-0.89***
	(0.03)	(0.07)	(0.06)
FC X Crisis Dummy (09-10)	-0.21***	-0.47***	0.64***
	(0.02)	(0.04)	(0.03)
Observations	100,352	100,352	100,352
Pseudo R2	0.0476	0.0096	0.0117

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10.
As control variables we use the size, country and sector fixed effects.

From a financer point of view, HGEs might be considered as enterprises with high risk profile due to the rescaling of their businesses. Beside liquidity shortages on their day-to-day activity due to rapid growth of turnover, both management and employees of high growth companies might face additional challenges in terms of quality of decisions, managing the capacity expansion and keeping the quality of the final products/services.

The increased difficulty of HGEs in getting additional loans might be explained, beside the high risk associated to their fast growth, also by their financial situation (see Table A6). They have a relatively high leverage (or low equity base) due to the accumulated debt and/or their credit lines close to their upper limit. Despite their profitable current and future investment projects (high investment rates) and good performance in terms of servicing their existing loans (low debt burden), they are not able to contract additional loans. Moreover, fast growing innovative companies (the ones that have more intangibles than tangible assets) and service firms that are functioning in general with a low level of tangible assets might face rejection due to the lack of assets used as collateral.

Our findings are in line with existing literature. Difficulties in accessing finance have been widely recognised as one of the major obstacles for growing businesses (OECD (2006), OECD (2015)). Lack of finance prevents SMEs from investing in innovative projects and seizing opportunities in expanding into new markets. Studies also show that in credit markets, adverse selection and moral hazard are exacerbated in the case of young, innovative businesses without loan history or collateral to secure a loan and these fast-growing companies also typically suffer from higher loan rejection rates than averagely performing firms (OECD, 2015).

As a robustness check of our results, we address some econometric issues which might arise with generated regressor (the financing constraints index, FC).[7] In line with previous studies with similar estimation issues (see Ferrando and Wolski, 2018), we apply the resampling techniques of Efron & Tibshirani (1993).

We construct the distribution of the estimated coefficients in Eq. 1 by naive bootstrap. We sample with replacement from the original sample stratified by year, and estimate the bootstrap equivalent of financial constraints model. We next fit the bootstrap parameters to the Eq. 2. Statistical significance of the second equation's coefficients is then assessed against the

[7] The standard errors of the regressors in the second step estimation are bias and significance cannot be precisely derived (see Pagan, 1984).

corresponding bootstrap distributions with bias correction. Results are presented in Table A7 and confirm the findings presented in Table1. Although the standard errors are higher, the statistical significance of the coefficients remains consistent with the original estimation and consequently, the main conclusions are fully preserved.

Type of financing of alternative growth-phases

We test whether different types of financing instruments are more specific to a given firms' growth phases. Traditionally, bank financing may be not appropriate for new, innovative and fast-growing companies, which have a higher risk-return profile. The "financing gap" affecting these businesses is in fact very much connected with a "growth capital gap", i.e lack of equity. Financing constraints can be especially severe in the case of small businesses whose business model relies on intangibles which are difficult to use as collateral in traditional debt contract.

In the EIB survey, firms were asked how they finance their investment activities. In both waves of the survey (2016 and 2017) 8345 firms answered to have used external finance out of 18131 valid responses. This means that around 58% of the firms in our sample use only internal or intra-group funding. Regarding the types of external finance used, the survey comprises 8 categories: 1) bank loans excluding subsidised bank loans, 2) other terms of bank finance including overdrafts and other credit lines; 3) newly issued bonds; 4) newly issued equity; 5) leasing; 6) factoring; 7) loans from family/ friends/ business/ partners, 8) grants. Table A7 summarises the use of the different types of financing. Firms reported to have used more bank products (around 63%) and leasing (23%).

