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High Growth Enterprises:

demographics, finance & policy measures

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Contents

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[1] The Research and Innovation Observatory, https://rio.jrc.ec.europa.eu/

Executive Summary

The economic importance of high growth enterprises (HGEs) lies in their impact on job creation, industrial renewal and the leverage effect they can have on sectoral productivity or regional competitiveness. However, difficulties (particularly financial ones) for existing or aspiring HGEs in Europe to maintain or achieve high growth can lead to potential economic gains being unrealised or to Europe losing jobs, taxable revenues, know-how and innovation by such enterprises moving to countries where raising finance is easier, and other framework conditions more favourable. These difficulties appear particularly acute in equity-financing for the scale-up phase of such enterprises.

This report analyses the geographical (by EU Member State and subnational level) and sectoral distributions of HGEs. It also examines the contribution of venture capital (VC) markets to financing growth and reviews relevant policy instruments across Member States. In addition, the report proposes a *HGE indicator framework* consisting of 17 standardised indicators divided into three groups: (i) demographics, (ii) financing growth, and (iii) other framework conditions. This indicator framework constitutes a tool which could be used to monitor and assess over time and location the relative performance of Member States and regions with respect to each other and vis-à-vis EU averages. Finally, the report contains *country-specific factsheets* providing insights on the HGE-related situation, including factors that facilitate or obstruct their development, in 21 EU Member States.[2]

HGEs demographics

The number of HGEs per Member State roughly correlates to the size of the national economies. However, the country-specific proportion of HGEs among all active firms[3] varies widely around the EU average. Year-to-year variability in the ranking of this proportion by Member State may be linked to business-environment specificities as well as to unpredictable factors giving rise to high-growth episodes in individual enterprises.

The time evolution of the regional HGE proportion of all active enterprises shows different national trends (e.g., increasing regional concentration in France versus a more regional balance in Spain). Across all regions, there is no systematic correlation between the share of HGEs in regions and the corresponding level of regional innovativeness.

HGEs are present across the entire business economy although with varying sectoral intensity. Not only are HGEs ubiquitous, they also account for a sizeable proportion of all active firms, varying from 7% to 20% in the EU across sectors in 2016 – the overall average was 10.7%. Their share tends to be higher in knowledge-intensive services than in manufacturing-related industries.

The growth in the number of HGEs has outpaced overall growth in the number of enterprises. The average share of HGEs among the EU firm population increased from 9.2% to 10.7% between 2014 and 2016. Since the number of HGEs in the EU grew during the aforementioned period, this indicates that HGE growth outperformed general enterprise growth.

HGEs are responsible for most net employment growth in the EU. Despite data limitations, from 2015 to 2016 HGEs accounted for a large share of net employment growth. HGEs were responsible for 53% of net employment growth (between 2014 and 2015 the figure was 90%!) though they only make up 11% of enterprises in the business economy. Hence, HGEs – by definition – substantially contribute to net employment growth.

VC backed companies are mostly high-tech. The highest shares of VC-backed companies are found in publishing (mostly software), electronics and pharmaceuticals with the UK, Germany, France, Spain and Sweden accounting for over 75% of the total number of VC-backed EU firms. Most VC in the EU goes to start-up stage firms rather than seed or later stage.

The median size of VC-backed firms per Member State ranges from six (Bulgaria, Croatia) to 130 (Germany) employees with a wide country-to-country variation in size distributions. The median age ranges from approximately one year old (Poland, Latvia, Hungary, Malta) to three-and-a-half years (Sweden, Ireland, France, UK, Austria, Belgium, Netherlands).

Financing growth

While debt dominates the financing of firm growth, VC is availed of more often by HGEs than other firms. Even though VC finance is rarely used, it is particularly suited to financing potential HGEs with high-risk and high-innovation profiles. The reasons to focus on VC include the fact that the average growth in turnover and employment for VC-backed companies is respectively five and two times higher than for SMEs and midsized companies. The literature also points to a multiplicative factor of three for spillovers from VC investments to the wider economy.

The geographical distribution of VC investment volumes shows the expected concentration in major urban hubs and hinterlands notably London, Paris, Berlin and other capital city regions. However, data also show that the regional distribution of start-up VC is more evenly spread than that of seed-stage and later-stage. VC investment as a percentage of GDP is highest in EU Member States like UK, Sweden, Ireland, and Finland, where private sector investors dominate, but these percentages as well as the EU average (0.07%) are much smaller than the values for the US and China (0.32% and 0.36%, respectively).

In 2017, the average VC investment per company exceeded EUR 6 million in Austria and Germany. It ranged between EUR 5 – 5.7 million in Sweden, Spain, Netherlands and France and between EUR 1 – 2 million in Portugal, Italy, Greece and Poland. In contrast, the

[2] AT, BE, CY, CZ, DE, EE, EL, ES, FI, FR, HR, HU, IT, LT, LV, NL, PL, PT, RO, SE, SK – the Member State coverage was determined by the European Semester country-specific teams of which the Unit JRC.B.7 forms part. However, the analytical basis could be directly used to cover all EU Member States.

[3] For the purpose of this study the terms 'firm' and 'enterprise' will be used as synonyms.

average size of VC investments is > EUR 15 million in the US and China.

41% of VC investments in the EU in 2017 went to medium-sized companies (50-249 employees), followed by small-sized companies (29%, 10-49 employees), and large companies (22%, >249 employees). Only 8% went to micro-sized companies (less than 10 employees).

Policy measures

Only a few national policy measures specifically target HGEs *per se*. HGE-favourable measures tend to focus more explicitly on young innovative SMEs with growth potential. Eligibility criteria for availing of such measures vary but most relate to firm size, revenue, age (less than 7-10 years old) and some metrics of innovativeness. In this regard, some policy measures have an explicit high-tech focus (e.g., in Germany, Lithuania).

Even though most non VC-related measures do not target specific sectors, most beneficiaries still tend to be active in high-tech sectors like ICT, health and clean-tech. Policy interest in supporting HGEs through grants (e.g., for R&D) remains high though effects of such grants on realising growth aspirations remain to be shown.

National policy mixes supporting access to finance for young innovative companies with growth potential in the EU are quite diversified. As far as debt-based support instruments are concerned, loans and loan guarantees are used by all countries. Governments are also equity (VC) investors in many EU countries, but the type and degree of their involvement varies. In some countries, governments invest directly in companies (alone or in syndication with private investors), while in others they channel funds to companies indirectly as limited partners in privately-managed VC funds (e.g., funds of funds).

Tax incentives are much rarer except in the UK where they have long been used to support VC investments. A few Member States (e.g., Belgium, France) have some form of fiscal incentives in place targeting "young innovative companies".

On average, between 2007 and 2018, public funds accounted for 25% of VC investment in the EU, mixed public-private funds for 16% and private funds for 59%. Over this period, the shares of public and private VC investments increased respectively from 10% to 15% and from 43% to 46%. In volume terms, public VC investments in the EU more than doubled from 2017 to 2018 (from EUR 703 million to EUR 1.7 billion). In some countries (Germany, Poland, Bulgaria, Estonia, Lithuania, Latvia and Greece) direct public VC investment is bigger than that of the private sector.

More than 50% of public VC programmes have sector requirements (mostly ICT, biotech and clean tech) and 65% target specific stages (mainly start-up and growth stages). A few of them (30%) have age and size requirements.

Few countries have properly evaluated their public VC programmes. In spite of that, such programmes are evolving by adding networking and coaching features, employing experienced fund managers, increasing fund size and having flexible geographical boundaries. The recent academic literature also notes a shift in government-backed VC, from direct funding sometimes matched by private funds (e.g., Finnish Industry Investment) to private VC-led hybrid co-funding (e.g., the Enterprise Capital Funds in the UK or the Dutch Venture Initiative in the Netherlands).

Limitations and relevant policy channels

The aim of the report is to take-stock and make-sense of available data sets and findings coming from research efforts in the field and identifying potential linkages between them in order to inform EU policy with relevant, carefully-researched insights.

Providing insights into the phenomenon of HGEs, their demographics, access to finance and policy measures related their emergence and development necessarily implies focusing on certain aspects, while merely touching upon others. The contribution of HGEs in delivering on environmental and social objectives is one example that could be further developed in future research projects. Another could be to examine how sustainable growth-periods of enterprises are over time.

Empirically investigating the emergence and development of HGEs is limited by data accessibility and comparability. A detailed description of the individual limitations of the data sources used throughout the report is provided in Annex 2.

In light of the emerging policy priorities of the European Commission (e.g., European Green Deal, a new Industrial Strategy for Europe, an SME Strategy), researching the drivers and obstacles for HGE entrepreneurship and its implications for economic, environmental and social sustainability objectives can provide useful insights to support these high-level policy initiatives. Additionally, the aforementioned findings, in particular those outlined in the *country-specific factsheets*, serve to inform the European Semester process.

In this context, studying HGEs can facilitate the understanding of how and why firms grow as well as their effects on the broader ecosystem of firms, environmental quality and social cohesion – thereby contributing to achieving the Sustainable Development Goals (SDGs).

1. Introduction

1.1. What are HGEs and why they are important?

Definition and measurement: There is no widely accepted definition or method of measurement of high-growth enterprises (HGEs). One possible HGE definition is - firms with average annualised growth above 20% for three consecutive years, in either number of employees or turnover, and with ten or more employees at the beginning of the growth period (OECD, 2008). This definition has been widely adopted and increasingly understood to be synonymous with the term 'scale-up'. In this report, however, we follow the European Commission definition which is the same as the above except for a lower 10% employment growth criterion (European Commission, 2014).

Nonetheless, it is important to recognise that in the literature there is no a consensual definition of what a HGE is. Rather there are numerous definitions, each corresponding to its own unique population of firms depending on the choice of growth indicators (e.g., employment, market share), measurement of growth (absolute vs relative term), time dimension and the process by which firms grow (i.e., organic growth or growth through acquisition).

In this report, following (Breschi et al., 2018), we also include a focus on companies with *a potential for growth*, proxied by 'venture capital backed companies' given that venture capitalists tend to invest in small companies with the potential to quickly grow large. However, it is worth noting here that although some VC-backed companies may meet the technical definition of HGE, as the injection of finance give them the fuel to achieve rapid growth, in many cases they subsequently 'burn out'.

The main strengths and weaknesses of both measures used - 'high-growth firms' and 'firms with *a potential for growth*' - will be discussed in depth in Box 1 in Section 2.3.

A fraction of the overall enterprise population: It is important to keep in mind that any discussion about HGEs concerns a limited proportion of the total number of firms operating in the business economy. We therefore start by examining how big this proportion is and how it varies across the EU on both a geographical and sectoral basis.

The numbers and distributions of VC backed companies are also discussed. This much smaller population of firms is particularly relevant for risky young innovative companies with untested business models which have either demonstrated high growth or high growth potential. Analysing such VC-backed firms, which are not necessarily picked up in official HGE statistics, may shed light on some aspects of high-growth entrepreneurship.

High economic relevance: The importance of HGEs is directly linked to their role as job creators (Hallak and Harasztosi, 2019; Ferrando et al., 2019)[4], even if the full impact in terms of net effects or job quality and location is not straightforward (Brown et al., 2017). In addition, such companies can have important knock-on and demonstration effects, leveraging the productivity of the sector or region in which they are located (Monteiro, 2019; Decker et al., 2016). Moreover, as hope and motivation play a role in igniting entrepreneurial initiative, the symbolical value of successful HGEs should not be underestimated[5].

A further reason for the economic relevance of HGEs in the economy is the 'spill over' effects they may have on the entrepreneurial ecosystem. For example, as (Mason and Harrison, 2006) argue, entrepreneurs as well as investors have the opportunity to learn from their exit strategy and reinvest their wealth and knowledge.

Financing difficulties: Policy makers concern with high-growth, scale-up companies is motivated by the aim of fostering their emergence and development in the EU. They also aim to curtail relocation abroad of such firms (to the US mainly) due to difficulties to raise finance, because of the losses of jobs, taxable revenues, know-how and innovation this entails. Regardless of whether or not unicorns represent a distracting or unsustainable[6] phenomenon (Aldrich and Ruef, 2018; Kenney and Zysman, 2019), their story sheds light on some weaknesses of European entrepreneurial ecosystems. Among these, one noteworthy aspect is the undersupply of equity risk finance in the EU for high-potential SMEs and midcaps in their growth and expansion phases, during which companies typically need and cannot readily find equity in the range of tens of millions of euros – the so-called scale-up equity gap (Aernoudt, 2017). Indeed, Ferrando et al. (2019) find that HGEs are on average financially constrained by an overreliance on debt financing and suboptimal use of equity financing.

It is also important to note that firms maintain their growth leads over their competitors through a variety of often complementary sources of financing. For example, a large supply of seed capital might not lead to the emergence of HGEs unless there is sufficient start-up and growth stage finance. Similarly, suppliers of growth finance require other investors to seed firms; otherwise they will have an insufficient deal flow. Indeed, firms use different types of finance at different stages in their 'entrepreneurial journey'.

[4] Ferrando et al. (2019) find that of the total new job creation between 2003 and 2016, 44% is due to HGEs as well as one third (29%) of the turnover growth of all firms in the sample.

[5] This is why so-called unicorns – a rather exceptional type of private technology start-up company worth over USD 1 billion not to be equated to HGEs – attract so much attention. The number of unicorns in a given country may be an indication of how favourable are the conditions to the generation of successful scale-ups (Duruflé et al., 2018). However, we concur with Mason's that such arguments and exceptions should not limit or deter entrepreneurial individuals from establishing an 'ordinary' business'.

[6] See editorial & briefing in The Economist, 17 April 2019.

Relocation[7]: In locations where business framework conditions are unfavourable, entrepreneurs aiming to scale up often leave their place of origin and have little reason to return at a later stage. Reliable data on such relocation are difficult to obtain (Bradley et al., 2019). In a study of so-called dual scale-ups,[8] Onetti (2017) estimates that 13% of European scale-ups are "dual", 83% of which relocated their headquarters to the US (more than half to Silicon Valley) and 14% to another European country with London being the most frequent destination. Entrepreneurs sometimes opt to sell their business. According to the European Investment Fund (EIF), 44% of companies backed by EIF VC investee funds during 2003 to 2015 were acquired by non-European (mostly US) buyers (Prencipe, 2017). Anderson (2018) published data on US-based unicorns which illustrate the attractiveness of the US for (would-be) high-growth entrepreneurs from other countries - more than half (50 out of 91) US unicorns had at least one immigrant founder; of these 70 (co)founders, 22 were from the EU (7 UK, 4 DE, 3 FR, 3 IE, 1 BG, 1 DK, 1 IT, 1 NL, 1 SE).

Relocation of HGEs clearly implies potential loss of jobs, value-added, productivity and ultimately wealth. It also means the impoverishment of local or regional entrepreneurial ecosystems, with a negative knock-on effect on social, economic and human capital. A study of just under 10,000 young, high-growth VC-backed companies across 17 European countries between 1990 and 2012 corroborates this concern (Braun et al., 2019). The study provides evidence that US investors have a positive causal effect on foreign exits by European VC-backed firms and that a high share of entrepreneurial talent goes abroad. Altogether, it suggests that VC-backed firms are a funnel through which innovation is absorbed by countries with large domestic VC markets but that government efforts to increase domestic supply of VC can have a positive impact on domestic economies. Therefore, an important implication of this study is that government policy aimed at increasing the size of domestic VC market should increase domestic supply of VC, rather than foreign supply.

A study by Matthews (2014) finds that difficulties to recruit experienced top management team members (TMT people) constrain growth just like difficulties to access finance do, especially in peripheral regions. For example, some 'dual start-ups' have their headquarters in the US, and other dedicated R&D divisions in Europe. As a result, knowledge workers, especially those in top management, tend to move from Europe to the US. This is confirmed in a study by Saxenian (2006), which explored the phenomenon of "the New Argonauts"., i.e. individuals who left their own country for the US and went back to their home country after 20-30 years to set up their business and/or to reinvest their strategic skills and expertise.

Other framework conditions: While a sufficient supply of equity finance is considered to be conducive to the development of HGEs, numerous other factors also shape entrepreneurial ecosystems (Stam and Spigel, 2016; Brown and Mawson, 2019). For instance, it is argued that higher regulatory and tax burdens for enterprises above certain size thresholds can serve as disincentives for entrepreneurs to grow (Long and Mandel, 2019).

On the other hand, the external regulatory framework may have an effects on firms' growth strategies. For example, when approaching a certain firm size threshold, the entrepreneur may create a legally separate business to channel further growth. The outcome might be a cluster of legally separate businesses, but all owned by a single entrepreneur or entrepreneurial team[9]. This effect is often termed 'splintered growth'.

These additional framework conditions are mentioned in the 'HGEs indicator framework' sections below but are not empirically explored in detail in this report. Another noteworthy emerging line of research seeks to relate high growth to factors which vary widely within firms over time rather than to more time-invariant factors - see (Coad and Srhoj, 2019) and references therein.

Exits. Another point to note is that the success of VC-backed companies depends on the exit strategy, which is typically achieved through acquisition or merger in Europe. However, it is often not clear whether the effect of acquisition on economic growth is positive or negative. In this regard, Wennberg and Mason (2017) provide a summary of such effects and in some cases the authors found that this effect is negative. More importantly, according to the authors, such negative effects could be avoided if the exit is done through initial public offerings (IPOs). Given that fewer HGEs in Europe exit through IPOs, this has a clear policy implication for European policymakers.

A focus for policy? Policy initiatives favourable to HGEs have been on the agenda across Europe for more than a decade, though little is known about how well they work (Autio and Rannikko, 2016).

At EU level, the European Commission has proposed a number of measures aimed at start-ups and scale-ups, such as the Entrepreneurship 2020 Action Plan, the Start-up and Scale-up initiative, the Capital Markets Union and the Single Market Strategy. Studying and better understanding the factors conducive and obstructive to the emergence of HGEs can also provide insights on the design and usefulness of policies targeting start-ups, scale-ups and SMEs.

A few EU Member States have policies directed specifically at fostering HGEs, including Finland, which aims at creating a friendly ecosystem of entrepreneurship, innovation and research, of which the Tekes Nyi programme (since 2008) and the VIGO accelerator form part; Denmark, with the Danish Growth

[7] Relocation is only indirectly addressed by this study. However, acknowledging its role is instrumental to a better understanding of the policy relevance of HGEs.

[8] These are scale-ups initially founded in a European country that subsequently moved their headquarters abroad while maintaining a strong operational presence in their place of origin.

[9] Please note that in this case, this would be considered a HGE, but from a statistical perspective, it is not in case it forms part of the same enterprise.

Fund since 1992 and the Gazelle Growth programme from 2007 to 2010; Austria, with its 'Frontrunner' programme to fund enterprises with an R&D-based high-growth strategy; the UK with its scheme on financing growth in innovative firms launched in 2017; and Estonia's Enterprise Development Programme. Most Member States focus on improving the conditions for enterprise growth and competitiveness more generally but not specifically targeted to HGEs – for more details see (Costa et al., 2016b).

Far from being an exhaustive and definitive study on HGEs, the scope of this research is represented by HGEs as a focus of policy. As a consequence, it is fair to disclose from the outset that the final picture will be only part of a bigger – still to be caught – one, as for the time being it does not include further considerations on what happens after the three years of rapid growth, nor it addresses issues related to fast but volatile growth.

1.2. Aims of the report

The promise of sector-wide growth and productivity gains as well as high net job creation is why HGEs are an explicit or implicit target of public policy at different jurisdictional levels in Europe and globally. The variability of conditions and contexts[10] in which businesses operate across the EU implies that HGE-favourable policies – whether generic or specific – must be tailored to Member State specificities and even implemented in ways which are adjusted to sub-national regions (Bosma and Stam, 2012). This makes an analysis of HGEs, which takes account of regional specificities, particularly pertinent to the country focus of the European Semester process.

The aim of the report, therefore, is to take-stock and make-sense of available data sets and findings coming from research efforts in the field, identifying potential linkages between them in order to inform the European Semester with relevant, carefully-researched policy insights.

What follows is a series of cross-country, cross-sector and Member State-specific empirical analyses of data and indicators relevant to HGEs, with a specific though not exclusive, focus on financing growth. This sheds light on the conditions in different Member States affecting the development of HGEs. Whenever possible, data visualisations and empirical analyses in Member State factsheets are broken down to the regional (NUTS-2 or NUTS-3) and industry levels (NACE 2-digit), providing internationally-comparable country-specific insights.

After this introduction, Chapter 2 explains the approach to the analysis and the reasons behind the choices of specific indicators and how they can be used in monitoring the development of HGEs in the EU. Limitations are acknowledged and explained along with some suggestions on how to overcome them in the future. Chapter 2 also presents a single 'HGE indicator framework' approach in which a range of indicators is presented in a standardised country-to-country comparable way and which is used throughout this report including in the 'HGEs country factsheets'. This approach sheds light on the relationships between the performance of HGEs, their access to finance and the framework conditions in entrepreneurial ecosystems which correlate with desirable HGE-dependent outcomes. While the current version of the 'HGEs indicator framework' is based on three principles (i.e., tailored to HGEs, comprehensive and succinct; see Chapter 2) and existing data sources, it is not set in stone and may be further developed as new evidence and data sources on the factors relevant for HGEs become available.