In order to investigate the types of external finance used by enterprises in alternative growth phases, we run three alternative probit models with a binary variable taking the value 1 if the firm is HGEs, stable and declining and 0 otherwise. Our explanatory variable consists of a multiple answer which is a share over a total[8]. Finally, size, sector and country fixed effects are added as additional controls. More formally, our dependent variable can be written as follows:

$$y_{it} = \begin{cases} 1 \; if \; HGE \;\; or \; Stable \; or \; Declining \\ 0 \; otherwise \end{cases}$$

The unobserved propensity of firms to be HGEs, Stable or Declining is denoted by y^*_{it} and the probit model can be written as follows:

$$y^*_{it} = \alpha + \beta_1 Bank_{i,t} + \beta_2 OtherBank_{i,t} + \beta_3 Bonds_{i,t} + \beta_4 Equity_{i,t} + \beta_5 Leasing_{i,t} + \beta_6 Factoring_{i,t} + \beta_7 Loans\ Fam/Friends_{i,t} + \beta_8 Grants_{i,t} + \gamma ControlVariables_{i,t-1} + \varepsilon_{it} \quad \text{(Eq. 3)}$$

Estimation results are reported in Table 2, where average marginal effects are presented. Overall, our findings suggest that HGEs are more sensitive to equity based finance while stable companies rely more on short-term bank financing and grants. By contrast, declining companies depend significantly less on bank financing, grants and alternative loans from family and friends as their turnover is contracting and they face lower investment and trade financing needs.

[8] We do not consider the category "Other sources" and we treat all the "don't know" and "refused" in each category as missing values.

HGEs are also relying on leasing, factoring and loans from family and friend. These alternative financing sources are not conditioned by collateral needs, a limitation faced in case of traditional bank loan. Stable companies prove to be the best candidates for bank financing and grants, as they are most likely to fulfil the conditions.

The sensitivity of HGEs on equity financing might be explained by the specific characteristics of these types of firms. HGEs might "afford" the relatively more expensive equity financing as they are strongly profitable. Moreover, increasing the financing in form of capital might be the only option left, after reaching their credit limits.

When granting credit, banks apply a strict scoring on the risk profile of the companies and the good profitability and promising future cash flows of HGEs may not be sufficient for qualifying them for financing. Nevertheless, the equity investors of HGEs are the final beneficiaries of the growth, as good projects are appraised by increasing their stock prices, if it is listed, or increasing the exit value, in case of private investment. Therefore, investors have all the incentives to invest further, every time there are good opportunities that generate future cash flow. The high growth profile of the firms attracts new equity investors, whenever the financial system is developed and diversified enough to offer such alternative financing sources.

Table 2: Probit model on alternative financing sources for HGEs, Stable and Declining enterprises, marginal effects at means.

	(1)	(2)	(3)
VARIABLES	**HGEs**	**Stable**	**Declining**
Bank loans	0.07*	0.11	-0.11**
	(0.04)	(0.07)	(0.05)
Other terms of bank finance (overdrafts, credit lines)	0.06	0.16**	-0.13***
	(0.04)	(0.07)	(0.05)
Newly issued bonds	0.05	0.26**	-0.14*
	(0.06)	(0.12)	(0.08)
Newly issued equity	0.12**	0.11	-0.13
	(0.05)	(0.12)	(0.08)
Leasing	0.08*	0.13*	-0.11**
	(0.04)	(0.07)	(0.05)
Factoring	0.08*	0.009	-0.08
	(0.04)	(0.08)	(0.06)
Loans from family/friends/business partner	0.08*	0.11	-0.12**
	(0.04)	(0.08)	(0.06)
Grants	0.06	0.15**	-0.10**
	(0.04)	(0.07)	(0.05)
Observations	5,948	6,439	6,383
Pseudo R2	0.0397	0.0284	0.0375

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10. As control variables we use the size, country and sector fixed effects.

Any additional equity financing of HGEs would lift the financing barrier, resulting on a positive impact on additional investments. Besides receiving the financing in form of equity, the improved balance sheet (lower leverage) qualifies the enterprise for additional bank loan.

4. HGEs and potential HGEs: which are their obstacles?

In this section, we investigate first, what holds back HGEs to achieve their best potential, focusing on their investment activities and second, we explain why some profitable and productive firms are just stagnating instead of turning to the high growth phase. In the previous sections, we presented evidence that HGEs face difficulties in getting additional external financing for new investments, resulting in a lower ability to achieve their potential growth.

Looking just at simple survey's statistics, the lack of staff with the right skills and uncertainty over the future is reported as the main barriers to investment for businesses (above 70% of firms) across the EU (Figure A2).[9] Labour market regulation and business regulation remain a barrier to investment for some 70% of EU firms. While on the long term perspective, financing is considered by around 50% of sample as a barrier to investment. However, to analyse the financing condition of the firms, we rather rely on the survey derived financing constraints that is more precise in determining external financing conditions (presented in section 2), while the availability of finance as an obstacle to investment, presented in this section, is more broadly defined and it might include also internal financing.[10]

In our empirical analysis, we focus on four non-finance related barriers of HGEs and potential HGEs: 1) lack of skilled workforce; 2) business regulations; 3) difficulties to find demand for products and services and 4) uncertainty.

As a *first hypothesis*, relying on the results of previous studies, we test whether the lack of skilled workforce might be a bottleneck for HGEs (Kolar, 2014, Lee, 2014). Hiring new staff for specific skills and upskilling of existing staff, including management, is key for SMEs to undertake growth oriented strategies. Using our survey data we can test whether HGEs and potential HGEs perceive availability of skilled staff as a strong obstacle to their investments.

Moreover, as a *second hypothesis* we can test whether HGEs and potential HGEs perceive business regulations (e.g. licences, permits and bankruptcy) and taxation as barriers to their investments. The literature suggest that taxation and regulation may limit the number of HGEs or reduce incentives to growth and the possibilities to use profit to finance new investments (see Henrekson et al., 2010, Michaelas et al., 1999). Regulation might also affect the introduction of new products, which is highly relevant for fast growing innovative firms.

Third, we test the hypothesis whether HGEs and potential HGEs face particular obstacles in finding demand for their products or services to continue or to start growing fast. According to previous empirical findings, HGEs are actually more likely to face better market condition, as the high growth in turnover is the result of the matching demand for their products, while potential HGEs might face difficulties in selling their products/services (Lee (2014)).

Fourth, we test the hypothesis whether HGEs and potential HGEs face uncertainty as a particular obstacle for investment. Risk awareness and the unpredictable and fast changing

[9] See also "EIBIS 2017 – EU overview": http://www.eib.org/attachments/efs/eibis_2018_european_union_en.pdf

[10] The share of HGEs reporting availability of financing as a barrier for investment is above the whole sample average (53% versus 50%) but it turns out to be less significant in the regression analysis.

environment (which might have an economic, political or regulatory nature) might hold back firms to take important production decisions and invest in capacity expansion and new products.

In order to better understand the role of the different factors that might impede firms to continue its fast growth or become HGEs, we identify first a subsample of potential HGEs beside the already identified HGEs. We rely on a propensity score matching technique to select firms that are similar in terms of productivity and profitability. We look at those that have a significant probability of achieving fast growth but report actually low growth or even a contraction of the turnover (see Lee, 2014 for a similar approach on a sample of UK companies). We define profitability as earnings before taxes to total assets (ROA), while productivity is the estimated total factor productivity that measures how effective firms are in converting inputs into outputs (taking into account both their labour inputs and capital stock).[11]

Empirically, we find that profitability and productivity are significant predictors of high growth. Higher profitability might reflect two important conditions of HGEs. First, the existence of a strong matched demand for their produced and sold output. Moreover, profitability is achieved through high sales and good turnover. Second, firms achieve high cost-efficiency production through accumulated expertise and good organizational or logistic performances, succeeding a higher profit margin.

The higher productivity is related to the level of development or complexity of the production and, in this perspective, innovation plays a significant role in achieving higher levels of productivity through the available factors of production (labour and capital). Consequently, we assume that firms with high profitability and productivity are the best candidates to experience rapid growth. We also found a strong correlation between the probability of being a HGE and a specific type of industry, such as the high technology knowledge intensive services that are characterized usually by strong innovative profile. Moreover, as described in Section 2, small and medium sized companies have a higher probability to grow fast than large firms (micro firms are excluded from the sample by construction).

As both profitability and productivity depends strongly on the type of industry, country development and stages of business cycle, we construct a dummy variable that takes the value 1 if the firm reports a higher profitability and productivity than the average of a given industry, country and year.