Chapter 3 on firm demographics presents and discusses data on HGEs in terms of the number, share, regional dispersion, average size and industry breakdown as well as their evolution over time and across countries as well as regions, drawing on official statistics as well as data on VC-backed companies.

Chapter 4 on financing growth, leveraging on earlier studies and JRC accrued knowledge (Gampfer et al., 2016; Hallak and Harasztosi, 2019; Lilischkis et al., 2015; Szkuta and Stamenov, 2017; Testa and Szkuta, 2018; Van Roy and Nepelski, 2017; Vértesy et al., 2017), includes a brief synoptic discussion of the range of financing means employed by innovative firms with high growth potential, including equity instruments, grants, loans, loan guarantees and tax incentives. A more detailed discussion of VC-trends is also included.

Chapter 5 discusses existing policy measures within and across Member States and their measured impacts, in cases where such information is available in the form of policy evaluation studies.

Chapter 6 concludes and outlines next steps.

Following the EU-wide discussion, the report continues with a number of Annexes one of which contains country-specific factsheets in which more detailed breakdown and commentary on the data discussed in the earlier sections is presented for 21 different EU Member States, in order to provide relevant material and insights informing the European Semester Country Reports.

[10] So-called entrepreneurial ecosystems (Stam and Spigel, 2016; Brown and Mawson, 2019).

2. Analytical approach and methodology

2.1. Analytical framework

Research on HGEs is characterised by differences in definition and methodology. Two main approaches emerge from relevant literature in this field. The first, favoured by economists (e.g., Criscuolo et al., 2014), is based on business register data following Eurostat and OECD definitions. This sheds light on how firm-specific characteristics (sector, age, size, origins and ownership) affect job creation. The second, based on financial indicators – among which VC is frequently a focus, provides important insights into the problems of companies scaling-up (see Box 1 in Section 2.3).

The framework of analysis depends on the ability to identify HGEs - a matter which is at the core of an on-going debate (Davidsson et al., 2010; Vivarelli, 2013). While HGEs on the whole tend to be innovative, innovative firms do not necessarily experience high growth (Coad et al., 2014). This may be due to long lead-times from R&D to innovation and from innovation to growth (Coad and Rao, 2008), or a conflict between growth and innovation whereby innovation investments generate diminishing returns (Pakes and Ericson, 1998). Some studies explore the growth relevance of a company's high-tech status (Delmar et al., 2003; Hölzl, 2009; Stam and Wennberg, 2009). However, HGEs are found in virtually all sectors (Henrekson and Johansson, 2010; Lopez-Garcia and Puente, 2012; Mason and Brown, 2013) especially in some services sectors (Schreyer, 2000). This is particularly the case for sectors with a high level of human capital and strong sector-specific needs (Delmar et al., 2003; Rossi-Hansberg and Wright, 2007). The positive effect of human capital-intensity on increased firm resilience and growth is well documented in the literature (Acs et al., 2007; Colombo and Grilli, 2010; Geroski et al., 2010). Industry-specific dynamics can also affect company growth and competitiveness, irrespective of an individual firm's innovativeness (Audretsch, 1995). Network effects and the degree of entrepreneurship in the economy may also play a role (Braunerhjelm, 2010). For a recent literature review of studies addressing the explanatory factors behind the growth of HGEs and an investigation of other previously-unexplored highly time-variable factors, see Coad and Srhoj (2019).

Regarding the link between innovation and firm growth, the regional dimension is particularly relevant since innovation is strongly affected by the structure of economic activity (Feldman and Audretsch, 1999), which varies widely across regions. Economic geography suggests that a higher sectoral concentration within well-defined geographic locations promotes knowledge spillovers between firms. These spillovers can happen both within and across industries and, in case of a favourable environment, can be amplified by the variety of sectors within a given location.

Since firm growth is volatile and hard to predict, an assessment of the innovation ecosystem in which HGEs operate may help to understand the factors behind their persistence. In this regard, the report also analyses sources of finance explicitly directed at firm growth such as VC.

In order to provide cross-country and sectoral insights which shed light on the variable distribution and performance of HGEs, all these perspectives are combined into a 'HGEs indicator framework', which is used in the report to support the analytical framework for monitoring the relative performance of factors conducive to HGEs across EU Member States.

An analytically-grounded understanding of cross-country and cross-sectoral HGE distributions is complemented by a review of existing policy measures and their effectiveness. This adds to the insights gained from the 'HGEs indicator framework' by providing additional information on the role of the policy environment in the occurrence of HGEs as well as the latter's sensitivity to the extent to which public support is currently in place.

2.2. Methodology and data

The report analyses datasets (see Table 1), which shed light on HGEs in Member States by region and sector, as well as on their means to finance growth and the role of framework conditions and policy in their development. Some of the data are publicly available, while others are confidential so that only aggregated information can be published.

More specifically, the study of HGE framework conditions makes use of data from different sources (see Table 1). Since multiple sources exist – each with strengths and limitations – a selection was made based on accessibility, relevance and robustness, keeping in mind the purpose of informing the European Semester process with country-specific insights. Table 8 in the Annex describes each dataset in greater detail, including a dedicated part on the limitations of each data source.

Table 1: Main data sources used in this report.

Data Sources
Eurostat Business Demography Dataset
European Investment Bank Survey on Investment and Investment Finance
Community Innovation Survey
Venture Source
European Innovation Scoreboard; Regional Innovation Scoreboard
European Investment Fund SME Access to Finance Index
Global Entrepreneurship Monitor

The study of the financing of firm growth (Chapter 4) mainly draws on data from the Venture Source database, allowing for an in-depth investigation of the role of VC in helping companies with growth potential to emerge.

The policy section (Chapter 5) draws on a four-page JRC questionnaire survey to 20 national experts knowledgeable of national policy measures targeting HGEs. The questionnaire sought to identify the set of

policy financial instruments which EU countries have in place, how they were designed to specifically target these firms, and whether policy interventions were effective in supporting them. It included questions relating to policy targeting and eligibility rules, types of market failure to be addressed by the policy, and policy impact assessment. Some specific questions were: 1) "is there a definition of high-growth firms in your country?" 2) "which stage of firm development does the policy target?" 3) "which market failures does the policy seek to correct?"

The report also employs descriptive analyses, and draws on published literature as well as expertise and knowledge in the European Commission, in JRC Innovation Country Reports and in policy-measure assessments provided by country experts.

2.3. Choice of variables for the 'HGEs indicator framework'

The 'HGEs indicator framework' covers HGEs demographics and key factors that broadly support or obstruct the development of HGEs. It draws on the data sources listed in Table 1 and which are further explained in Table 8 in the Annex.

The 'HGEs indicator framework' helps to provide a coherent snapshot of the more detailed analyses on HGEs demographics (Chapter 3) and financing growth (Chapter 4). It also supports deriving country-specific insights related to framework conditions conducive to the development of HGEs, based on the findings in the academic literature. This allows the 'HGEs indicator framework' to be used in the context of the European Semester as a starting point to analyse the relative performance of EU Member States vis-à-vis the EU average to identify areas, which support or obstruct the emergence and development of HGEs.

While the 'HGEs indicator framework' is designed to inform the European Semester process and support country-specific analyses, it is not set in stone and may be further developed as new evidence and data sources on the factors relevant for HGEs become available. It is also important to acknowledge the limitations of the 'HGEs indicator framework', which is outlined in the Annex. Relevant limitations range from partially relying on survey data, which could suffer from subjectivity, to not capturing all relevant framework conditions due to data availability limitations in the context of the selection principles mentioned below.

The selection of the indicators forming the 'HGEs indicator framework' followed the following three core principles:

1. Tailored to HGEs: Numerous indicator frameworks exist that inform on a wider set of issues beyond HGEs, including SMEs and scale-up firms, innovation activities, and digital entrepreneurship. While some HGEs are SMEs (and vice versa), they do not share the same dynamism, growth prospects and innovativeness (Decker et al., 2016).[11] In short, HGEs bring together a unique group of characteristics and circumstances and so require a particular set of framework conditions to support their development.
2. Comprehensive: The 'HGEs indicator framework' aims to capture the most important factors that determine the overall quality of the HGEs ecosystem. Priority is given to regional-level indicators since the HGEs ecosystem is often determined by specific local circumstances. Access to finance plays a crucial role as well as access to human capital, exchange between innovators, regulation and innovation centres. While the priority lies with indicators that both are comprehensive and tailored to HGEs, a pragmatic approach is chosen in cases where one or both conditions cannot be met. Therefore, the indicators do not cover every single relevant framework condition (e.g., mezzanine finance, access to infrastructure, inventory strategy) (Coad and Srhoj, 2019; Costa et al., 2016a), but rather relies on either highly-correlated indicators (e.g., HGE access to finance) or indicators covering the broader environment (e.g., most innovative region).
3. Succinct: To ensure usability and with a particular view to the European Semester, the 'HGEs indicator framework' should be concise. To this end, a set of 17 variables was selected. While this could be deemed to reduce the comprehensiveness of the indicator framework, it constitutes a compromise based on the approach adopted for the purposes of this study.

The HGEs indicators are grouped into three pillars. The first contains information on HGEs and innovative SMEs to proxy the presence of HGEs in a region or country. The second covers financing growth, as this is a key public policy concern considered crucial for the development of HGEs. The third cover the most important framework conditions conducive to the development of HGEs. Table 2 lists the indicators grouped for each pillar, identifying the source and motivation for the choice of each.

Combining the more detailed analyses in Chapters 3 and 4 for the first and second pillar of the 'HGEs indicator framework' with the framework conditions indicators (see Box 2 for details), allows a preliminary identification of areas that may require further investigation. Therefore, Chapter 5 provide additional insights related to policies for HGEs that in combination with the 'HGEs indicator framework' can result in a useful depiction of Member States' performance vis-à-vis the EU average.

The cross-country comparison illustrates where EU Member States are performing above or below the EU average. In practice, a standardised presentation of the indicator values in terms of the number of standard

[11] This is exemplified by the fact that most SMEs do not seems to scale-up and be innovative (Decker et al., 2016; Foster et al., 2019), whereas HGEs by definition experience a rapid growth phase and often innovative.

deviations above or below the EU28 average[12] is used. This illustration can be seen in the 21 country factsheets in the Annex of this report. Figure 1*: Relative performance of Member States* summarises the findings of the 'HGEs indicator framework' that will be successively introduced throughout this report. On the horizontal axis, the share of HGEs relative to the EU-average is shown, whereas the vertical axis depicts the HGE framework conditions. For example, Germany performs above the EU-average for both, HGE share and framework conditions. Estonia performs above the EU-average in terms of framework conditions, but below the EU-average in the context of HGE share.

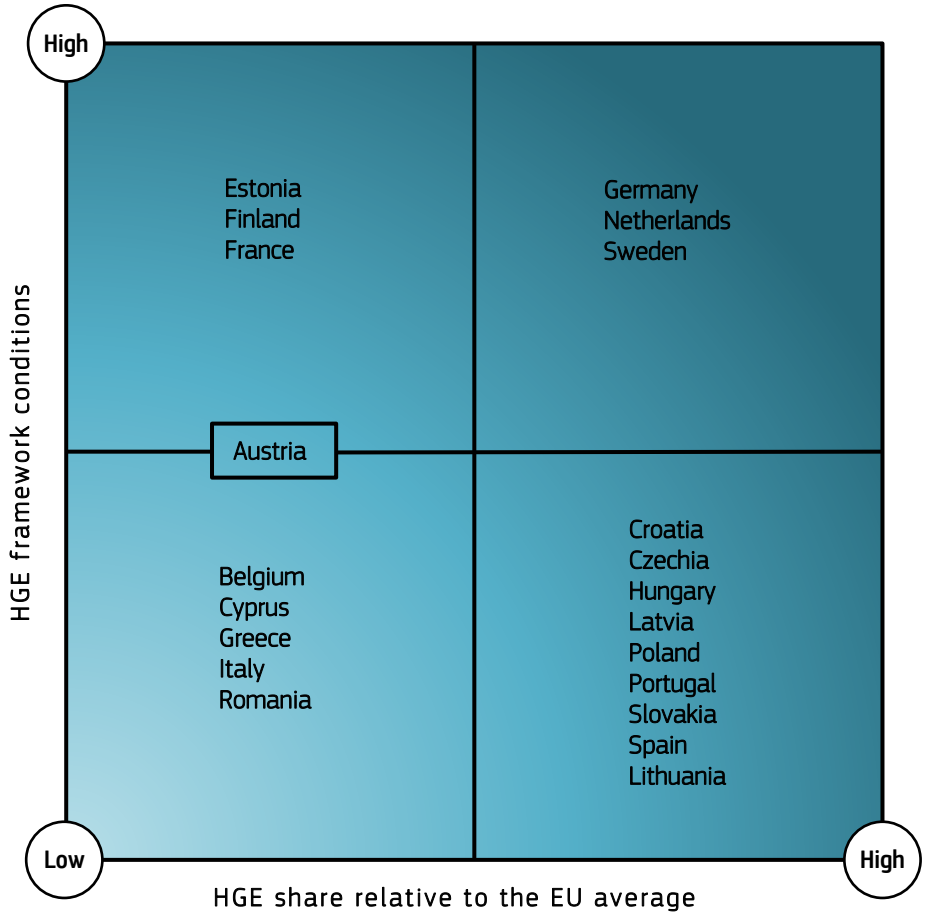


Figure 1: Relative performance of Member States

[12] It is important to note that the standardisation assumes the indicators to be normally distributed. For reference, 68% of the observations fall within one standard deviation, 95% within two standard deviations and 99.7% within three standard deviations

Box 1. High-growth firms and firms with growth potential

The OECD definition "HGEs are enterprises with average annualised growth in the number employees greater than 20% per year, over a three-year period, and with ten or more employees at the beginning of the observation period" and the Eurostat definition "HGEs are enterprises with at least 10 employees in the beginning of their growth and having average annualised growth in number of employees greater than 10% per annum, over a three year period" have been widely used in high-growth entrepreneurship research. Both definitions are used to describe the rapid growth achieved by enterprises over a short period of time. Although both definitions provide a useful guide to identify HGEs, there are alternative definitions of HGEs in the high-growth entrepreneurship literature.

For example, (Mason, 2020) discusses the definition of HGEs, and argues that there are multiple definitions of HGEs, each varying according to:

1. The choice of growth indicator

2. Growth measurement

3. Time dimension

4. The process through which firms grow

Definitions of HGEs may vary in the choice of firm growth indicators. Employment, market share, physical output, profits, and sales are commonly used measures in existing literature on high-growth entrepreneurship. Firm growth can be measured in absolute and relative terms13. Multiple or composite growth indicators and growth measures are also employed. The choice regarding the time period affects the definition of HGEs. For example, some scholars use annual growth, others use growth between initial and final year. Finally, the HGEs definition may be influenced by the process through which firms grow. In particular, growth can be organic, i.e. as a result of changes in the economic environment or can be the result of merger and acquisitions.

In this report, we distinguish HGEs from companies with a potential for growth. In this report, the former are measured in terms of the number of employees using the Eurostat definition, whereas the latter are measured in terms of VC-backed companies using the Venture Source database. While HGEs are firms that have already experienced sustained employment growth, VC-backed companies are companies with the potential to become HGEs. Giving that high-growth companies are companies with realised growth, relying on the number of HGEs in a country could shed light on the "outcome" of a policy aimed at supporting high-growth entrepreneurship.

Companies with a potential for growth, as opposed to companies with realised growth, are seen as "the target of policy interest" as these companies are most likely to fail to realize their expected growth potential for several reasons. The most common reasons are: they have no prior experience of the markets in which the new technology will be used, their inability to use their technologies to create new markets, their inability to defend their advantage against imitators, their inability to translate their technological advantage into commercially viable products or processes, and their inability to raise further round financing to fund development and growth. For these reasons, according to several scholars, they should be the main target group for policymakers.

[13] It is worth noting here that measuring growth in relative terms clearly favour smaller firms.

Table 2: Overview of information used in the HGEs indicator framework.

Indicators	Details	Motivation
HGEs indicators		
HGIE employment share	Percentage share of employees among HGEs in 50% 'most innovative' industries relative to total employment (EIS; 2018)	Measures contribution of HGIEs to employment creation
HGE number share	Percentage share of HGEs of total enterprises with at least 10 employees (Eurostat; 2016)	Measures how many firms are HGEs
HGE average size	Average size of HGEs (employment definition); employees divided by number of HGEs (Eurostat; 2016)	Measures average size of HGEs, an indication for future job growth potential
SME innovators	Share of SMEs with product, process, marketing or organisational innovations or innovating in-house among all SMEs (EIS; 2018)	Existing SME innovativeness as predictor for future innovations
Financing HGEs indicators		
HGE availability of finance	Percentage of HGEs considering the availability of finance is not an investment barrier (EIBIS; 2016-2018)	HGEs access to finance is considered a precondition for the development of HGEs
Venture capital seed	Share of seed venture capital to GDP (Venture Source; 2017)	Venture capital is a relevant source of finance for potential HGEs
Venture capital start-up	Share of start-up venture capital to GDP (Venture Source; 2017)	Venture capital is a relevant source of finance for potential HGEs
Venture capital later stage	Share of later stage venture capital to GDP (Venture Source; 2017)	Venture capital is a relevant source of finance for potential HGEs
SME access to loans	EIF SME Access to Finance Sub-index for loans, comprising the use and cost of loans (EIF; 2018).	SME access to loans is an important framework condition indicating the access to loans for HGEs
SME access to equity	EIF SME Access to Finance Sub-index for equity, comprising use of equity and the sophistication of the equity market (EIF; 2018)	SME access to equity is an important framework condition indicating the access to equity for HGEs
HGEs framework conditions indicators		
HGE human capital	Percentage of HGEs considering the availability of staff with the right skills is not an investment barrier (EIBIS; 2016-2018); survey data	HGEs access to human capital is essential for the development of HGEs
HGE labour market regulation	Percentage of HGEs considering the labour market regulation is not an investment barrier (EIBIS; 2016-2018); survey data	HGEs may be constrained by existing labour market regulation
HGE business regulation and taxation	Percentage of HGEs considering the business regulation (e.g., licences, permits, bankruptcy) and taxation is not an investment barrier (EIBIS; 2016-2018); survey data	HGEs may be constrained by existing business regulation
Entrepreneurial skills	Percentage of 18-64 population who believe to have the required skills and knowledge to start a business (GEM; 2018); survey data	HGEs may require entrepreneurial spirit, skills and knowledge
Innovative entrepreneurship	Ratio between improvement-driven and necessity-driven entrepreneurship (EIS; 2018)	Countries with high relative prevalence of improvement-driven opportunity, and entrepreneurship tend to be primarily innovation-driven, thus conducive for HGEs
Linkages among SME innovators	Innovative SMEs collaborating with others, public-private co-publications and private co-funding of public R&D expenditures (EIS; 2018).	Quality of innovations increases with collaboration and provides information on sophistication of SME innovation ecosystem, thus related to HGEs.
Most innovative region	Relative performance of most advanced region in the Regional Innovation Scoreboard within each Member State vis-à-vis the best performing regions across all other Member States (RIS; 2017).	HGEs innovation ecosystems tend to be concentrated in most innovative regions/centres.

Box 2. 'HGEs Indicator Framework' – Framework Conditions

While Chapters 3 and 4 provide a more detailed foundation for the first and second pillar of the 'HGE indicator framework', the following provides explanations on the third pillar (i.e. framework conditions) as no dedicated chapter of this report provides in-depth analyses and evidence on them. This is due to limited data availability for several of the framework conditions identified and to keep the analytical parts of the report streamlined and focussed to HGE firm demographics. Therefore, this pillar of the indicator framework is based on the insights provided by the academic literature. A more thorough analytically-based review of this pillar is left for future research.

Numerous factors shape entrepreneurial ecosystems and thus the emergence and development of HGEs (Stam and Spigel, 2016; Brown and Mawson, 2019). One frequently-cited factor is the availability of adequate human capital and skills that allows the emergence of new HGEs through new ideas as well as enabling existing HGEs to flourish (Arrighetti and Lasagni, 2013; Goedhuys and Sleuwaegen, 2016).

It is also argued that higher regulatory and tax burdens for enterprises above certain size thresholds can be a disincentive to firm growth or lead to 'splintered' growth (i.e., new spin-off firms are being created) (Long and Mandel, 2019). Therefore, indicators capturing the labour market and business regulation as well as taxation are included in the 'HGEs indicator framework'. Their inclusion is also justified by the sensitivity of both the number and proportion of HGEs to such factors, which might affect the count of HGEs in each country.

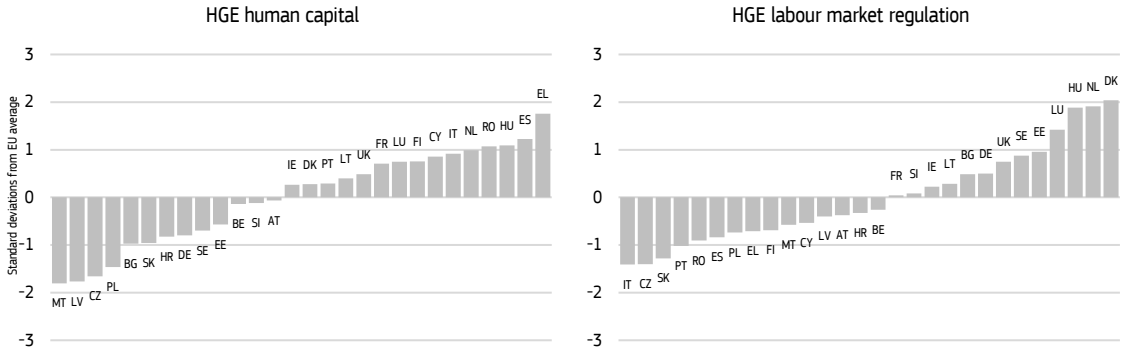
Literature focusing on staff and particularly managers running HGEs, suggests that ability, motivation and self-confidence play a role in the success of HGEs (McKenzie and Sansone, 2017). Hence, self-assessed entrepreneurial skills and innovative entrepreneurship provide indications of the entrepreneurial attitude of the general population and the role of improvement-driven entrepreneurship indicates the level of innovativeness of a country, thus approximating factors conducive to the emergence of HGEs.

Networks and clusters of growth-minded firms also play an important role in the development of HGEs (Guzman and Stern, 2016). This is in line with the literature on innovation agglomerating in innovation centres. The metrics chosen for this are linkages among innovative SMEs and the best performing region in the Regional Innovation Scoreboard of each country vis-à-vis the best performing region across all other Member States.

Other factors are certainly also important (Coad and Srhoj, 2019). Examples include internationalisation/trade/global value chains, the ownership structure of HGEs (Pereira and Temouri, 2018), the share of permanent workers (Lopez-Garcia and Puente, 2012), corporate governance (Guzman and Stern, 2016), the availability of public financial support measures (e.g., grant, subsidies) for innovations and thus indirectly for firm growth (Flachenecker and Kornejew, 2019), and geographical location (Daisuke and Perez, 2017). Metrics of these could complement the 'HGE indicator framework', but constraints on data availability and cross-Member State comparability prevent them from being integrated. Nevertheless, further research and access to additional data sources may allow complementary or substituting indicators to be included in a future revision of the 'HGEs indicator framework'.

In the meantime, Figure 2 shows, in a comparative manner across the EU, the above-mentioned indicators which characterise the framework conditions which are key to the business environment which HGEs operate in. No country (or group of countries) is above the EU average for all indicators. For instance, Nordic countries are above the EU average in indicators related to regulation, linkages and innovation performance, particularly in terms of the most innovative region comparison, but are often below the EU average for entrepreneurial skills and human capital. Yet, the concentration of innovative entrepreneurship within this group of countries is noteworthy.

Overall, Denmark, the Netherlands, Sweden Finland and the UK are the Member States with the highest relative performance across the seven indicators on HGEs framework conditions. Italy, Malta, Bulgaria, Latvia and the Czech Republic are the Member States with the lowest relative performance across the seven indicators on HGEs framework conditions.



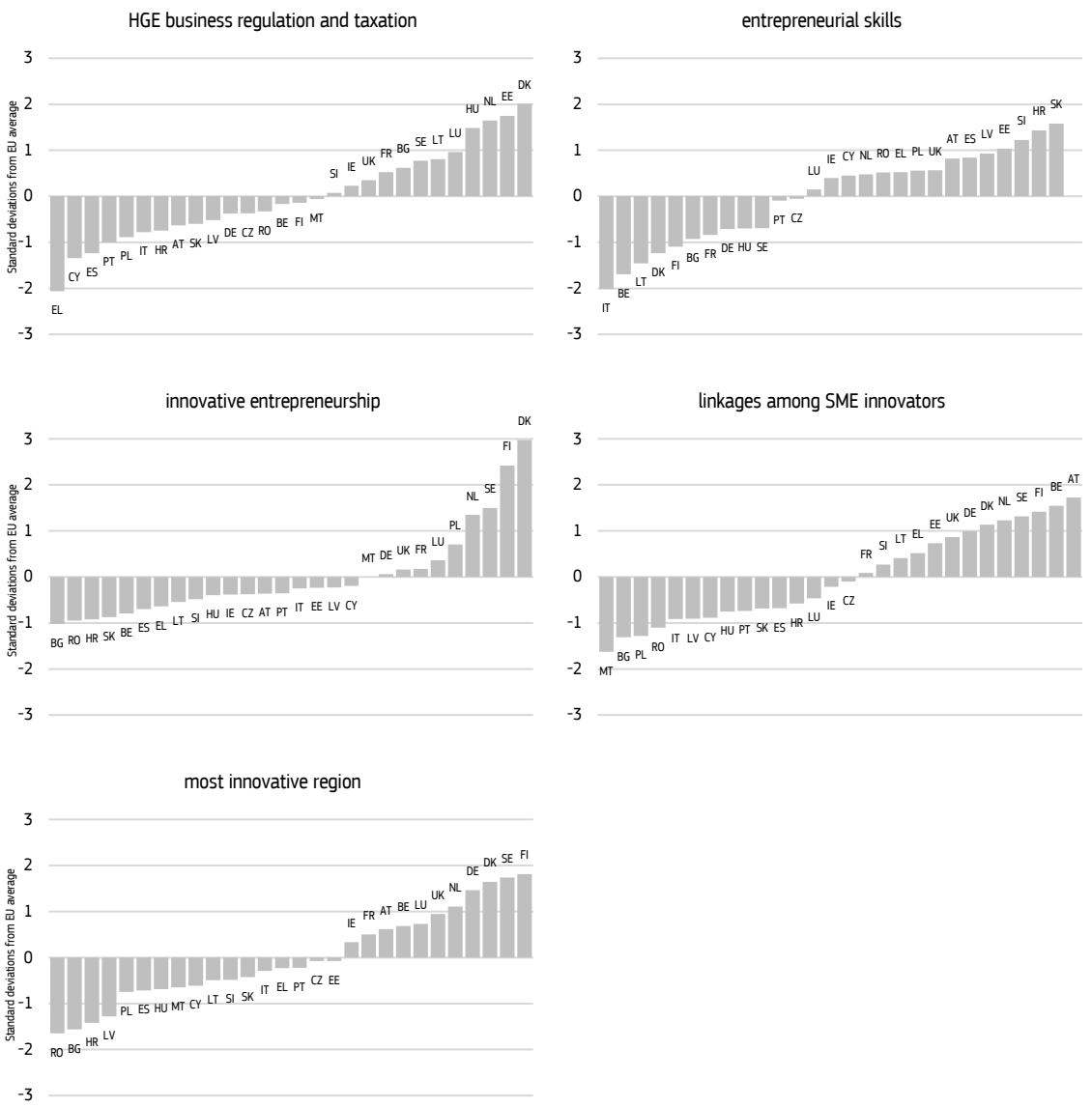


Figure 2: HGEs framework conditions indicators of the 'HGEs indicator framework'.

3. Demographics of HGEs in the EU

According to Eurostat, there were 187,677 HGEs[14] in the EU in 2017. This figure increased by 30% since 2014 (144,356 HGEs), far exceeding the 9% growth rate in the EU for the number of all active firms in the business economy. Furthermore, EU HGEs in 2017 accounted for more than 16.1 million employees. This demonstrates the importance of HGEs in the business dynamism of the EU.

It is important to note the developments over time shown in this Chapter are generally aligned with the more general economic development observed over the past years. However, Criscuolo et al., (2014) find that while the 'Great Recession' has disproportionally affected young firms with growth potential in terms of their employment growth, the overall contribution of such firms to net employment increases remained positive during the crisis. This suggests that the importance of HGEs for job creation continues throughout the business cycle.

This Chapter presents and discusses trends in the geographical and industrial sector distributions of HGEs at respectively the NUTS-2 and NACE two-digit level. For this, HGEs demographic data contained in the Eurostat Business Demography dataset are used to compare the emergence and development of HGEs across regions and industries at two points in time (2012-13 and 2016-17). Various HGE indicators are presented: the number and share of HGEs among active firms; the employment and employment share of HGEs; and the average size of HGEs.

3.1. Distribution by Member State

Figures 2 to 5 show the variations in the numbers of HGEs and in the HGE proportion of all active firms in each Member State for 2013 and 2016. The exclusion of certain countries from such charts is merely due to data availability. The numbers of HGEs in each Member State is strongly related to the size of each economy. However, more interesting is the variation across Member States of the HGE proportion of all active firms, with some countries far above the EU average and others far below. Importantly, the ranking of this proportion by Member State in 2016 was quite different to what it was in 2013. This may be linked to specificities in each country's business environments as well as to the episodic and rather uncertain and unpredictable nature of high-growth for companies (Brown et al., 2017).

Note, for example, that Italy is 4th in terms of the number of HGEs in 2016 while it is amongst the lowest for HGE share of all active companies. In contrast, Spain is 3rd and above Italy both for the number and proportion of HGEs. France on the other hand lags just behind Italy on both metrics. Belgium instead is in the middle of the distribution for the number of HGE whereas is in the last positions for their proportion.

In light of the above, it seems fair to say that the size of the economy is not all that matters. Others factors seem to be at play for the presence and predominance of HGEs, possibly related to the eco-system in which such companies operate.

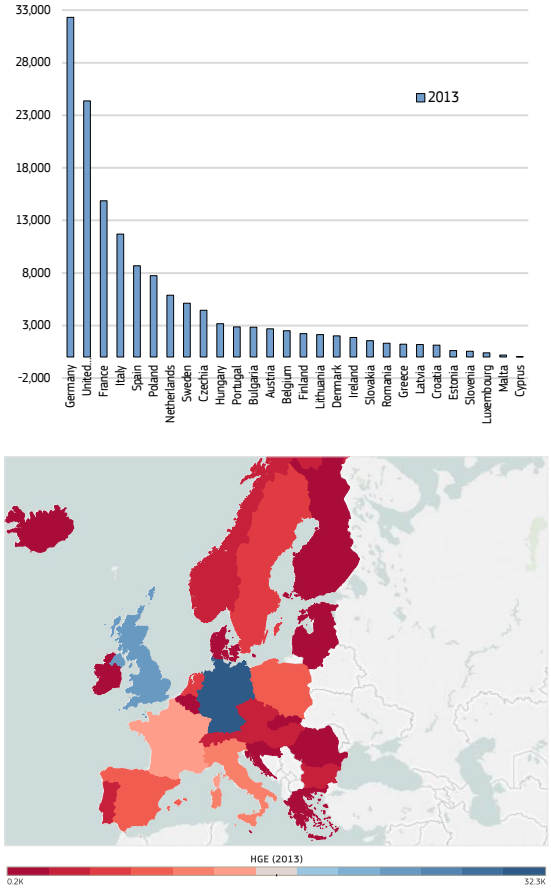
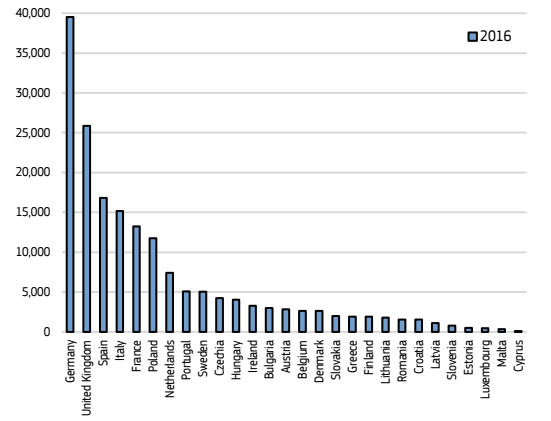


Figure 3: Number of HGEs across countries in the EU28 in 2013 - (a) Distribution & (b) Spatial Patterns. Sources: JRC elaboration based on Eurostat (2019).



[14] The data are aligned with the *Eurostat* definition of HGEs, i.e., enterprises with at least 10 employees having experienced an annualised average employment growth rate of 10% per year over a three-year period.

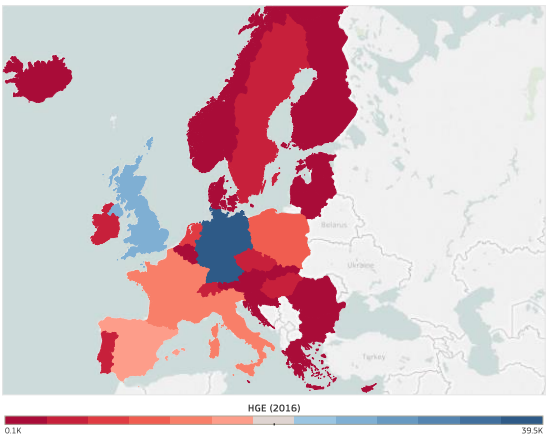
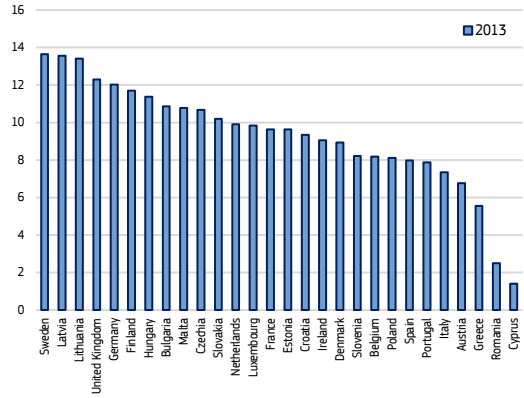


Figure 4: Number of HGEs across countries in the EU28 in 2016 - (a) Distribution & (b) Spatial Patterns. Sources: JRC elaboration based on Eurostat (2019).



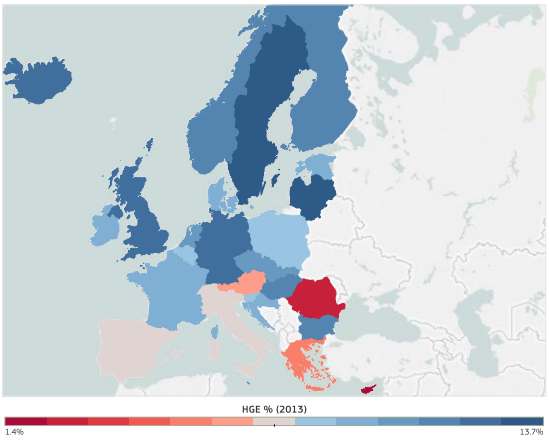
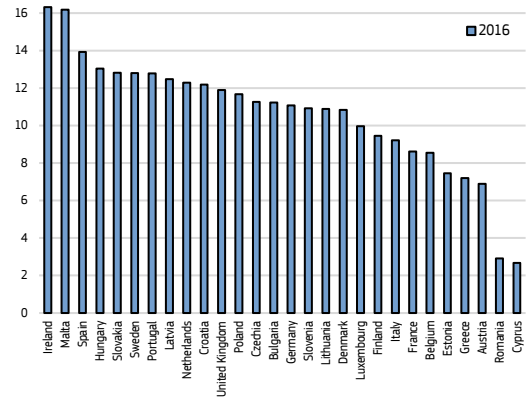


Figure 5: Share of HGEs over all active enterprises across regions in the EU28 in 2013 - (a) Distribution & (b) Spatial Patterns. Sources: JRC elaboration based on Eurostat (2019).



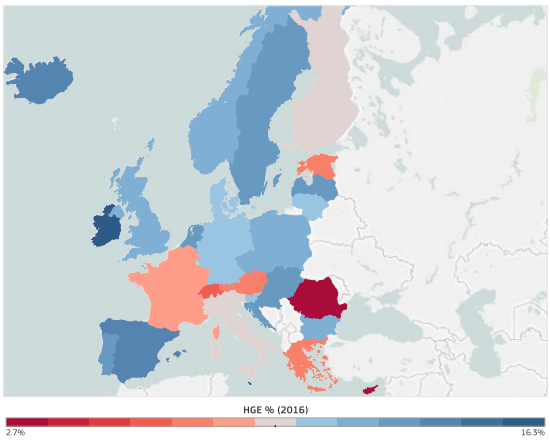


Figure 6: Share of HGEs over all active enterprises across regions in the EU28 in 2016 - (a) Distribution & (b) Spatial Patterns. Sources: JRC elaboration based on Eurostat (2019).

3.2. Regional variation

Looking at the data available for the regional distribution of HGEs in 2013[15] we find that Ile de France (FR) with about 4,700 and Lombardia (IT) with 3,000 HGEs are the regions with the highest incidence of HGEs in absolute figures. Next come Rhône-Alpes (FR), Cataluña (ES) and Madrid (ES) with about 1,700 HGEs each. All remaining regions have lower numbers of HGEs.

By 2016, the numbers had increased. Ile de France with 4,400, though lower than in 2013, was still the region with the highest number of HGEs. Lombardia had 3,700 while other regions have caught up - Cataluña had 3,900; Madrid had reached 3,400 and the number for Andalucia (ES) had more than doubled to 2,400. Rhône-Alpes however remained at 1,700 whereas neighbouring regions improved: Provence-Alpes-Côte d'Azur (FR), Piemonte (900 to 1,200), Emilia-Romagna (1,200 to 1,500) and Tuscany (900 to 1,100).

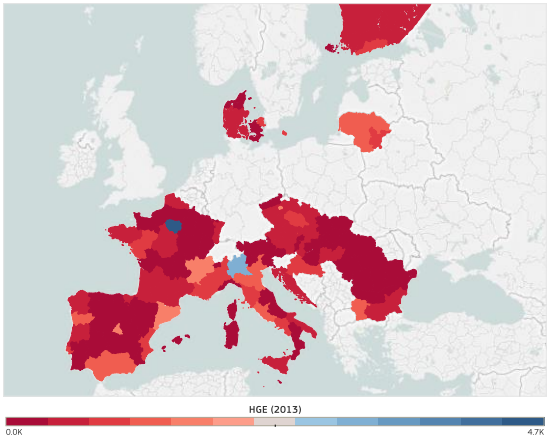


Figure 7: Number of HGEs across regions in the EU28 in 2013. Sources: JRC elaboration based on Eurostat (2019).

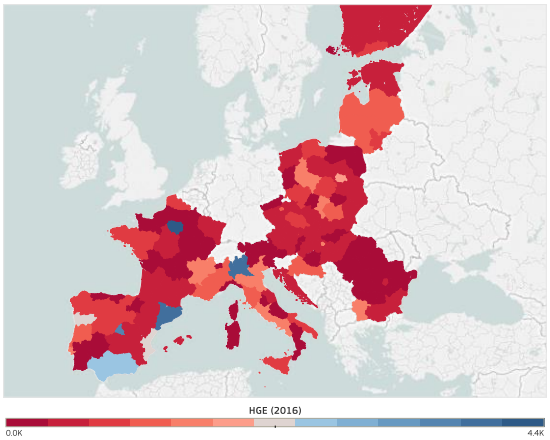


Figure 8: Number of HGEs across regions in the EU28 in 2016. Sources: JRC elaboration based on Eurostat (2019).

[15] Regions absent in the maps are simply not available in the Eurostat Business Demography database.

The case of neighbouring regions is particularly relevant in Spain where all regions around Madrid had higher numbers of HGEs in 2016 than in 2013. Both Castilla y Leon and Castilla-La-Mancha had 700 compared to 300 in 2013. The number for Aragon (ES) rose from 200 to 700; for the Pais Vasco (ES) from 400 to 1,000. Other regions showing a steep rise include Galicia-ES (400 to 900) and Centro-PT (1,300 to 2,200).

Turning to the share of HGEs as a proportion of all active companies the previous picture changes substantially.

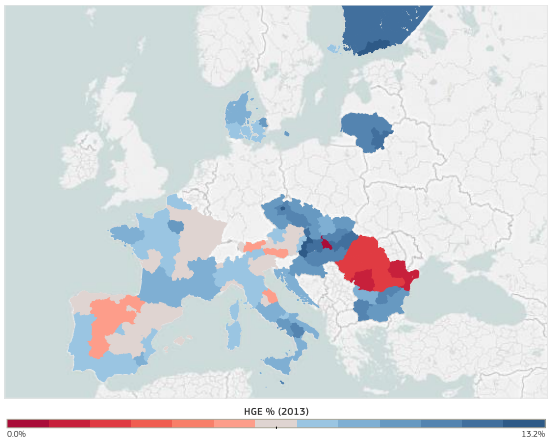


Figure 9: Share of HGEs over all active enterprises across regions in the EU28 in 2013. Sources: JRC elaboration based on Eurostat (2019).

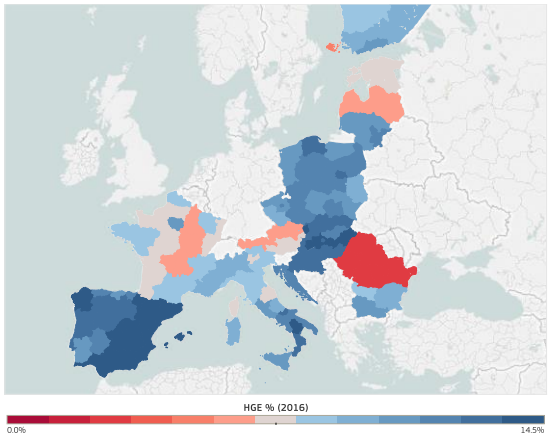


Figure 10: Share of HGEs over all active enterprises across regions in the EU28 in 2016. Sources: JRC elaboration based on Eurostat (2019).