Technically, we consider as the treatment group the one of actual HGEs and the resulted control group is the one of potential HGEs that are similar to HGEs in terms of the chosen characteristics but are not achieving high growth. Moreover, as the high growth status can change through time, we would assure that in our sample of potential HGEs there are only those firms that have never been classified as HGEs. In this way, we exclude from the potential HGEs: firms in those years right after the HGEs status (highly probable to show all characteristics of a HGEs) and firms in those years before the HGEs status, as they certainly had a good potential to grow and ultimately they managed to achieve it.

[11] To derive a measure of firms' total factor productivity, we estimate the following equation:
$\log(VAit) = \beta_{c0} + \beta_{j0} + \beta_{jk} \log(FA_{it}) + \beta_{jL} \log(L_{it}) + \omega_{it} + u_{it}$ for each industry (manufacturing, service, construction and infrastructure) with country fixed effects, where VA stands for 'value added', FA stands for 'total fixed assets'; L for 'labour' measured as number of employees.

Table 3: Propensity score equation: Probit model of HGEs relying on firm characteristics

VARIABLES	(1) HGEs
Profitability	0.275***
	(0.014)
Productivity	0.061***
	(0.014)
medium	0.516***
	(0.018)
small	0.635***
	(0.018)
High-tech service	0.278***
	(0.039)
Constant	-1.977***
	(0.017)
Observations	74,347
Pseudo R2	0.0475

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Results of the propensity score probit estimation are included in Table 3. Stratification matching is used to separate potential from non-potential HGEs. The matching technique gives several bands of similarity to high growth firms. In order to pick the closest group to HGEs in the potential category, we decided to include the first nine bands of probability that corresponds to the 40th percentile of the treated sample. The final number of potential HGEs is 24,868, which represents 15% of our whole sample while actual HGEs are 8% (see Table 4 and Table A9 for sample description of different type of firms).

Table 4: Sample description: HGEs, Potential HGEs and firms with less potential to become a HGEs

	Number of firms -years	Number of firms (yearly average)	% Share from total
Actual HGEs	13,062	933	8%
Potential HGEs	24,868	1776	15%
Not HGEs , low potential	132,008	9429	78%
Total	169,938	12,138	100%

Table 5 shows the share of firms with above average productivity, profitability and investment rate in each given industry and year. The figures confirm the effectiveness of our selection measure and, at the same time, gives us a powerful insight into the profile of the potential HGEs: there is a high concentration of firms above average profitability and productivity but there is a lower share of firms investing above average.

Table 5: Share of firms with productivity/profitability and net investment above average level defined on country-industry-year level.

	Productivity	Profitability	Net Investment
Actual HGEs	55%	56%	43%
Potential HGEs	61%	53%	29%
Not HGEs , low potential	41%	40%	29%
Total sample	50%	43%	30%

We use a probit model based on survey answers on investment barriers faced by enterprises, to single out what obstacles are more stringent among actual HGEs and potential HGEs.

The unobserved propensity of firms to be HGEs or potential HGEs is denoted by y^* and the probit model can be written as follows:

$$y^*_{it} = \alpha + \beta_1 Obstacle1_{i,t} + \cdots + \beta_9 Obstacle9_{i,t} + \gamma ControlVariables_{i,t-1} + \varepsilon_{it} \text{ (Eq. 4)}$$

Table 6 shows the estimated average marginal effects. Our *first hypothesis* namely that HGEs perceive lack of availability of skilled staff as a strong obstacle to their investment, is confirmed. In fact, this factor appears to be one of the most stringent obstacles, with significant and positive correlation with the HGEs status. Moreover, there are no particular correlation among being a potential HGEs and facing shortage of staff with the right skills.

Regarding the *second hypothesis*, we found that business market regulation as an obstacle to growth is positively related to the HGEs status, while again, no particular relationship can be established with the potential HGEs. Especially small and middle-sized HGEs might be more dependent than large companies on their business ecosystem and, due to their internal constraints, are more vulnerable to inefficiencies of regulatory and policy approaches, such as bankruptcy law and tax changes. Our result is in line with previous literature. Calvino et al. (2015) showed that the effect of policies on the growth of young firms is especially pronounced in high-risk sectors, such as telecommunications, scientific research and development and IT services. Other studies found that improving the efficiency of corporate bankruptcy procedures can foster labour productivity and value-added growth, notably in sectors that are most dependent on external finance (Serres et al. (2006), Succurro (2012)).