Indeed, in 2016 although regions such as Madrid (13.9%), Cataluña (13.8%), Ile de France (10.8%), Lombardia (9%) still present a high share of HGEs in relative terms, there are other regions where the share of HGEs is higher, even within their respective countries. In Spain, this is the case for Valencia (14.5%), Aragón (14.2%), Castilla-La Mancha and Murcia (14.1%), whereas regions such as Navarra (13.8%), Galicia (13.5%), Andalucía (13.4%), Castilla y Léon (12.9%) are not far from the top-performers and contribute to shape the 3rd highest score at the country level in 2016 (13.9% for Spain overall).

Spain shows consistently higher scores with respect to those in 2013, where the best performing regions were respectively Murcia (8.2%), Valencia (7.9%), Madrid (7.6%) and Andalucía (7.1%) and to a lesser extent Castilla-La Mancha (6.9%), Aragón (6.6%) and Cataluña (6.7%). Interestingly, looking at the change across 2013 and 2016, the share of HGEs across regions has improved particularly for the latter. This could be evidence of beneficial spill-over effects from the better performing regions (e.g. Madrid, Murcia, Valencia) exerting a pull on the emergence and location of HGEs in neighbouring areas.

In France we also observe a considerably better pattern regarding the regional share of HGEs with respect to their presence in absolute numbers. However looking at the change from 2013 to 2016, while HGEs are overall more numerous across regions and Ile de France remains the best performing with a 2016 share of 10.8% HGEs (9.9% in 2013), neighbouring areas to Ile de France present instead a visibly weaker increase over time with respect to other French regions.

A positive trend in the share of HGE is also detected in Italy (particularly in the southern regions), as well as in central and eastern European countries such as Croatia, Hungary and Poland.

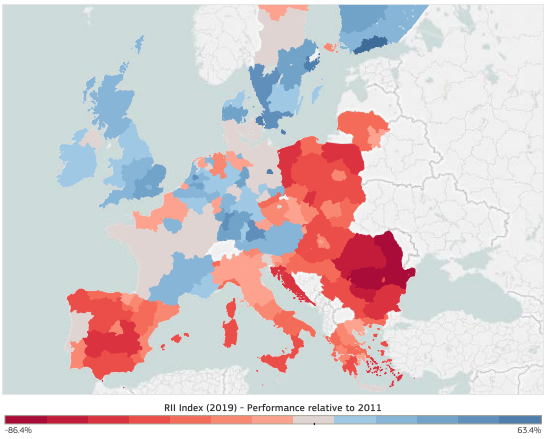


Figure 11: RII Index across regions in the EU28 in 2019 relative to 2011. Sources: JRC elaboration based on European Regional Innovation Scoreboard (2019).

Considering now the innovation performance of European regions, the Regional Innovation Index (RII; Regional Innovation Scoreboard, 2019) in 2019 with respect to 2011 highlights – with particular emphasis to the countries available in previous maps – the innovativeness of regions belonging to France, Austria, Germany, Finland and Denmark. Only to a lesser extent we find regions in Spain (e.g., Madrid and Cataluña) and Italy (e.g., Lombardia, Piemonte, Veneto) and various other countries among those previously displayed. This peculiarity points in favour of the need for further disaggregation to understand disparities in the regions with high shares of HGEs with respect to their innovative performance. One starting point could be to investigate the most relevant industries for HGEs and then looking at the regional distribution of such sectors across Member States. The following section develops in detail the HGE industry breakdown that is instrumental to the next steps in the analysis conducted.

3.3. Industry breakdown

Figure 12 indicates that 21% of HGEs are in the wholesale and retail trade sector, 20% in manufacturing, 11% in construction, and 10% each in the administrative and support services; professional, scientific and technical activities; and accommodation and food services industries.

Figure 12: Number of HGEs across industries in the EU28 in 2017. Sources: JRC elaboration based on Eurostat (2019).

Three sectors dominate HGE employee distribution (Figure 13): administrative and support services (22%); manufacturing (19%); and wholesale and retail trade (17%). The greater prevalence of HGEs in services sectors is at least in part a function of the definition of HGEs that is based on employment. This may not emerge from an analysis using a turnover definition of 'high-growth'. A further breakdown (not shown) reveals that in administrative and support services, employment activities (NACE code N78)[16] alone account for 12% of all HGE employees, followed by retail trade (NACE code G47) with 9% - i.e. part of the wholesale and retail trade sector. The number of employees in HGEs has increased from 12.2 million in 2014 to 16.1 in 2017.

Figure 14 shows the employment share of HGEs, which stood at 12.8% and 15.2% in 2014 and 2016, respectively. In 2016, the shares by industry ranged from about 8% in the electricity, gas and steam sector to 28% for administrative and support services. Of note is the faster increase in employees in HGEs as a share of all employees in firms with at least 10 employees than the increase in share of the number of HGEs among active firms with the same characteristics. This means that between 2012 and 2014, HGEs have not only increased their share among all active firms, but also increased in terms of their employment level.

[16] Employment activities comprise activities of employment placement agencies, temporary employment agency activities and other human resources provision.

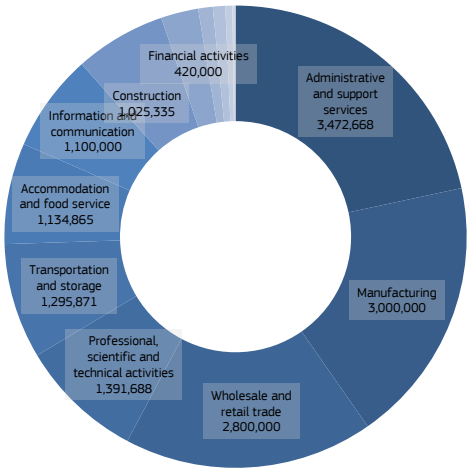


Figure 13: Number of employees in HGEs across industries in the EU28 in 2017. Sources: JRC elaboration based on Eurostat (2019)

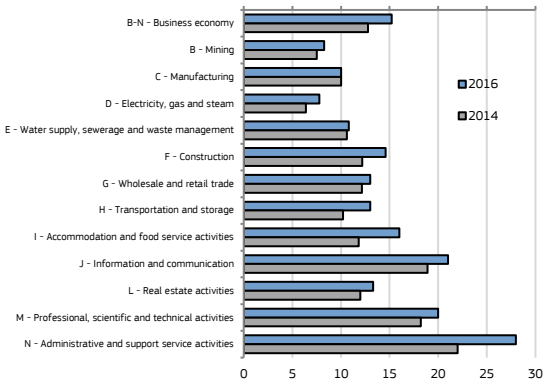


Figure 14: Employment shares of HGEs among all active firms in the industry for the EU28 in 2014 and 2016. Sources: JRC elaboration based on Eurostat (2019)

Figure 15 provides information on the average size of HGEs in terms of their number of employees. In 2017, the average size of HGEs in the EU28 was 85.9 employees, a slight increase on 2014 (84.8 employees). The industry breakdown shows a heterogeneous picture: the smallest average size is in the construction sector (about 50 employees), and the largest HGEs are within the administrative and support service sector (about 184 employees), closely followed by electricity, gas and steam (about 182 employees), a sector dominated by utilities. This means that – on average – HGEs appear to be medium-sized companies (50-249 employees), which is broadly aligned with findings using firm-level data (Ferrando et al., 2019). However, the average size does not allow any conclusions to be drawn on the distribution of the sizes across sectors.

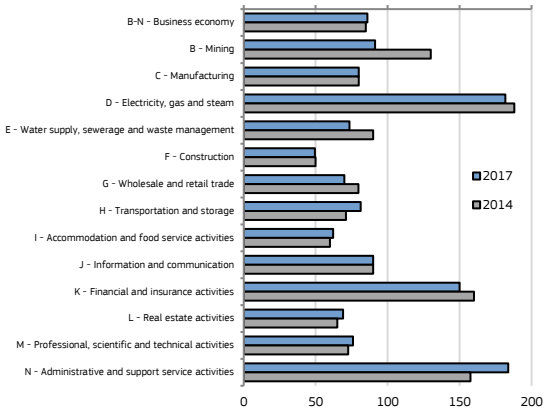


Figure 15: Average size of HGEs across industries in the EU28 in 2014 and 2017. Sources: JRC elaboration based on Eurostat (2019).

Figure 16 shows the share of HGEs among all active firms within the business economy with at least 10 employees (NACE codes B-N) in the EU28 in 2014 and 2016. Four important insights can be underlined:

1. HGEs occur across the entire business economy: The share of HGEs varied between 7% and 20% in 2016, while the weighted average (as well as the median) stood at 11%, which indicates that HGEs can be found across the entire business economy and the industry dispersion of HGEs follows a normal distribution. The fact that HGEs do not only occur in high tech sectors is in line with findings in the literature (Brown et al., 2017). This has implications for how HGEs are viewed and supported by policy. Merely focusing policies on high tech sectors may not reach HGEs across other sectors, which may have a higher share of HGEs than high tech sectors.

2. HGEs are ubiquitous across industries: Given that the share of HGEs lies between 7-20% across industries in the business economy, HGEs cannot be considered to be a rare phenomenon, but rather a relevant subgroup of enterprises within each sector, even if the duration of a high-growth period for individual firms can be limited (Dillen and Crijns, 2019). HGEs should not be considered to be such an exceptional group of firms with unique characteristics that they can be considered to be outliers.

3. HGEs tend to be more prevalent in service sectors: While HGEs can be found across all sectors, the share of HGEs among all active firms tends to be higher in service-related than in manufacturing-related industries. One of the reasons could be that services can be scaled-up easier since they are more often associated with economies of scale and lower marginal production costs.

4. HGEs have substantially increased their presence: The number of HGEs has increased from roughly 144,000 to 177,000 between 2014 and 2016, which indicates that HGEs are generally on the rise in the EU. Considering that the number of active enterprises with at least 10 employees has increased by just over 4% during the same time

period, the average share of HGEs has thus grown from 9.2% to 10.7% across the EU business economy between 2014 and 2016.

It is also becoming apparent that the sectors NACE-B, D, E, G and K show a decrease in the average size, despite increasing the share of employees, suggesting that the number of HGEs in these sectors has increased more than the employment growth of HGEs. Additionally, it is important to note that the number share of HGEs in the sector employment activities (NACE code N78) has substantially increased between 2014 and 2016. This sector comprises employment in employment placement agencies, temporary employment agencies and other human resources provision, even if the employee temporarily performs tasks in another firm in another sector. The increase in the number of share of HGEs in this particular sector can be interpreted in the context of the increase in non-standard forms of employment (Gonzalez Vazquez et al., 2019).

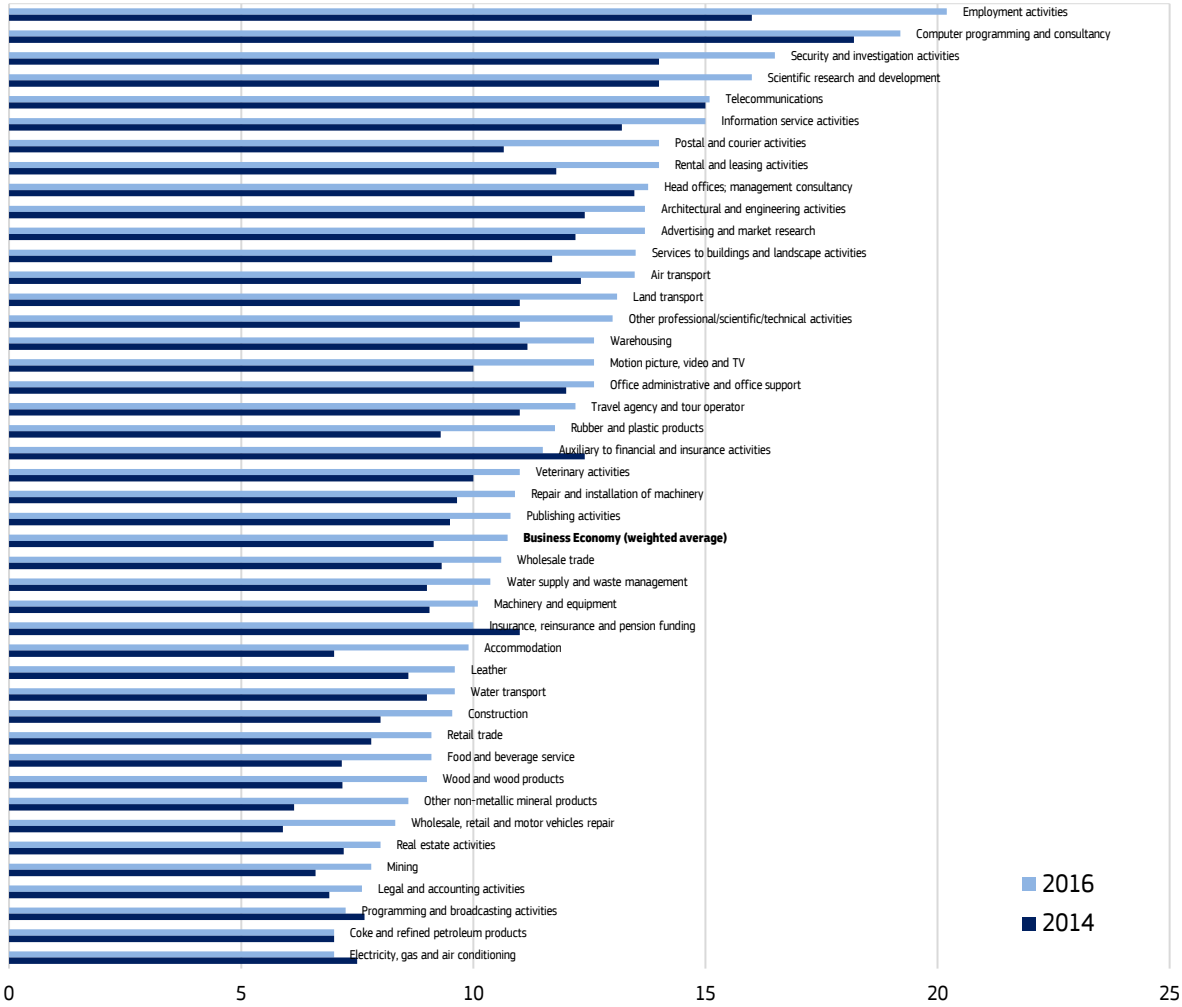


Figure 16: Industry shares of HGEs among all active firms in the industry for the EU28 in 2014 and 2016. Sources: JRC elaboration based on Eurostat (2019).

Another important aspect is the contribution of HGEs to employment growth (Ferrando et al., 2019; Hallak and Harasztosi, 2019). Table 3 provides a rough estimate of the HGE contribution to the overall employment increase among firms in the business economy. Given a few caveats to the comparability and methodology underlying the data, these estimates should not be interpreted as precise numbers, but rather as a broad indication due to cross-country comparability in the business registers.[17] Different administrative sources depending on national law, as well as surveys, are used to update the business registers. Additionally, the employment growth by all firms is a net figure, i.e., negative employment growth is also included, whereas the employment growth by HGEs is by definition a positive figure. These limitations need to be kept in

[17] The data are taken from the business register and therefore the accuracy depends on the quality of the individual registers, which can be heterogeneous across the EU. Although the business demography statistics are produced in a unified way based on the recommendations manual, some differences stemming from the data sources can occur that restrict the data comparability across countries. Different administrative sources depending on national law, as well as surveys, are used to update the business registers.

mind when interpreting the estimates provided in the table.

Based on Eurostat data, it can be estimated that approximately 90% of the net employment growth across firms active in the business economy between 2014 and 2015 occurred in HGEs. For the net increase in the 2015 to 2016 time period, HGEs were responsible for about 53% of the employment increase. This would suggest that HGE are responsible for the majority of net employment growth in the EU, even though they *only* represent around 11% of firms in the business economy. This is in line with findings in the literature (Hallak and Harasztosi, 2019; Ferrando et al., 2019). At the same time, the large year-to-year changes also suggest that the estimates in a specific year may not be representative of the average contribution of HGEs over time.

Table 3: Contribution of HGEs to employment growth in the EU28 in millions of employees. Sources: JRC elaboration based on Eurostat (2019).

EU28 | Business economy	12-13	13-14	14-15	15-16	16-17
Net employment growth all firms	1.2	4.2	1.5	3.0	
HGE employment growth			1.3	1.6	1.0
HGE employment growth share			87%	53%	

3.4. Linking regional and industry breakdown

Complementing previous analyses in this Chapter, this Section considers the link between the regional and industry breakdown, exemplified by four sectors.

First, according to Eurostat, the industry sector comprises mining and quarrying, manufacturing, electricity and gas, and water and waste management (NACE codes B-E). This aggregation is chosen since a large number and employment share of HGEs are located in the manufacturing sector (Figure 12 and Figure 13), whereas the electricity and gas sector has the second highest average size of HGEs (Figure 15). In order to draw a picture of both relevant components (i.e., relative share and average size), Figure 17 displays the regional distribution of HGEs in the whole industry representing manufacturing-related sectors.

Second, the wholesale and retail trade sector is chosen since it hosts a large number and employment share of HGEs (Figure 12 and Figure 13). Figure 18 shows the regional dispersion of this sector across the EU.

Third, the information and communication (IC) sector is selected given its large employment share among all active firms in the EU (Figure 14). Figure 19 depicts the geographic distribution of the IC sector across the EU.

Forth, the professional services sector, which comprises professional scientific and technical activities, and administrative and support services (NACE codes N-M), is considered given its importance in terms of its share among HGEs (Figure 12 and Figure 13) and share among all active firms (Figure 14). Figure 20 displays the regional breakdown of this sector.

Interestingly, among the regions previously identified as best performing in terms of HGEs share over active enterprises, a regional breakdown of the wholesale and retail trade sector does not offer the same picture and rather presents its top performers in the central and eastern parts of Europe. HGEs in the wholesale and retail trade are prominent in these areas plausibly because of their stage of economic development. Such countries are experiencing a consolidation in these sectors, a process that occurred much earlier in other Member States.

The regional distribution of HGEs relative to active enterprises in IC and professional services instead confirms the prevalence of HGEs for regions in northern France and Italy, central and eastern parts of Spain, as well as northern and eastern European regions.

The pattern identified for IC and professional services seems to be rather aligned with the regional innovation performance (Regional Innovation Index 2019) previously outlined. For these sectors, on the one hand, this would confirm the possible association between HGEs and innovation at the firm and regional level, and on the other hand, signal that the emergence of HGEs is attainable – although to a lower extent – even when the innovative ecosystem may appear weaker, as the wholesale and retail trade case seems to suggest.

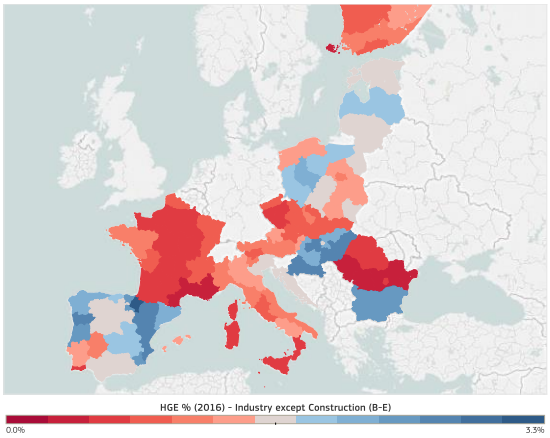


Figure 17: Share of HGEs (Industry excluding Construction) over all active enterprises across regions in the EU28 in 2016. Sources: JRC elaboration based on Eurostat (2019).

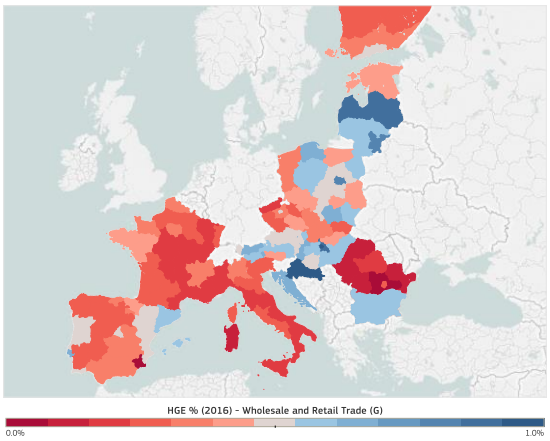


Figure 18: Share of HGEs (Wholesale and Retail Trade) over all active enterprises across regions in the EU28 in 2016. Sources: JRC elaboration based on Eurostat (2019).

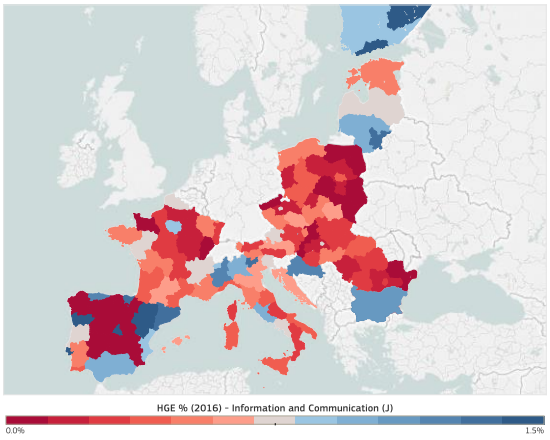


Figure 19: Share of HGEs (Information and Communication) over all active enterprises across regions in the EU28 in 2016. Sources: JRC elaboration based on Eurostat (2019).

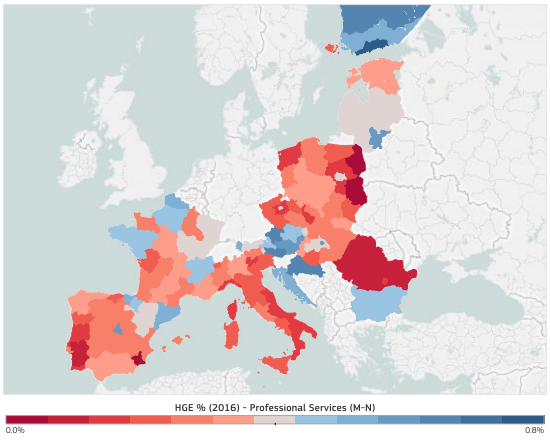


Figure 20: Share of HGEs (Professional Services) over all active enterprises across regions in the EU28 in 2016. Sources: JRC elaboration based on Eurostat (2019).

3.5. Venture Capital backed companies

In this section, we examine the patterns of high-growth ventures across countries and across sectors using VC-data. The importance of analysing enterprise growth by using VC data resides in one of the main characteristics of VC investing activities – i.e. to fund the internal growth of companies[18]. This means that the investments are made in new companies that have a capacity for rapid growth.

The data used are taken from Venture Source by Dow Jones - a comprehensive, non-public database listing companies that have received VC in different regions, sector and stages of financing. The database downloaded in October 2018 contains information on more than 23,000 VC-backed companies located in the EU28 and covers 2000-2017.

Companies are classified into 227 different "industries", henceforth referred to as "sectors". This classification does not follow an official or internationally-recognized system, but is customized to the world of VC and emerging sectors. However, it is possible to match the Venture Source classification to the NACE rev. 2 industry classification. The comparison shows that the company distribution over the Dow Jones sector categories on the whole align rather well with a distribution over different NACE-coded sectors. However, it also reveals that the NACE 2-digit classification may not fully capture the technological diversification of VC-backed companies, as it shows a relatively large concentration of companies in: publishing activities (23%, NACE code J58); computer, electronic and optical product manufacture (14%, NACE code C26); and basic pharmaceutical product and pharmaceutical preparation manufacture (12%, NACE code C21).

Venture Source variables include the full name, location (city and region), the start date of the company, the date on which the VC transaction was made and the number of employees. The number of employees is taken from their internal source Factiva – Companies & Executives. Other sources include: company websites, press-release articles and social media. These variables are typically updated when a company raises a new round of financing or has an exit event such as an initial public offering (IPO) or acquisition. Venture Source also labels[19] each VC-deal as belonging to one of three financing stages, each having different financial requirements:

- Initial financing for launch: The VC seed round is the first round of financing received by a company from a VC fund. According to Dow Jones, the initial capital needed to start a company is relatively modest, typically USD 20 million or less. This small amount of capital is provided to a company to prove a concept. If the initial steps are successful,

[18] This characteristic also allows distinguishing VC from other types of private equity. VC investment proceeds are used to build new businesses, not to acquire existing businesses.

[19] (Nepelski and Piroli, 2016) provides a comprehensive overview of different stages of financing, with a particular reference to Venture Source data.

this may involve product development, market research, building a management team, and developing a business plan.

- First and second-round financing for initial development: The start-up round can be the first or the second round of financing for a company that receives capital from a VC fund. This stage provides financing to companies completing development where products are mostly in testing or pilot production stages. In some cases, products may have just been made commercially available. Companies may already be in business for three years or less.
- Third-round to later VC for consolidation and growth: The later stage venture round tends to be from the third VC-round till the late stage VC-round. It is typically made available to companies that have positive cash flows and includes companies that are considering IPOs.

The following graphs show aggregate values by country and sector.

The first group includes the cross-country and cross-sector distributions of the number of VC-backed companies. Figure 21 shows the number of VC-backed companies after the year 2000, by country (Panel A) and NACE sector (Panel B), distinguishing between seed, start-ups and later stage companies. Not surprisingly, the UK accounts for the largest share in the sample (around 29% of all companies), followed by Germany (18%), France (16%), Spain (6.5%) and Sweden (6%). Panel A of Figure 21 also shows that Ireland, UK, Germany and Sweden have the largest share of later-stage companies (17%) compared to other countries. Denmark (26%) however has the largest share of seed companies in our sample of countries. It also shows that, in most European countries, the share of start-ups is higher than the share of seed and later-stage companies, suggesting that European venture capitalists tends to finance start-ups more than seed and later-stage companies.

These statistics need to be treated with some caution as the geographical concentration of VC-backed companies is clearly biased towards major cities, where there is a high concentration of venture capitalists. Indeed, VC-backed companies choose to locate close to their venture capitalists. There is also a 'home bias effect' in place –physical, linguistic and cultural - which could explain why VC-backed companies generally prefer to stay close to their venture capitalists.

In terms of VC-backed companies by sector (Panel B), the share is highest in publishing (20% - mostly software). The second largest share (11%) is in wholesale and retail trade and the third in manufacturing, especially of computers, electronics products (9%) and basic pharmaceuticals (8.5%). This finding reveals that the sector distribution of VC-backed companies is biased towards high-capital intensity sectors and corroborates the argument that VC-backed companies tend to concentrate in high-tech sectors given their greater technical and market risk. However, this finding contrasts with the evidence that the share of HGEs is higher in less high-tech sectors such as wholesale and retail and manufacturing sectors (illustrated in Section 3.1). This may suggest that VC-backed companies and HGEs constitute two different groups of firms with little overlap. Indeed, as indicated in Box 1 in Section 2.3, although VC-backed companies may meet the technical definition of a high-growth company, as the injection of finance gives them the 'fuel' to achieve rapid growth, in many cases they 'burn-out'. Furthermore, (Motoyama, 2019) 's research on entrepreneurship in the US suggests that VC-backed companies do not represent an alternative to, or substitute, for HGEs as only a minority of fast growing companies were VC-backed companies.

The second group of graphs reports the size (number of employees) and age[20] distributions of VC-backed companies by EU Member State. Figure 22 reveals a variation in size of VC-backed companies across the EU28 economies. The median size ranges between 6 and 130 employees depending on the country. In some countries, like Germany and Sweden, there is a wider size range due to a larger tail at the lower end of the size spectrum. In other countries, like the UK, France, Spain and Denmark, the size distributions of VC backed companies are a lot narrower, though the median size of French and Danish firms is small, whereas the median size of British and Spanish firms is medium.

It is worth noting here that Figure 22 can be also influenced by the structure of a country's VC industry. Indeed, Figure 22 shows that large firms tend to concentrate in countries such as Germany and Sweden where venture capital firms are mostly involved in later stage investments. Similarly, small firms tend to concentrate in countries whose venture capital funds target at early-stage investments.

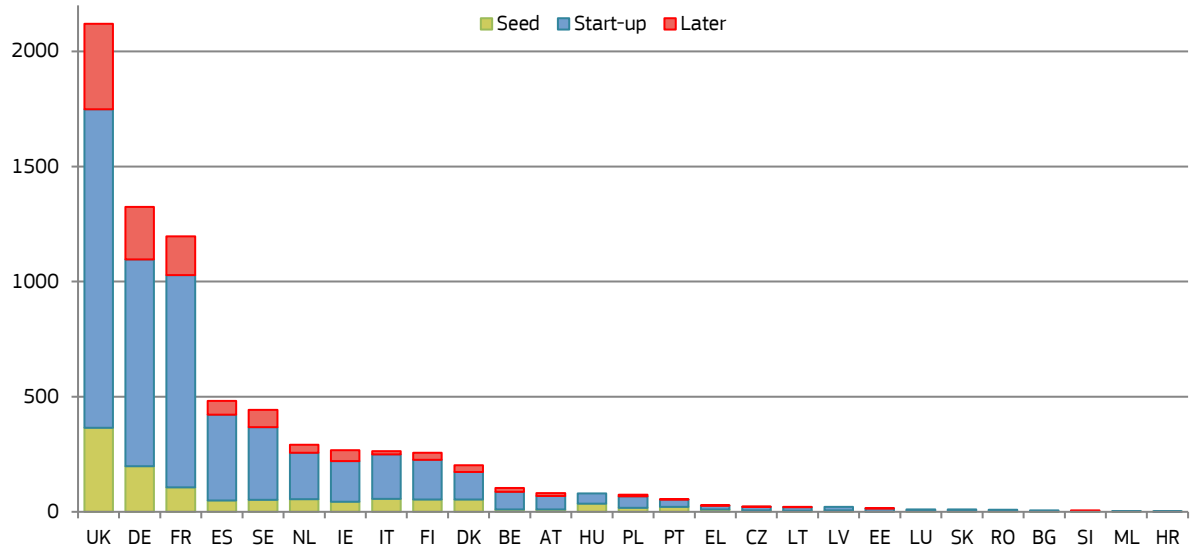
Figure 23 shows box-plots of the distribution of firm age (i.e. their age when they last received VC-funding)21 for each EU Member State. The average age shows a fair degree of variability across countries. The median age ranges approximately from 1 to 3.5 years. Countries like Greece, Romania, Lithuania, Latvia and Malta show a much wider range of ages than other EU countries.

But again, we need to be careful – the box plot showing the influence of firm age in a country could be influenced by its VC industry. Compare Sweden and Hungary. Swedish VC-backed firms are older than Hungarian ones. This may suggest that Sweden's VC industry target at later stage investments, whilst Hungary's VC industry target more directly at early-stage investments.

[20] i.e. the age of the company when it last received VC-funding = the difference in years between the closing date when last receiving VC-funding and the start date (i.e. the year of firm foundation)

[21] The sample is limited to companies created after the year 2000. Companies for which the start date or the firm age or the country code is missing are excluded. The firm age has been inferred from the start year of business operations. The box identifies the lower adjacent value (low bar/ whisker below the box), the 25th percentile (lower end of the box), the median (bar inside the box) the 75th percentile (upper end of the box), and the upper adjacent value (bar/ whisker above the box) of countries' average firm size/age.

Panel A: by country



Panel B: by sector

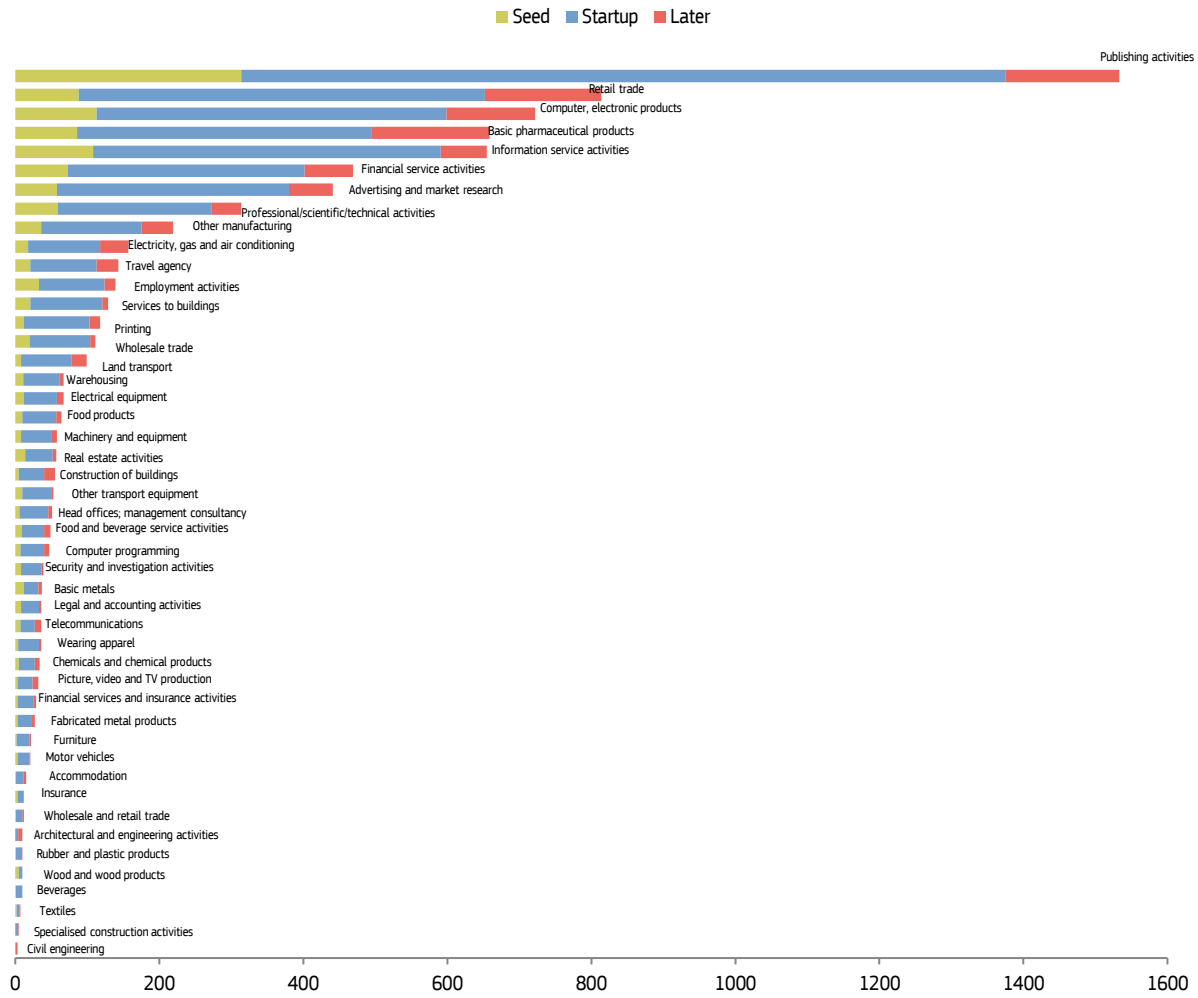


Figure 21: Number of VC-backed companies during the period 2001-2017 and operating during the period 2013-2017.

Box-plots across European countries

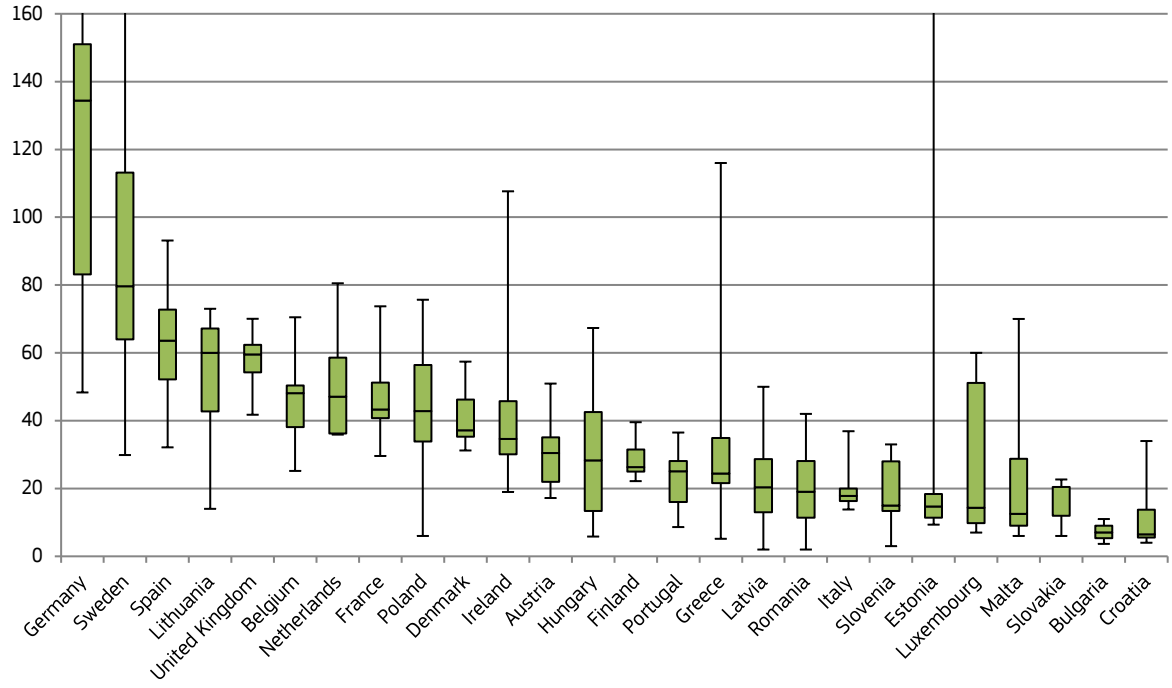


Figure 22: Size of VC-backed companies.

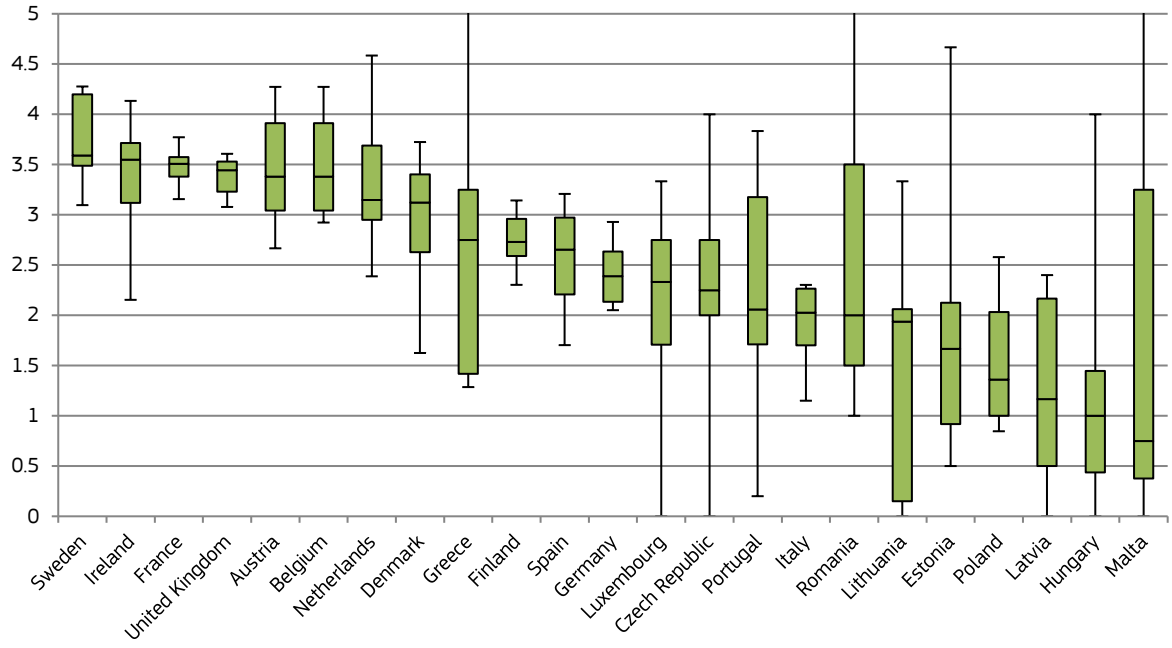


Figure 23: Age of VC-backed companies at the time when the last transaction was made

Box 3. 'HGE Indicator Framework' – HGE Demographics

As outlined in Chapter 2, the analysis in this chapter of HGE demographics at regional and industry-levels is reflected in the 'HGE indicator framework' via the inclusion of the following indicators (also reported separately for each country in the country factsheets): **HGIE employment share**; **HGE number share**; **HGE average size**; and **SME innovators.**

Figure 24 shows these indicators in a normalised way which permits cross-country comparison. This shows the heterogeneous situation across the EU. For instance, while Romania seems to have the largest HGIEs in terms of numbers of employees, it also has the second lowest share of HGEs and the lowest number of innovative SMEs in the EU. This implies how interpreting single indicators can lead to an erroneous picture of the situation in a country. It also shows that having on average larger HGEs might not necessarily be desirable if they are only few, if they are responsible only for a small share of the employment in firms and they may be less innovative. At the same time, larger HGEs have the potential to significantly contribute to employment growth since – by definition – they increase the number of employees of already large firms.

It is important to note that the indicator 'HGIE employment share' captures the percentage share of employees among HGEs in the 50% most innovative industries relative to total employment (see Box 2). In line with the analysis provided in Annex 1 and 3, HGIEs are an innovative subgroup of HGEs. This particular subgroup of HGEs is not further discussed as part of this report, but is left for future research on the topic. In this context, the indicator 'SME innovators' captures a broader group of firms that are innovative, but not necessarily high growth. However, growth periods are often interlinked with innovative activities (Brown et al., 2017; Ferrando et al., 2019; Vértesy et al., 2017). Therefore, both indicators aim to reflect this important driver of HGEs.