The third hypothesis is rejected, as potential HGEs do not face particularly higher barriers than other firms in terms of demand for products. While in the case of HGEs, as expected (Lee, 2014), they are less likely to face barriers in terms of market conditions. Just as confirmed by their successful growth of turnover, they managed to overcome demand-related barriers. Moreover, there is no evidence that potential HGEs might face difficulties in selling their products/services.

Finally, by checking the *fourth hypothesis*, our result shows that uncertainty is the most significant barrier that differentiates potential HGEs from other firms in general and also from actual HGEs. Uncertainty about future is the obstacle that is particularly relevant for potential HGEs while HGEs face significantly lower barriers in terms of uncertainty.

Overall, we could conclude that HGEs face shortages of skilled labour and business regulation as obstacles to their investments, while the better market conditions and lower uncertainties about the future might be key for their success to grow fast. Still, their fast growth

faces some barriers and this is actually related to the expansion of their activity, which would imply recruitment of new staff, so they are more exposed to lack of skilled labour force. This might be also explained by the fact that, as our findings confirmed, HGEs belong particularly to innovative industries that might need employees with specific, highly qualified or new characteristics.

For potential HGEs most of the obstacles are not particularly relevant compared to other firms: the only barrier that is turned out to be significant is uncertainty about the future. These companies, although are profitable and would even have the necessary resources (given their high cash flow) they do not invest because they face particularly high uncertainties. Despite the relatively high returns (as shown in Table 5), uncertainty brings higher risk that probably outpace their expected return.

Table 6: Probit model: Obstacles for investments, marginal effects at means

	(1)	(2)	(3)
VARIABLES	**HGEs versus all other firms**	**Potential HGEs versus all other firms**	**Potential HGEs Versus HGEs**
Demand for products or services	-0.0056**	-0.0013	0.0277
	(0.0027)	(0.0037)	(0.0212)
Availability of staff with the right skills	0.0085***	-0.0010	-0.0357
	(0.0030)	(0.0040)	(0.0228)
Energy cost	-0.0015	-0.0034	0.0061
	(0.0028)	(0.0040)	(0.0212)
Access to digital infrastructure	-0.0007	0.0040	0.0077
	(0.0029)	(0.0041)	(0.0221)
Labour market regulation	0.0005	-0.0082**	-0.0216
	(0.0029)	(0.0041)	(0.0223)
Business regulations (e.g. licences, permits, bankruptcy) and taxation	0.0069**	-0.0005	-0.0508**
	(0.0030)	(0.0041)	(0.0224)
Availability of adequate transport infrastructure	0.0053*	-0.0034	-0.0375*
	(0.0028)	(0.0039)	(0.0210)
Availability of finance	0.0021	-0.0046	-0.0065
	(0.0027)	(0.0038)	(0.0207)
Uncertainty about the future	-0.0103***	0.0092**	0.0925***
	(0.0031)	(0.0044)	(0.0240)
Observations	16,848	16,848	2,622
Pseudo R2	0.0647	0.1986	0.1733

Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
As control variables we use the size, country and sector fixed effects.

5. Conclusions

In this paper, we found evidence that in Europe a small share of firms (8%) that are high growing significantly contributed to new jobs creation (43%) and total production (30%) between 2003 and 2016. We also showed that these firms are mainly small and middle-sized companies belonging to industries of high technological and knowledge intensity.

We contribute to the existing literature by showing the different implications of alternative methodologies to define HGEs using a rich cross-country sample of enterprises. Moreover, we mapped three different growth phases of firms: high, stable and declining. Looking at the financing conditions for the three different growth phases, we found evidence that HGEs are strongly financially constrained. As they reach fast a relatively high leverage ratio, their financing needs are exceeding the available bank loans and they are more likely to apply for equity financing. Banks, despite the good profitability and promising future cash flows, are not suited to go above a conservative threshold of leverage ratio. Moreover, bank financing of innovative, young and service companies are hindered by lower level amounts or lack of tangible assets taken as a guaranty. By contrast, the equity investors have all the incentives to invest in HGEs and consequently, HGEs would benefit the most from the development of equity markets and private equity funds.