Overall, Ireland, the UK, the Netherlands, Portugal and the Czech Republic are the Member States with the highest relative performance across the four indicators on HGEs firm demographics. Cyprus, Estonia, Austria, Romania and Lithuania are the Member States with the lowest relative performance across the four indicators on HGEs firm demographics.

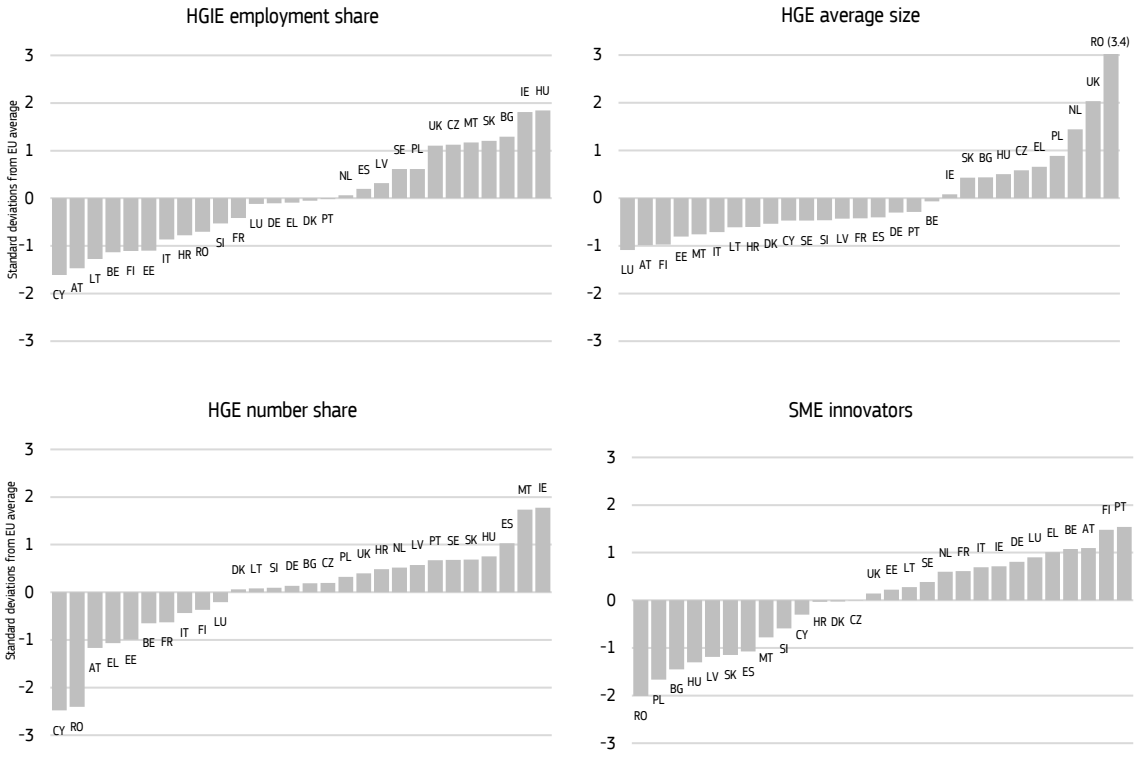


Figure 24: HGEs demographics indicators of the 'HGEs indicator framework'

4. Financing growth

4.1. HGE financing

Enterprises draw on both internal and a wide range of external sources of finance (Table 4). As far as external sources are concerned, there are conceptually two main types – debt and equity. Debt finance is when a firm borrows money for working capital or capital expenditure from individuals or institutional investors like banks. In return, the lenders become creditors and receive a promise that the debt and interest on the debt will be repaid. The main examples are bank loans, credit lines and leases.

Table 4: Use of financing instruments by non-financial corporations.

(percentage averages out of total sample over 2009-2014)				
	Micro	Small	Medium	Large
Retained earnings	24	30	38	46
Grants/subsidised loans	12	16	20	22
Bank overdrafts	38	43	40	42
Bank loans	28	39	43	48
Trade credit	26	30	35	38
Other loans	9	12	19	28
Leasing	19	40	50	56
Debt securities	1	1	1	4
Mezzanine	1	2	4	6
Equity	4	6	8	9

Sources: ECB and European Commission Survey on the access to finance of enterprises. Please note that the columns do not sum up to 100%, because firms can choose more than one source of finance.

Equity finance is when investors provide capital in return for an ownership interest (shares) in the company. Sources of equity finance generally vary according to the size of individual investments: from informal business angels who contribute a few thousand euros, to more professional business angel networks, to VC funds, large private equity investors and up to initial public offerings (IPOs) on stock markets for the largest amounts.

Most external financing across all types and sizes of firms is in the form of debt. In Figure 25 and Figure 26, access to finance is measured via the following question (Q4 in the SAFE survey[22]): "Which sources of financing have you used in the past six months?" Firms can choose among a set of financing instruments ranging from grants, bank overdraft, bank loan, trade credit, other loan, debt securities, equity capital, leasing or hire-purchase, and factoring. Given that SMEs and HGEs[23] are present in the SAFE population, Figure 26 reports the percentage of firm respondents from each subgroup of firms (i.e. HGEs, SMEs, and high-growth SMEs[24]) stating that they have used the respective financing source over the past six months, distinguishing among the whole sample and three sub-samples of firms, i.e. SMEs, HGEs and high-growth SMEs.

Although there is no wide heterogeneity in the use of financing instruments across different types of firms, we can observe that the use of financing instruments (especially bank products, leasing, trade credit, and factoring) is higher among HGEs compared to SMEs and high-growth SMEs. Figure 26 also shows that bank-related products (overdrafts and loans) are the most widely used source of external financing, followed by leasing or hire-purchase and trade credit. A very small fraction of survey respondents (among SMEs, high-growth SMEs and HGEs) state that they have used equity and debt securities over the past six months (1.6%, 2.6% and 2.6%, respectively).

Whilst this finding demonstrates that bank loans and loans from other sources are relevant to the majority of HGEs, it is important to highlight that our data refers to the current use of finance, i.e. last six months. This means that the data used provides a cross-sectional perspective, which can be misleading because it does not tell us much about the types and the amounts of finance used by firms in their entrepreneurial journey. Indeed, the 'entrepreneurial journey' is a long and difficult journey through which firms bring their ideas to the marketplace; and the progress of the firm along this journey depends on types and amount of financing at particular points in time in its development.

Looking at the use of financing instruments by HGEs across European countries (see Figure 27), Cyprus, Finland, Slovenia and Bulgaria are the countries with the highest proportion of HGEs using bank-related products, while HGEs in Sweden and Latvia use bank overdraft and loans less frequently. Sweden and Latvia are instead the countries with the highest proportion of HGEs using equity, whereas equity as a financing source is less prevalent among HGEs in Slovakia, Portugal, Italy, Czech Republic, Bulgaria and Poland.

[22] The SAFE survey data are of the 19th wave, which was conducted during October 2018 and March of 2019. The whole sample size amount to 16,775 firms, of which 15,148 have less than 250 employees. These companies were randomly selected to form a sample stratified by firm size class (based on the number of employees), economic activity and country. The number of firms in each of these strata of the sample are then adjusted to increase the accuracy of the survey across activities and size classes.

[23] In the SAFE survey, a HGE is a firm with an average annualised turnover growth of 20% per annum over a three-year period.

[24] In the SAFE survey, a high-growth SME is an SME with an average annualised turnover growth of 20% per annum over a three-year period.

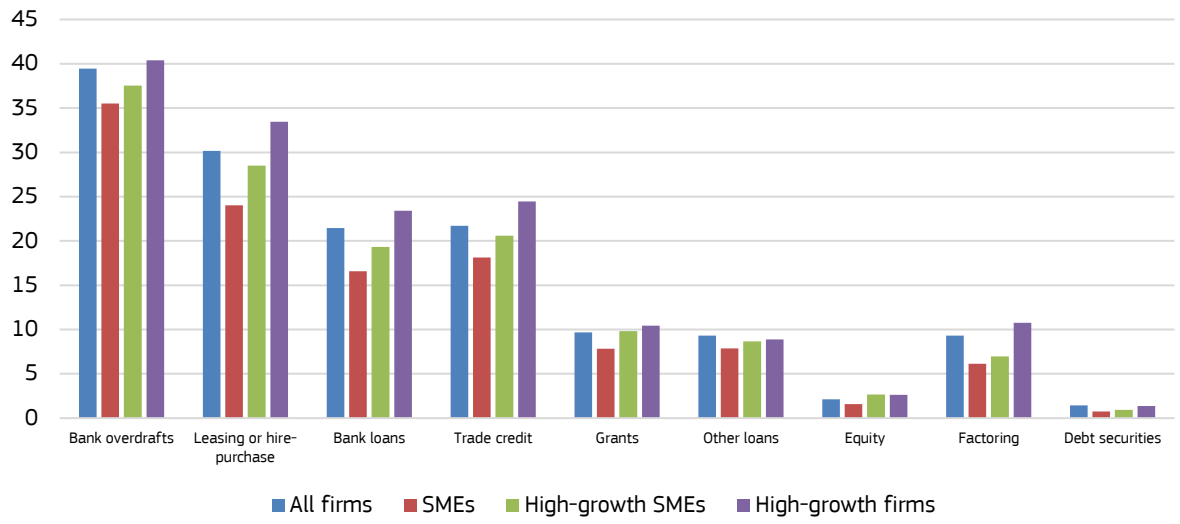


Figure 25: Percentage of firms by source of financing used, across different samples of firms.

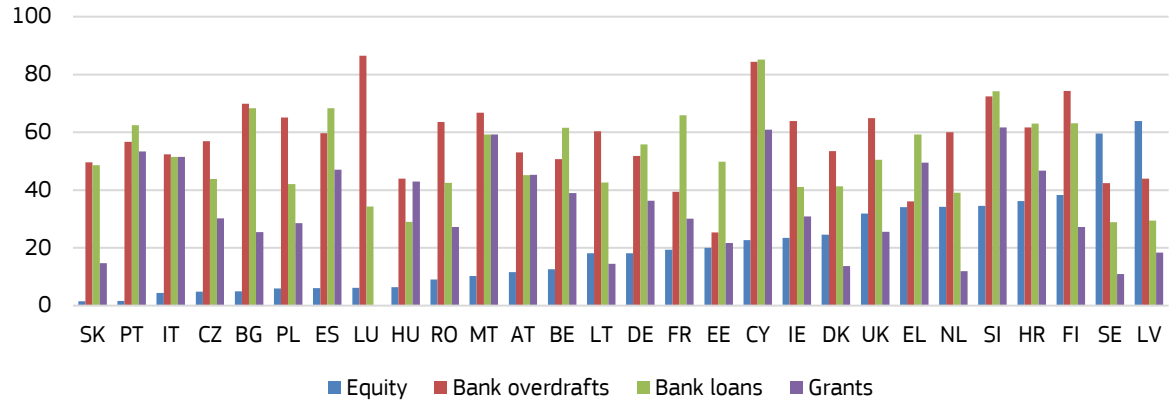


Figure 26: Use of external source of financing by high-growth firms across countries. Note: Question. Have you obtained any of the following sources of financing in the past 6 months? Percentage of respondents (weighted results) stating that they have used the respective financing source over the past six months. Source: Authors, based on SAFE (DG GROW, 2018).

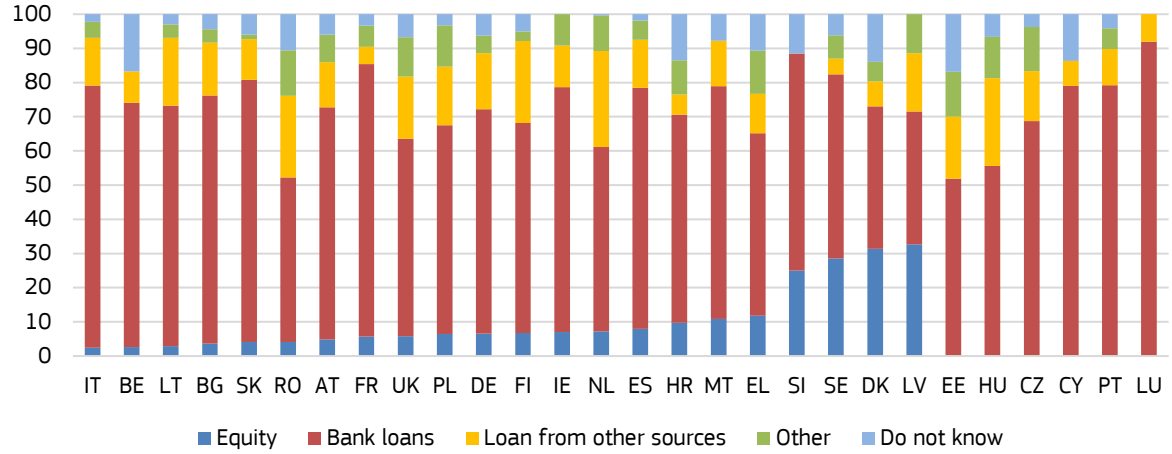


Figure 27: Use of external financing to realise growth ambitions among high-growth firms, across countries. Note. Question: "If you need external financing to realise your growth ambitions, what type of external financing would you prefer most?" Answer: "Bank loans", "Loans from other sources", "equity", and "other".

Considering different financing instruments with the purpose to realise growth ambitions used by HGEs, Figure 27 shows that in the Member States the percentage of HGEs which would use bank loans and loans from other sources to finance their growth is the highest. Across EU countries, equity is the most prevalent source of financing growth ambition among HGEs in Latvia (32%), Denmark (31%) and Sweden (28%) in 2018. Thus, it clearly emerges that, although the type and availability of funding depends on the stage of development of HGEs, debt financing would still the preferred option.

More recent research has examined the cost of growth in terms of the pricing of banking for HGEs. For instance, a study based on the 2007 UK Survey of SME finance find a difference in the cost of growth between HGEs, and SMEs. In particular, in their study, (Rostamkalaei and Freel, 2016) find that firms who have recorded recent high growth are more likely to pay higher interest rates for the loan they obtained, whereas, SMEs who intend to grow through the introduction of new products exhibit a higher probability of paying more for credit than their peers.

The European Investment Fund SME Access to Finance Index (ESAF) also gives a comparable EU Member State level measure of SME external financing. The index[25] aggregates over measures of the availability[26] and affordability[27] of external financing. In 2018, Sweden, Germany and Finland headed the EASF index ranking indicating well-developed financing environments for SMEs. Greece, Cyprus and Romania were laggards. The two sub-indices access to loans and access to equity are part of financing growth pillar of the 'HGEs indicator framework' (Figure 40).

Two mid-range groups of countries with similar ESAF values can be distinguished: an upper-middle group with the Czech Republic, Netherlands, Malta, Estonia, Denmark, Lithuania, Poland and Spain; and a lower-middle group with Latvia, Slovakia, Hungary, Croatia, Italy and Portugal (see Figure 28).

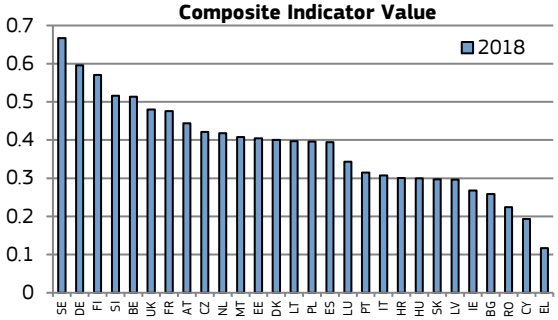


Figure 28: The 2018 EIF SME Access to Finance Index, Composite Indicator Values.

A closer look at the equity sub-index (Figure 29) shows the comparative prevalence of the use of equity for all Member States. Countries which seem to have a relatively more developed equity ecosystem include northern European countries (Sweden, Finland, Denmark, the Netherlands, the UK and Germany).

Turning to the relative importance of different types of equity instrument: public funding sources dominate at the conception/idea stage, while private VC tends to target later stages of company development as focusing on later-stage companies can be more cost-effective given the greater availability of information (Kraemer-eis et al., 2014; Nepelski and Piroli, 2016). This has led to a private funding gap at intermediate start-up stage. A second gap appears at the later scale-up stage, when firms are preparing for growth - this is the biggest financial obstacle for HGEs in Europe (Aernoudt, 2017; European Commission, 2016). Recently, governments have responded to this funding-gap market failure by developing early stage and growth stage financial instruments including loan guarantees, public equity instruments, syndicated loans or capital market regulation provisions.

These conclusions are also confirmed by the study by (Mason and Pierrakis, 2013), suggesting that pubic sources of venture capital are of critical importance at both national and regional level. In particular, the authors find that in peripheral regions public venture capital is particularly effective in conjunction with private venture capital.

Closely linked to the above 'entrepreneurial journey' is the use of different sources of finance for HGEs. Indeed, a firm considers a variety of different financing strategies at different points in time in their stage of development. For example, in the start-up stage, firms can engage in 'bootstrapping' activities as a way of compensating for the lack of finance and other resources. According to (Harrison et al., 2004), for example, start-up companies can raise finance using a personal credit cards, cross-subsidising (from other businesses or employment), speeding up invoicing and loans from family and friends. Alternative ways of accessing other resources include sharing or borrowing equipment, hiring temporary employees, as well as obtaining knowledge and skills from family and friends. Another important aspect of the financing of HGEs is related to non-dilutive source of finance such as grants and competitions which enable entrepreneurs to create value before raising equity finance, and hence reducing the dilution effect on their ownership, and de-risks the business for potential investors.

[25] It is composed of four sub-indices which in turn contain a series of indicators (see Kraemer-Eis et al. (2016).
[26] The supply, type, range and quality of external capital, and SME capabilities to access it.
[27] The price of acquiring finance.

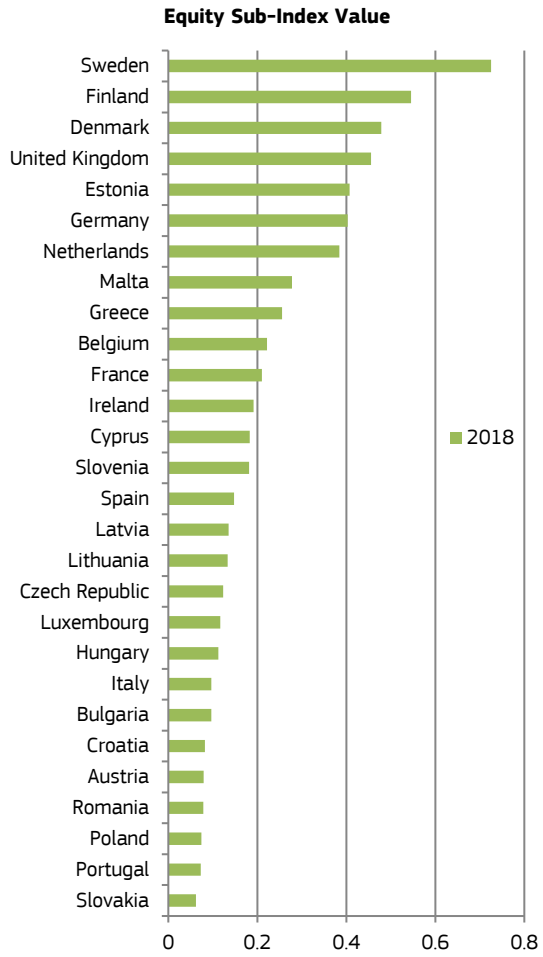


Figure 29: ESAF equity sub-index.

4.2. The role of venture capital

Although the most recent trends in entrepreneurial finance has opened the way to new sources of finance such as crowdfunding, VC is still an important source of equity finance for enterprises to realise high growth potential rapidly. The financing of three different stages of company development are normally distinguished: seed, start-up and later-stage. Venture capitalists, for the most part, focus on investing in companies with growth potential in technological sectors where new products can potentially penetrate and create large markets. These are often companies taking high risks, which require capital to implement their innovative strategies, develop their technologies and scale-up their operations. As market success is uncertain and as they often lack collateral, banks are less willing than venture capitalists to fund such companies (Colombo and Grilli, 2007).

For these reasons, venture capitalists are a vitally important source of equity finance for firms with high growth potential. They invest funds raised from investors in so-called 'portfolio' companies – i.e., VC-backed companies. They also play an active role in monitoring and helping their portfolio companies. They typically take a position on the board of directors and act as unofficial recruiters and facilitators of business contacts (Hsu, 2007; Luukkonen et al., 2013). However, their primary goal is to maximise financial return on their investment by exiting through sale or an IPO.

However, it should be noted that short-term payback[28] is not at all times the principal objective. In this context, it is important to mention corporate venture capital (CVC). Differently from traditional VC funds, these funds employ resources of single companies to invest in strategic start-ups. They are not only interested in financial returns, but also in collaboration, learning processes and sharing synergies. It is often the case that CVC-backed firms are used to signal technological disruptions or potential market development. The CVC backing European ventures has risen from EUR 1.3 to 7.5 billion between 2013 and 2018, constituting almost 30% of the European VC market (Dealroom.co, 2019).

In most Member States (Figure 30), VC constitutes a very small percentage of GDP - with the EU average of 0.07%. One exception is the UK, where the VC-industry is more mature, representing more than 0.22% of GDP. By comparison, VC-investments in China and the United States account for 0.36% and 0.32% of their GDP, respectively.

Seed, start-up and later stage investment vary greatly across the EU. However, it is important to recognize that these three stages are equally important in all countries and regions. Indeed, there is no point having a supply of later stage VC investment if there is no early stage investment to provide deal flow. As well as, seed and start-up will be not effective if follow-on later stage investments are not available.

In 2017, the later stage VC-investment was 0.12% of GDP in the UK, while it was about 0.02% in the three major European countries, France, Germany and Spain (Italy lagged behind the three European economies in each stage of financing). Compared with 0.02% of GDP in France, Germany and Spain, the later-VC investment accounted for 0.04% and 0.02% of GDP in Sweden and Ireland, respectively. The start-up stage of VC-investment was 0.09% in the UK, whereas it ranged between 0.02% and 0.04% in France, Germany and Spain. In Sweden and Ireland, the share of start-up stage of VC-investment has been 0.05% and 0.06% respectively, while in the Netherlands, it was 0.03% in 2017. In most countries, seed VC-investment represents a tiny percentage of GDP in 2017. Amounts invested by venture capitalists in eastern European countries such as Romania, Latvia, and Lithuania were very low in 2017. Across countries, Malta is a clear outlier for the average size of seed investment in 2017 (€4 million).

Thus, the evidence shows that VC remains concentrated in certain countries, where private sector investors are strongly engaged. It is also typically argued that the uneven distribution of VC investments across European countries reflects a combination of different national policies and framework conditions. These issues will be discussed in depth in Sections 4.3 and 4.4 respectively.

[28] Studies on venture capital have highlighted the importance of the time scale of investing. Indeed, since much of new technologies are about uncertainty, it follows that returns may not emerge quickly and that there will be a need for 'patient money'. In this respect, business angels are more patient than venture capitalists (see Harrison et al., (2016)).

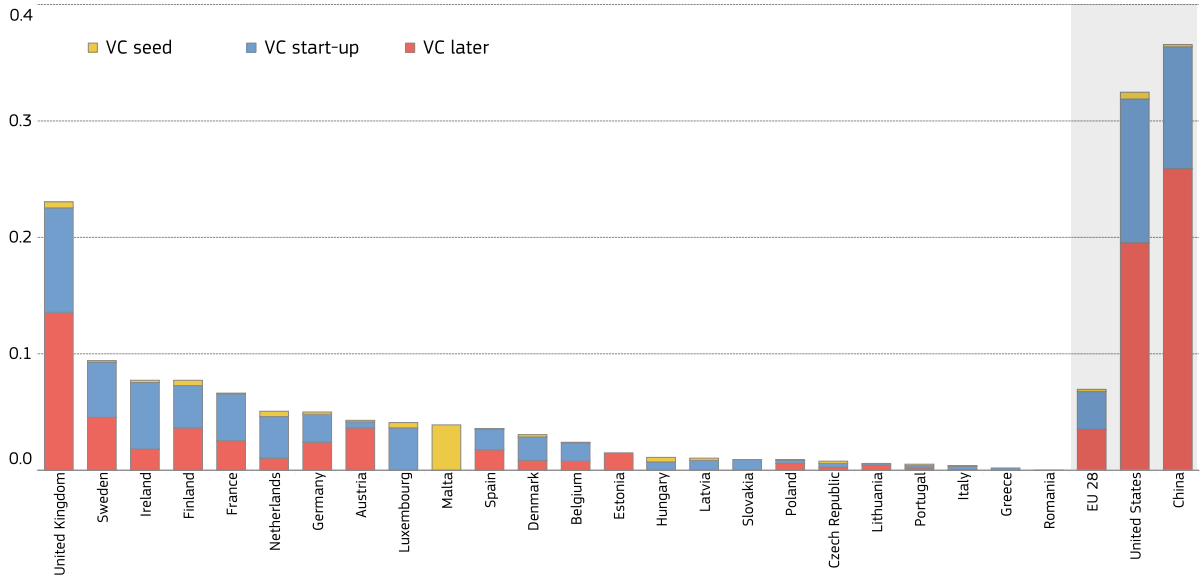


Figure 30: Venture Capital investment as a percentage of GDP, 2017.

Figure 30 shows VC investment as a fraction of the worldwide VC industry in EU28, China and US. Although the United States still remain the world leader in VC, with about 47 percent of the worldwide investment, VC markets in China have shown a notable development in recent years. Many European countries continue to lag behind the rest of the word in VC activity instead. More precisely, we can see (Figure 31) that, in the United States, after a peak of 67 percent in 2013, VC investment fell steadily to its low of 42 percent in 2017 before rising to 47% at the end of 2017. By contrast, in China, the percentage of VC investment rose gradually from 2013 to 2017, whereas investing activity in Europe, after a slight drop in 2012-2014, remained remarkably stable from 2015-2017.

Looking at the average size of VC investment in the EU, US and China in 2017 (Figure 32), as pointed out by Aernoudt (2017), EU VC investments are smaller on average than their counterparts in the US and China: the average US and Chinese VC investment in 2017 was EUR 15/16 million in size, whereas the average size of EU VC investment in the is EUR 6 million.

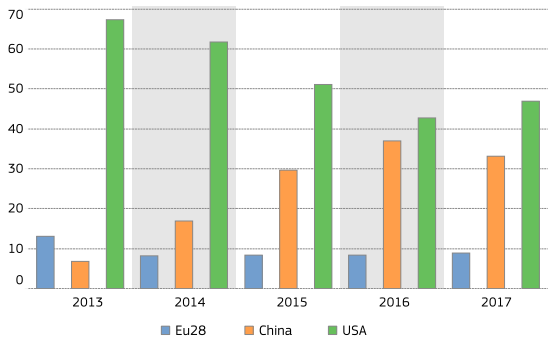


Figure 31: Share of venture capital investment for EU28, China and the US (EUR billion) Source: Venture Source database (2013-2017)

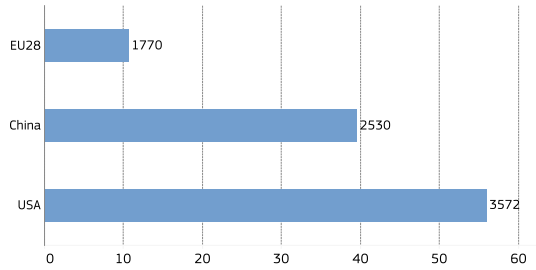


Figure 32: Amount of venture capital investments (EUR billion) and number of deals. Source. Venture Source database, 2017

Finally, Figure 33 shows the VC-investments (in EUR millions) and number of deals in the Member States and in the US for each year since 2008. Between 2008 and 2014, VC-investments in the EU remained stable, on average around EUR 3.7 billion, it increased in 2015 and after a decline in 2016, and it increased again to EUR 10 billion. In terms of relative size, the EU VC is substantially lower than the size of VC in the US, and the number of deals in the EU is, on average, approximately one-third the numbers in the US.

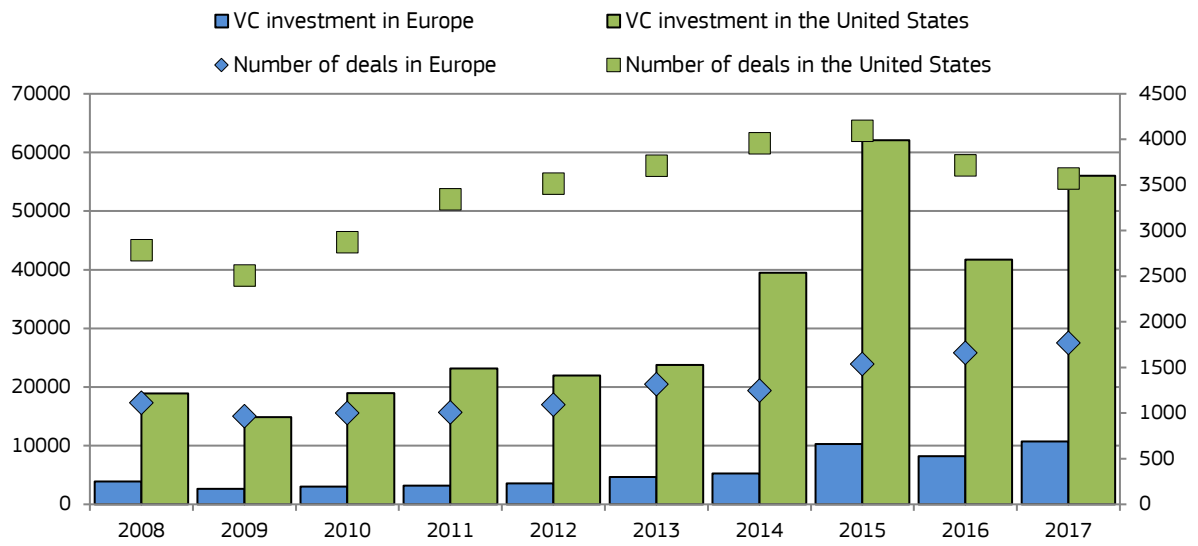


Figure 33: Venture capital investments in Europe and in the United States (2008-2017) – EUR Million (left-hand side) and number of deals (right-hand side)

4.3. Venture capital trends in the EU Member States since 2008: an aggregate analysis

Figure 34 and Figure 35 show VC-investments by stage of financing in the Member States since 2008, both in terms of amount and number of companies. The amount of annual VC-investments decreased between 2008 and 2012 from about EUR 4 billion to nearly EUR 3.5 billion, but it almost tripled between 2012 and 2017. A closer examination of the stage of financing indicates that this expansion in VC-investments has been propelled by a modest increase in the start-up stage and a substantial increase in the expansion stage. The share of VC invested in later-stage deals as a proportion of the total VC-investments has increased from 45% in 2008 to 50% in 2017 (except for the years 2009, 2013 and 2016). The share of start-up stage investments have increased from 50% in 2008 to 60% in 2013, and then dropped back to 47% in 2017. The share of seed VC-investment has recovered from its low share in 2012, but has decreased since 2008 as a proportion of the total amount invested from 5% to 3% in 2017.

The number of seed stage deals has largely increased since 2008, from 9% to 18% in 2017. This has had the effect of driving down the average size of seed investment over the period. While the share of start-up stage deals – although increasing in number – has remained fairly stable between 2008 and 2017, the share of later-stage deals has decreased from 22% to 17%. The average size of later stage investments is now higher than at the start of the period.

Figure 36 illustrates the average VC-investments[29] per company across the EU. In 2017, the average investment per company exceeded EUR 9 million in the UK; it exceeded EUR 6 million in Austria and Germany and it ranged between EUR 3.5 and 5.7 million in Sweden, Spain, Netherlands and France. It ranged between one and two million euros in Portugal, Italy, Greece, and Poland. The average size of VC investments is above EUR 15 million in the US and China.

[29] The average VC investment per company is the ratio between the total VC investments in a country and the number of VC-backed companies in the country.

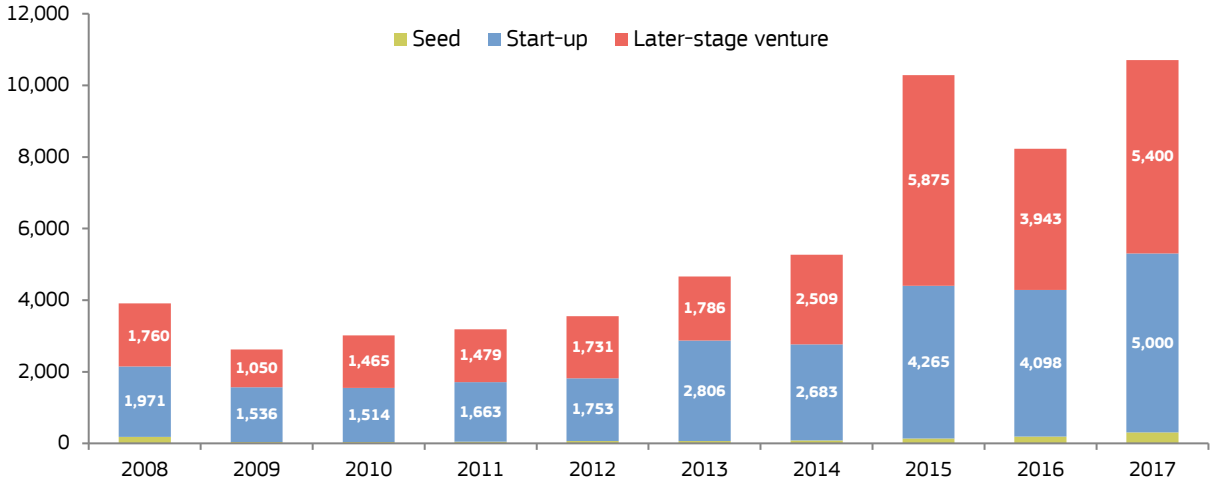


Figure 34: Venture Capital investments in the EU by stage (2008-2017) – amount in EUR million

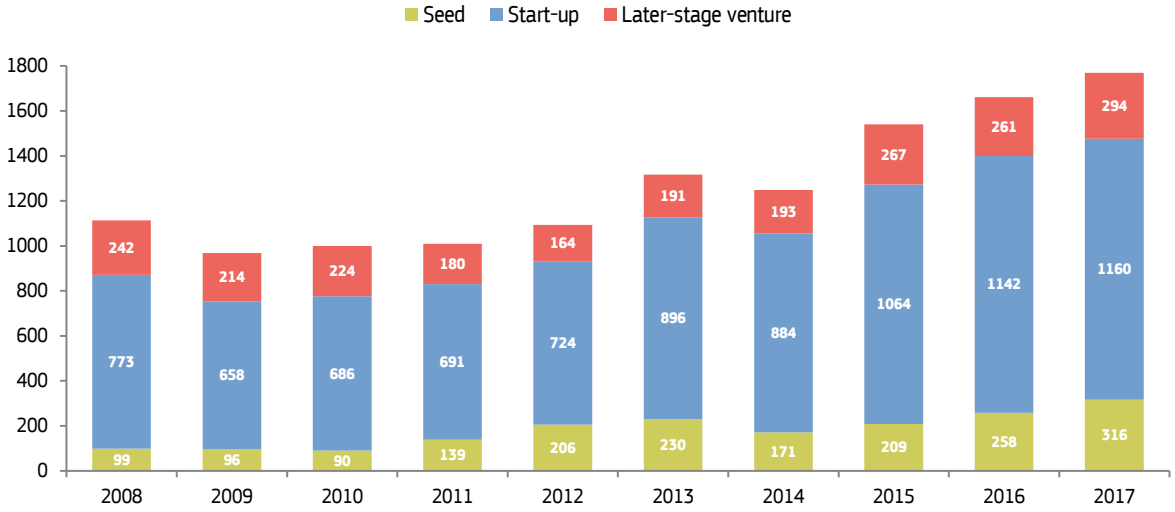


Figure 35: Venture Capital investments in the EU by stage (2008-2017) – number of companies

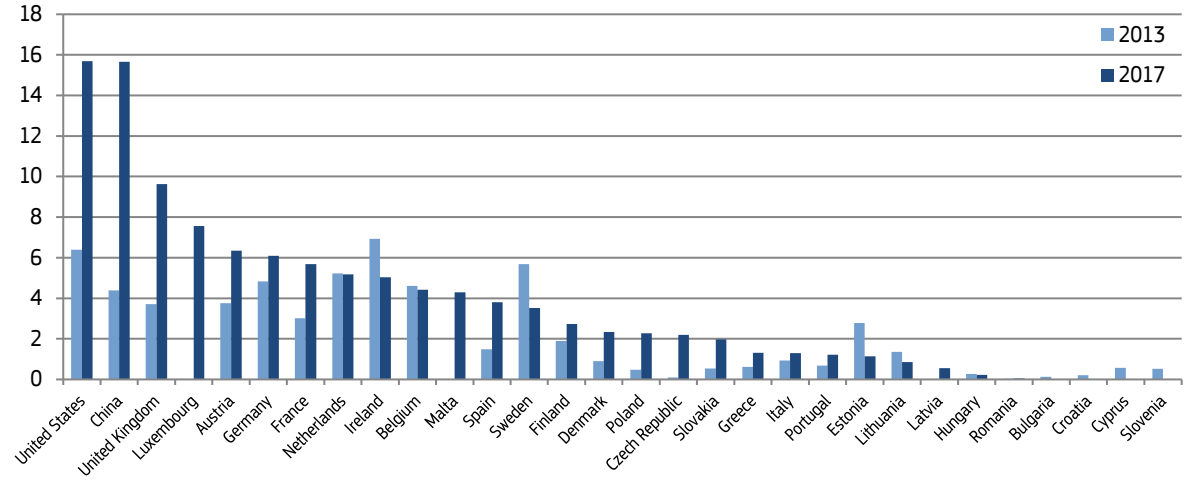


Figure 36: Average venture capital investments per company in the EU, 2013-2017 in EUR million

4.4. Types of venture capital-backed companies

In the EU, while the relative share of the total VC investment volume by size of VC-backed companies with less than 249 employees remained fairly stable from 2008 until 2017 (on average, around 7% for micro firms, 32% for small firms, and 37% for medium-sized firms), there has been a significant increase in the share of large VC-backed companies (>249 employees), from 12% in 2008 to 22% in 2017 and even up to 42% in 2015. In 2017, the largest beneficiaries of VC-investments (41%) were medium-sized companies (those having between 50 and 249 employees), while only 8% of micro-sized VC-backed companies (with less than 9 employees) received VC-investment in 2017 (Figure 37).

From 2008 to 2017, the top two sectors attracting more than 50% of total VC-investment were manufacturing and information and communication. Figure 38 also shows an upward trend in VC support to financial and insurance activities as well as wholesale and retail trade. Information and communication and manufacturing were also the top two sectors in terms of number of firms receiving VC (see Figure 21).

In 2017, the sector with the highest amount of VC was manufacturing (about EUR 3 billion of VC for manufacturing in 2017 went mostly to firms in the manufacture of computer, electronic and basic pharmaceutical products. More than EUR 2 billion of VC went into information and communications, in particular to software firms. Other sectors accounting for > EUR 1 billion of VC invested were financial and insurance activities and wholesale and retail trade.