From a policy perspective, the focus would be to ensure a proper environment for such dynamic and innovative firms that, although they consist of a small share of companies, they can create large and positive spill-overs for the overall economy. Our findings show that financing constraints, availability of skilled labour force and business regulations are particularly binding for HGEs. Consequently, among essential policies to boost economic growth might be those that support high growing enterprises in obtaining alternative financing and those that help these firms in developing personnel's skills and in attracting qualified personnel amid a business friendly regulatory environment.

Finally, we provide evidence on obstacles that might block some firms to become HGEs. We found that some companies that would have the potential to grow, since they are as profitable and productive as the HGEs, are blocked in their investment activities by the perceived higher uncertainties that probably lift risks above their expected returns.

Annex

Table A1: Sample description by size.

Enterprise' size	percent	No. of employees	Turnover, EUR mn	Total Assets, EUR mn	Age
Micro (5-9 employees)	24	5.8	1.7	2.2	14.4
Small (10-49 employees)	28	23.6	5.8	6.3	18.0
Medium (50-249 employees)	32	110.6	23.8	22.3	23.8
Large (250+ employees)	15	705.1	152.6	162.1	30.2
Total	100	151.7	35.6	35.7	20.9

Note: Total sample: 154,654

Table A2: HGEs, stable and declining firms by size

	Total sample	HGEs	Stable	Declining
Micro	28%	0%	32%	21%
Small	25%	43%	22%	27%
Medium	31%	42%	30%	33%
Large	16%	15%	16%	19%
Total	100%	100%	100%	100%

Note: Total sample: 152,700

Table A3: HGEs by size, age and technological intensity

		Whole sample	% of HGEs
Size			
	Micro	28%	-
	Small	25%	10%
	Medium	31%	10%
	Large	16%	5%
	Total	100%	8%
Age classes	**less than 2 year**	1%	2%
	2-5 years	8%	12%
	5-10 years	17%	13%
	10-20 years	37%	9%
	more than 20 years	38%	4%
	Total	100%	8%
Technological intensity			
	High-technology manufacturing	2%	9%
	Medium-high technology manufacturing	10%	6%
	Medium-low technology manufacturing	14%	6%
	Low technology manufacturing	17%	6%
	High-tech knowledge intensive services	4%	13%
	Knowledge intensive market services	1%	9%
	Other knowledge intensive services	1%	6%
	Less knowledge intensive services	52%	7%
	Total	100%	8%

Source: authors' calculations based on Bureau Van Dijk's Orbis database (2003-2016). Total sample: 152,700, HGEs: 12,759

Note: Share of high growth enterprises (HGEs) in the EU, by technology intensity of the sector (in %). HGEs are defined as companies that had significant growth (above 10%) in turnover over the past three years. Eurostat aggregation of manufacturing industry according to the technological intensity based on NACE code at 2 digit level. Firms in Orbis are weighted with value added.

Table A4: Probability of changing the status *to* HGEs and *from* HGEs

Stable to HGEs	4%
Declining to HGEs	3%
keep HGEs	27%
HGEs to stable	56%
HGEs to declining	16%
Declining to stable	71%
Stable to declining	21%

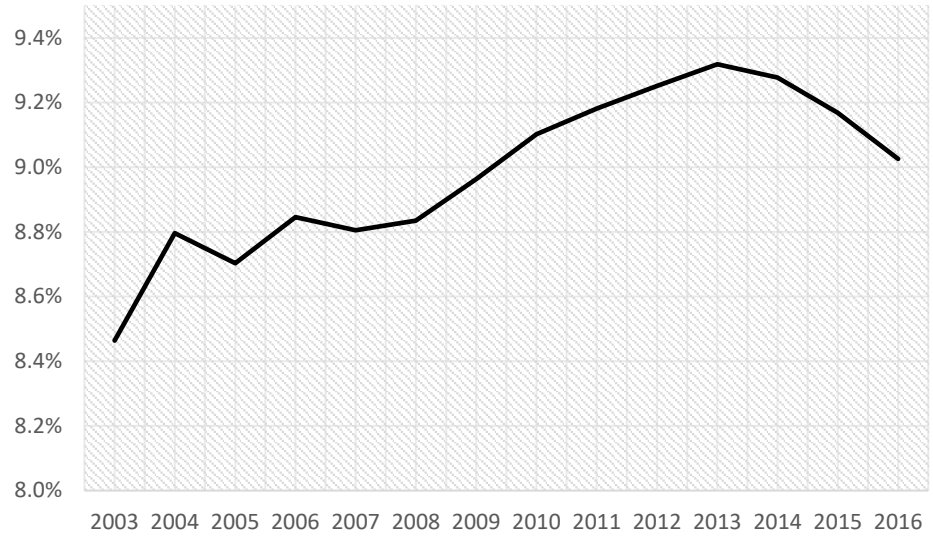
Source: authors' calculations based on Bureau Van Dijk's Orbis database (2003-2016). Total sample: 116,775.

Table A5: Characteristics of Financially Constrained firms, based on the constructed Financing Constraints index

		% of Financially constrained
Size	**Micro**	11%
	Small	10%
	Medium	9%
	Large	7%
Age classes	**less than 2 year**	13%
	2-5 years	11%
	5-10 years	10%
	10-20 years	10%
	more than 20 years	8%

Source: authors' calculations based on Bureau Van Dijk's Orbis database (2003-2016). Total sample: 169,938.

Figure A1: Dynamics over time of the estimated financing constraints index



Source: authors' calculation. EIB calculations based on EIBIS and Bureau Van Dijk's Orbis database (2003-2016). Total sample: 169,938
Note: Pseudo R2 = 0.0458.

Table A6: Financial ratios of HGEs relative to Stable and Declining enterprises.

	Financial leverage	Investment rate	Debt Burden	Shareholders fund	Capital
HGEs	20%	63%	17%	33%	10%
Stable	19%	27%	22%	37%	12%
Declining	19%	10%	29%	40%	14%

Source: authors' calculations based on Bureau Van Dijk's Orbis database (2003-2016). Total sample: 169,938.
Note: Financial leverage defined as the sum of short term loans and long term debt over total assets. Investment grade defined as difference of fixed assets between two subsequent years, over previous fixed assets. Debt burden defined as interest paid over EBIT plus depreciation and amortization. Shareholders' fund and capital are expressed as a percentage of total assets. Shareholders' fund is the sum of capital and retained earnings.

Table A7. Robustness check: Bootstrap estimates of standard errors. Probit model on financing constraints of HGEs, Stable and Declining enterprises. Marginal Effects at mean.

	(1)	(2)	(3)
VARIABLES	**HGEs**	**Stable**	**Declining**
Fin Constr. Dummy	0.57***	0.23*	-0.86***
	(0.199)	(0.118)	(0.288)
Fin Constr. Dummy X Crisis Dummy (09-10)	-0.20***	-0.46***	0.63***
	(0.032)	(0.064)	(0.060)
Observations	100,352	100,352	100,352

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10.
As control variables we use the size, country and sector fixed effects.
Note: there are 100 replications to construct the bootstrap standard errors.

Table A8: Summary Statistics of the External financing sources, as share of total.

Variable	Mean	Std.Dev	Min	Max
Bank loans	50.9	45.3	0	100
Other terms of bank finance (overdrafts, credit lines)	12.6	29.3	0	100
Newly issued bonds	0.6	6.9	0	100
Newly issued equity	0.5	5.7	0	100
Leasing	23.9	38.4	0	100
Factoring	2.6	12.6	0	100
Loans from family/friends/business partner	2.8	14.3	0	100
Grants	5.7	21.3	0	100

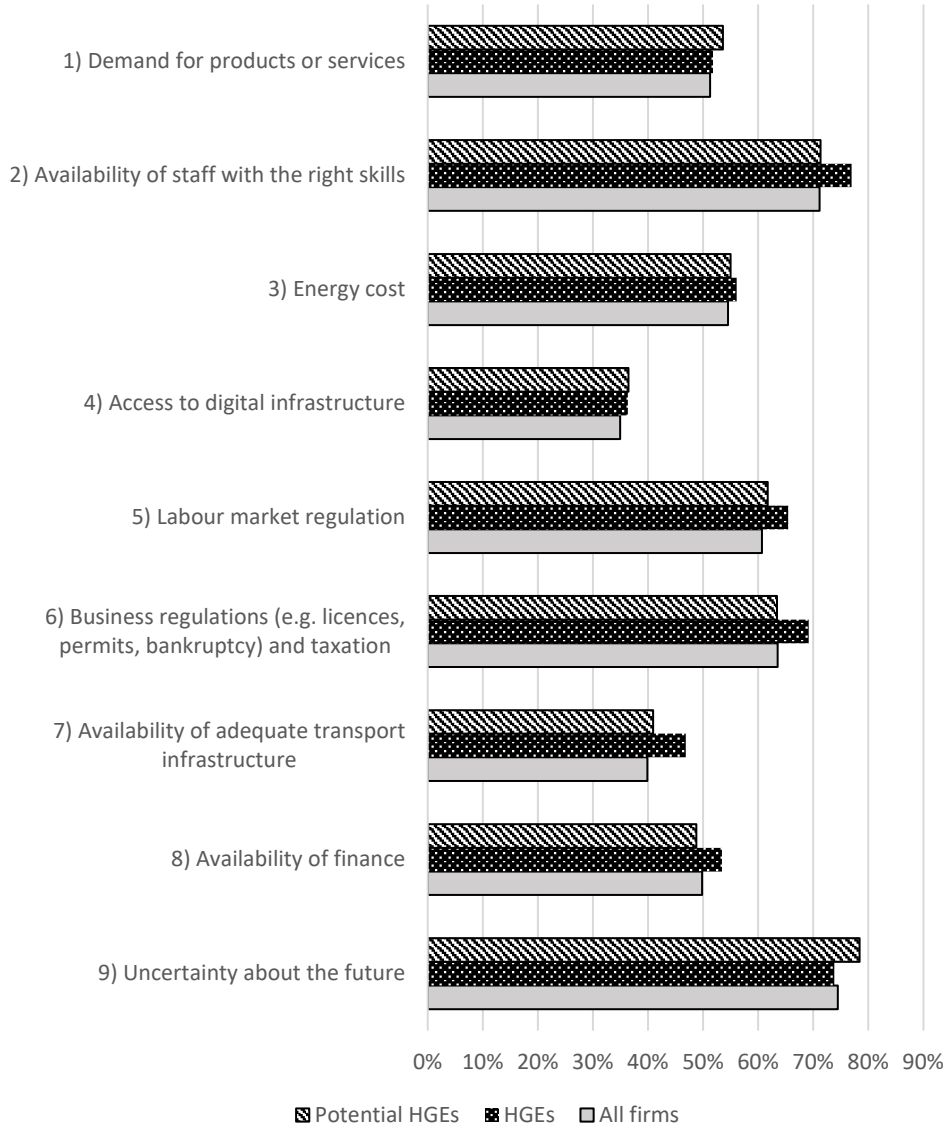
Source: authors' calculation. EIB calculations based on EIBIS (2016-2017). Total sample: 8345

Table A9: Sample distribution of Potential HGEs versus Actual HGEs

		% of Potential HGEs	% of Actual HGEs
Size			
	Micro	0%	-
	Small	52%	10%
	Medium	38%	10%
	Large	0%	5%
	Total	15%	8%
Age classes	**less than 2 year**	0%	2%
	2-5 years	13%	12%
	5-10 years	13%	13%
	10-20 years	16%	9%
	more than 20 years	17%	4%
	Total	15%	8%
Technological intensity			
	High-technology manufacturing	15%	9%
	Medium-high technology manufacturing	14%	6%
	Medium-low technology manufacturing	18%	6%
	Low technology manufacturing	16%	6%
	High-tech knowledge intensive services	22%	13%
	Knowledge intensive market services	8%	9%
	Other knowledge intensive services	10%	6%
	Less knowledge intensive services	16%	7%
	Total	15%	8%

Source: authors' calculation based on EIBIS and Bureau Van Dijk's Orbis database (2003-2016). Total sample: 169,938

Figure A2: Long term barriers to investments



Q. Thinking about your investment activities in [country name], to what extent is each of the following an obstacle? Is a major obstacle, a minor obstacle or not an obstacle at all?
Reported shares combine 'minor' and 'major' obstacles into one category
Source: authors' calculation based on EIBIS database (2016-2017). Total sample: 24,137.

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