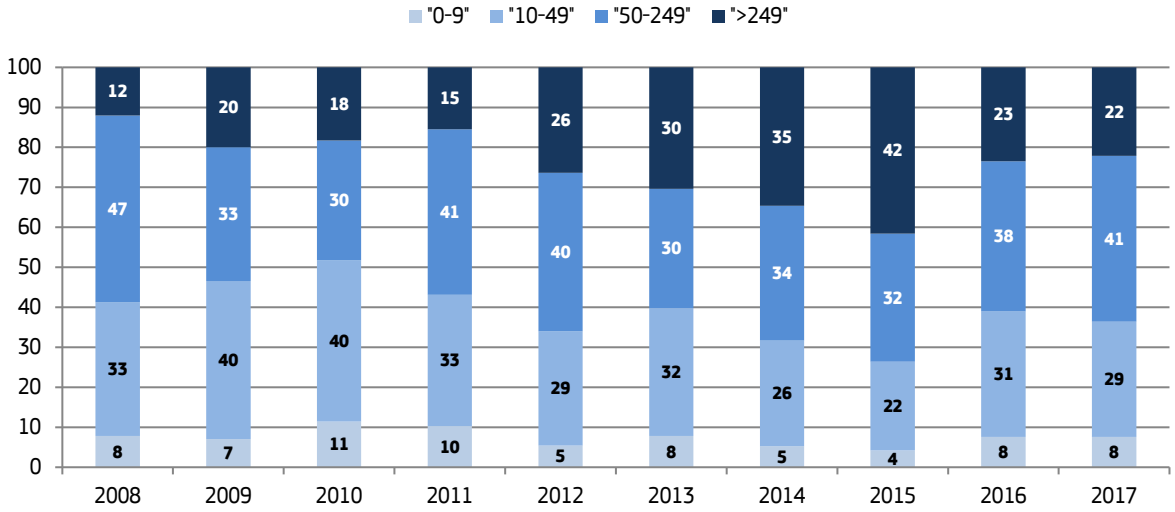


Figure 37: Trends of venture capital investments in the EU by size of venture-backed company – percentage, 2008-2017

Figure 38: Trends of venture Capital investments in the EU by sector – percentage, 2008-2017

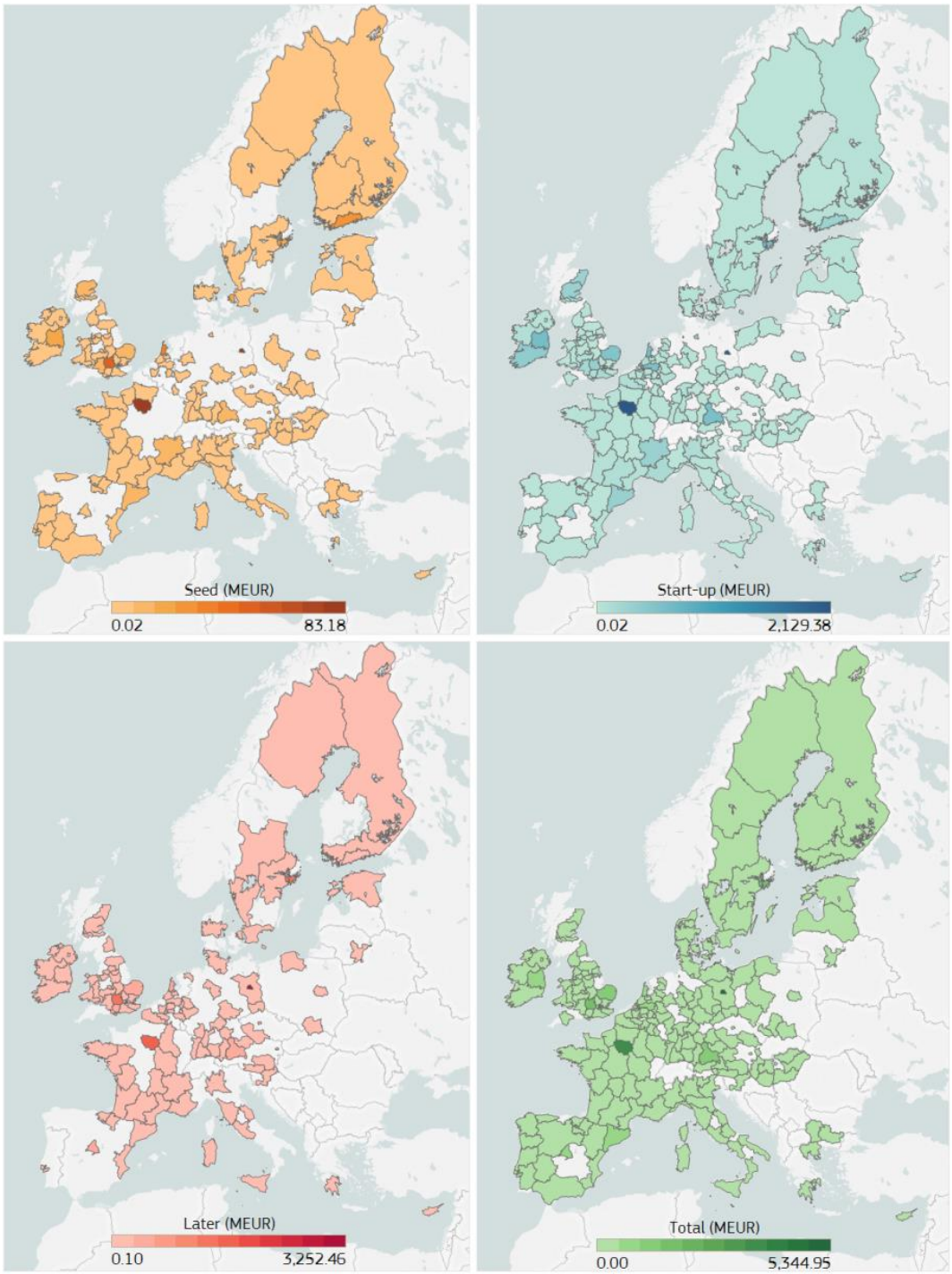


Figure 39: Regional distribution of VC investments across different stages of financing.

4.5. Regional distribution of venture capital investment

Figure 39 shows the EU-wide regional distribution of different types of VC investments[30] for the 2013-2014 period. The geographical concentration of the VC industry is not a novel finding in the VC literature (see, for example, (Mason and Harrison, 2002); (Martin et al., 2002); (Mason, 2007); (Colombo et al., 2019) (Mason and Harrison, 2006)). However, studies have rarely addressed the geographic concentration of VC investments by stages of financing (see Testa, G. et al., forthcoming).

Looking at the seed VC investment map, it is evident that Berlin (DE30 NUTS 2 region), Paris (FR10 NUTS 2 region), London (UKI31 NUTS 2 region) and Oxford (UKJ1 NUTS 2 region) attracted higher amounts of investments than elsewhere. A significant amount of seed-stage VC was also invested in Amsterdam (NL32 NUTS 2 region), Helsinki (FI1B NUTS 2 region) and Dublin (IE06 NUTS 2 region). Looking at the start-up stage map, VC over the same period was also concentrated in the regions of Paris, London, Berlin, Dublin, and Stockholm. However, the regional distribution of start-up VC is more evenly spread than that for seed-stage VC. The regional distribution of later-stage VC contrasts with that for early-stage VC. Berlin, London, Paris, Stockholm continue to account for more investment volume compared to other EU regions, but fewer regions are concerned. It is also worth noting that the scale of total later stage investment was larger than the scale of total early (seed and start-up) stage investment.

Thus, in line with expectations, VC investments tend to cluster geographically in the most advanced regions. This can be attributed in part to the location of VC firms, and in part to the availability of investment opportunities. Secondly, the data suggest a potential bias towards start-up investments in EU VC-backed companies, but a more solid network analysis between VC firms and companies would be needed to test for this. Thirdly, to draw implications for policies in support of EU VC, it would be interesting to investigate whether or not VC investments target the major EU regions, because they are affected by the presence therein of specific support programmes.

[30]Note that the dominance of some regions may mask important globalising forces. Although companies headquartered in certain European regions received a higher share of VC investments than others, some of these funds may be reinvested in foreign operations.

Box 4. 'HGE Indicator Framework' – Financing Growth

As outlined in Chapter 2, the analysis in this chapter of financing growth in HGEs or potential HGEs with a particular focus on VC is reflected in the 'HGE indicator framework' via the inclusion of the following indicators (also reported separately for each country in the country factsheets): **HGE availability to finance**; **Venture capital seed**; **Venture capital start-up**; **Venture capital later stage**; **SME access to loans**; and **SME access to equity**.

Figure 40 shows these financing growth-related indicators. The overall picture suggests that the availability and uptake of VC is highly polarised within the EU with one country having the highest share of seed stage funding relative to GDP (Malta). Data reveal that start-up stage VC in UK, Ireland and Sweden account for the largest values as a percentage of GDP and UK dominates in the same regard for later-stage VC. Access to equity for SMEs, on the other hand, is visibly similar in a larger set of countries (Sweden, Finland, Denmark and the UK), with Estonia being the only non-Western European country. This is different for loans, which shows a relatively uniform distribution.

Overall, the UK, Sweden, Finland, France and Malta are the Member States with the highest relative performance across the six indicators on HGEs financing growth. Greece, Romania, Cyprus, Latvia and Croatia are the Member States with the lowest relative performance across the six indicators on HGEs financing growth.

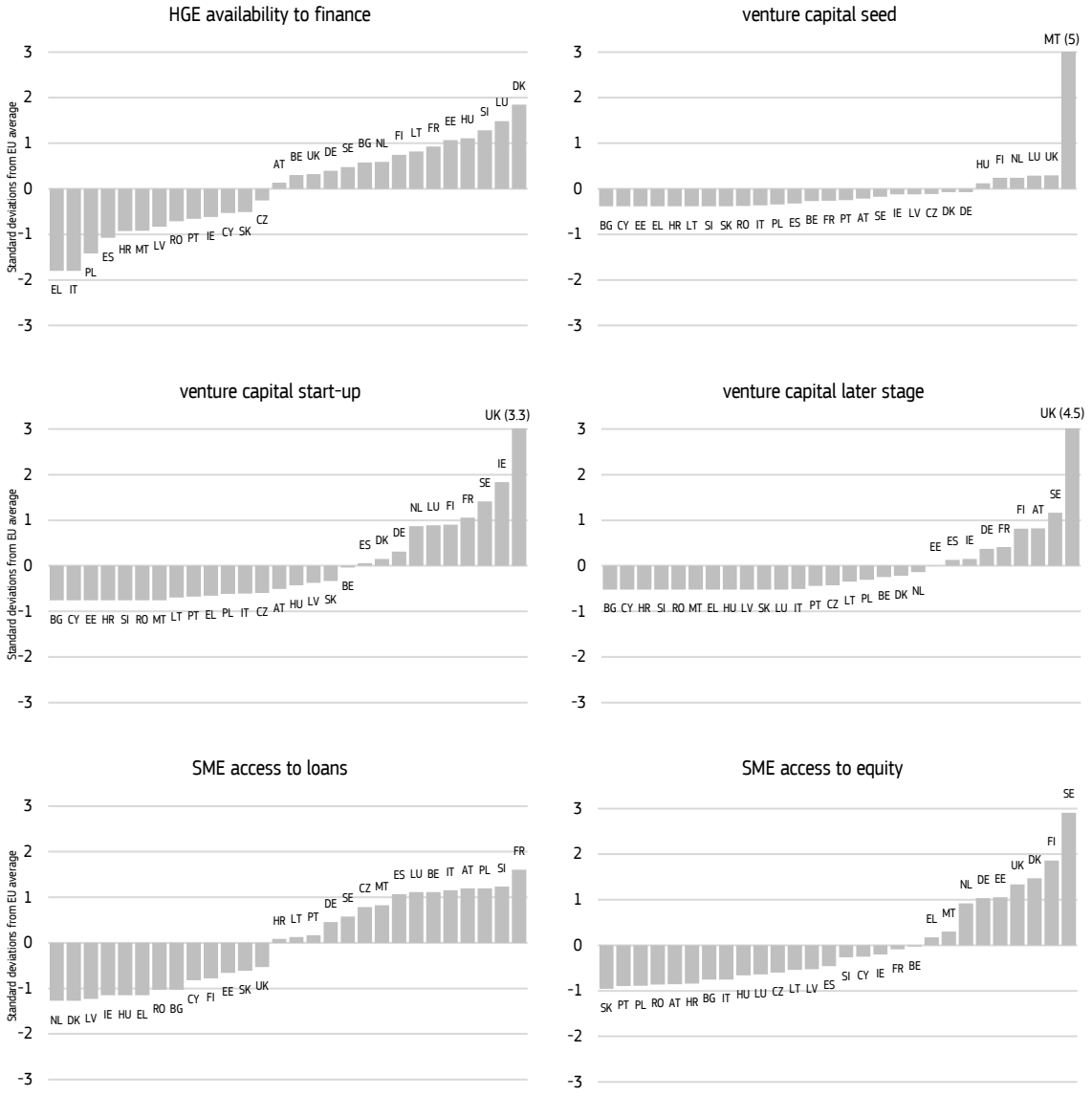


Figure 40: Financing indicators of the HGEs indicator framework

5. Policy measures

5.1. How do policies target HGEs?

In this section the degree to which national policy measures are tailored to HGEs is examined, and whether they favour certain sectors, sizes and ages over others. Table 5 presents a synthesis of some relevant information gleaned from a network of national experts[31] who – within the frame of this analysis on HGEs – examined the characteristics of the main funding instruments in a number of Member States.

As already known from the debates in the academic literature on the various definitions of HGEs, it turns out that HGEs are not a clearly defined and recognized policy target group. Situated at the interface between innovation and entrepreneurship, HGE policies are in fact at the intersection of general innovation policies, SME policies that also target non-innovative SMEs, and industrial policies with a specific sectoral focus.

Table 5 also shows that very few national policy measures specifically target HGEs. This is probably due to the difficulty of defining and anticipating high growth ex-ante. Policy instruments usually target young innovative SMEs with growth potential. The requirements for a firm to qualify for support vary from measure to measure, and they mostly relate to size, revenue, age or innovativeness:

- Most instruments in the EU apply the EU SME definition in terms of size.[32,33]
- Investee firms are usually expected to continue to grow rapidly and to have certain run-rate revenues[34] or a certain turnover.
- In terms of age, beneficiary firms should be young, e.g. less than 10 years old, less than 7 years old or even less than 3 years old, depending on the specific instrument.
- Firms should also show "innovative activity" or should be "technology-oriented"[35]

In terms of sectoral focus, some policy measures have an explicit high-tech focus (e.g., in Germany and Lithuania) but most policy measures do not explicitly target specific sectors. In practice, however, the majority of the beneficiary companies seem to be in the ICT, health and clean-tech sectors.

The policy mix supporting access to finance for young innovative companies with growth potential in the EU is quite diversified.

As far as *debt-based* support instruments are concerned, loans and loan guarantees are used by all countries to improve SMEs' access to finance, but in terms of funding volume they are usually lower than equity instruments for supporting the scale-up of young innovative companies (Gampfer et al., 2016). Whereas evaluations show that guarantees are very successful in leveraging private loans, there is no evidence of positive economic impact specifically on HGE (this is, however, also because most evaluations of guarantees do not assess this question). Direct loans or grants explicitly supporting scale-up exist in a number of countries and they often finance international expansion/internationalisation in particular. The policy literature provides some evidence that combining different types of funding works very well. For example, the impact of a Finnish programme (Young Innovative Companies - YIC) that combines loans and grants, as well as coaching and networking support, has been deemed very positive in an evaluation (Autio and Rannikko, 2016).

Tax incentives are much rarer as a form of public support. They are used to a much greater extent in the United Kingdom, where tax incentives for equity investments have a long history as instruments to support VC investments. However, the few evaluations available demonstrate very limited effects of such tax incentives on beneficiary companies' turnover and job growth (Cowling et al., 2008). This calls into question the instrument's efficiency from a public policy perspective, given the high costs in the form of forgone tax revenue.

Among *equity-based support instruments*, most provide indirect support, i.e., public funding is used to leverage private investment and the investment decisions are taken by the private actors. One of the most common vehicles of indirect support are the fund-of-funds instrument, whereby the public sector invests in private VC funds. Public VC funds investing directly in companies is used in some countries (e.g., Finland, Denmark) but only to a lesser extent. This is due to the idea that the higher portfolio diversification of the fund-of-funds and the possibility to harness the sector-specific experience of private fund managers in multiple sectors leads to higher returns on investment (Gampfer et al., 2016). Moreover, fully public funds are less effective in coaching and mentoring investee companies (Cumming, 2013). Some recent evaluations (e.g., Baldock, 2016) note the shift of government-backed VC from direct funding which might require private matching (e.g. Finnish Industry Investment) to private VC-led hybrid co-funding (e.g. the ECFs in the UK). This makes the case for a focus on policy measures to support and enhance HGEs via supply of adequate VC.

[31] National experts with knowledge of national policy measures facilitating access to finance for young innovative companies in their countries.

[32] European Investment Fund (2019). European Angel Fund. Available at: https://www.eif.org/what_we_do/equity/eaf/

[33] European Investment Fund (2019). Mezzanine 'Fund of Fund' for Germany (MDD). Available at: https://www.eif.org/what_we_do/resources/MDD/index.htm 12/05/2019.

[34] European Investment Fund (2019). ERP-EIF Co-Investment Growth Facility. Available at: https://www.eif.org/what_we_do/resources/ERP_EIF_Co-investment_Growth_Facility/index.htm

[35] The InnovFin SME Guarantee Facility for example supports SMEs that should be innovative according to engagement in risky product, process, or service innovation, significant innovation potential, or investment – see: https://www.eif.org/news_centre/publications/eif_flyer_innovfin_sme_guarantee_en.pdf

Table 5: Age, Stage and Sector requirements of some specific policy measures (based on JRC Questionnaire available upon request)

Main policy measure(s) in	Age	Stage	Sector
Germany	Young (<3 years)	Seed and early	High tech
Austria	Young	Early and growth	All
Finland	Young (<5 years)	Early and growth	All but mostly ICT, health, cleantech
Belgium	Young (max 5-10 years)	Growth	All
The Netherlands	All but in practice young (average age of beneficiaries 6 years)	Early and growth	ICT, health, energy, cleantech
France	Mostly young (<10 years)	All	All but mostly ICT, energy, other scientific and technical activities
Spain	Young	All	Mostly ICT, healthcare, industrial products
Poland	Young	Early and growth	ICT, energy, cleantech, materials
Lithuania	Young (<5 years)	Early and growth	High-tech (robotics, photonics, AI, medical devices)

5.2. Rational for public equity/VC intervention

Governments are active VC investors in many EU countries, but the type and degree of their involvement varies (Alperovych et al., 2018). In some countries, governments invest directly in portfolio companies (alone or in syndication with a private investor), while in others, they channel funds to companies indirectly by acting as a limited partner (LP) in privately managed VC funds (e.g., funds of funds).

Governments intervene in the equity/VC market for a number of reasons:

- To overcome market failures;
- To reduce the so-called "financing gap";
- To promote emerging technologies;
- To remove barriers to entry.

Market failures are probably the most common reason for public interventions. Two types of situation are typical: (1) technology or expertise needs to be developed but the start-up company is excluded from bank loans as it cannot provide a track record; (2) the firm's technology needs to be developed further before it can be marketed, but the firm discontinues product development because it cannot capture the full rents from their R&D investment (e.g. when others can copy innovation through R&D spillovers). In both cases, the challenge is to help companies to invest in developing their own ideas and to grow.

Typically, venture capitalists invest in HGEs (i.e., scale-up companies which have a realistic chance of growing into a large company within five to seven years after the initial investment). In fact, small businesses are generally difficult to exit, and only "large businesses" have a realistic chance of going public or being sold in a liquid acquisition market[36]. Moreover, as rapid growth is difficult to attain in most industries, venture capitalists tend to focus on high-technology industries, where new products can penetrate or create large markets. In practise, this means venture capitalists fund only a handful of companies, and so some promising start-ups may remain unfunded.

To qualify for VC consideration, a company usually needs some product innovation that can create a large market[37]. Sometimes the proposed innovation is high-tech - e.g. a new drug or new type of software. Sometimes, the innovation might be a business process, where early movers may have erected entry barriers to competitors. Government intervention may help to reduce barriers to entry to new players, thus allowing greater levels of innovation and competition.

However, there are a number of risks associated to government intervention:

[36] However, Prencipe (2017) highlights that European VC-backed companies' choice of staying private or being acquired is often guided by the lack of European stock exchanges suited to host scale-ups.

[37] Signore and Torfs (2017) estimate the private value of innovations made by EIF-backed start-ups between 1996 and 2012. Interestingly, the authors find that EIF has supported patented innovations for a total volume of EUR 22.38bn – EUR 28.38bn for that period, and for every Euro of VC financing flowing into EIF-backed start-ups, VC-backed companies were able to create EUR 2.74 of private value via patented innovation.

- the crowding–out effect
- Evaluation and selection of investment opportunities based on policy objectives
- Start-ups re-location.

The so-called "crowding-out" effect would occur when government investment would displace private investments (Leleuxa and Surlemont, 2003). Empirical evidence on the effects of public equity/VC investment leans towards the absence of the crowding out effect on average, but specific program designs can make this happen. For example, Cumming et al. (2017) find evidence of a crowding-out effect in Canada as a consequence of the "Labour Sponsored Venture Capital Corporation[38]". Colombo et al. (2016) instead argue that government policy aiming at fostering the development of a private VC market may result more or less effective depending on the type - direct vs indirect - of government support.

However, there are few empirical studies that discuss the relationship between public and private investment at regional level. Kraemer-Eis et al. (2016) represents an important contribution as the authors use EIF investment data and VC investment data from Invest Europe to show that EIF increases VC investments at regional level and results in an improved regional VC ecosystem. More precisely, in their study, the authors indicate that a 1% increase in the EIF share of EIF-backed VC investments in a region leads on average to a 0.89% increase in the VC ecosystem investment volumes three years later. When focusing on the early stage VC investment, a study suggests that private institutional investors have moved away from investing rather than being crowded out (DAMVAD 2013). The reason is that sub-par investment performance and poor historical returns have reduced private sector willingness to invest in the early stage VC.

Empirical evidence for the impact of government equity/VC capital on firm performance also provides unclear conclusions. On average, VC-backed companies appear to perform better than public VC-backed companies in terms of successful exits (Brander et al., 2015), innovation output (Bertoni and Tykvová, 2015), sales and employment growth (Grilli and Murtinu, 2014), although there are also several success stories.

Policy makers find it difficult to identify and select the "right" HGEs, i.e. "not those that would grow in any case but, only those that do not grow because of the existence of market failures" *(OECD Science, Technology and Innovation Outlook 2018*, 2018). Instead, they tend to support those companies that fit best the profile of a public mission perspective.

Finally, since a significant share of young and high-growth companies funded with public money at an early stage re-locate abroad, the positive spillovers stemming from government investments might be partially lost (Onetti, 2017). Similarly to a start-up re-location, governmental investment and its capacity to reinforce the market structure with young innovative companies may be "lost" due to a foreign acquisition.

5.3. Are HGEs publicly supported?

EU governments are heterogeneous in their policy support to the VC industry: some use a direct government VC approach, while indirect government VC investment prevails in others. Invest Europe data permits an overview of the use of these two channels of public intervention in the VC market across EU countries for the period 2007-2018.

To this end, VC investments made by 13 investor groups[39] are aggregated into three categories. Public VC investments are "government agencies" and "sovereign wealth funds". Mixed VC investments are those involving public money but which are managed by pension funds and fund-of-funds (FOFs)[40]. The remaining investments are classified as purely private VC investments. Figure 41 reports the amount of private, public and private/public investments[41] in the EU VC industry over the last twelve years. The data shows that private, public and mixed investments have risen in recent years. In particular, public investments have more than doubled in 2018 (from EUR 703 million to EUR 1.7 billion). On average, EU private venture funds account for about 59% of VC investment; public VC funds for approximately 25%; and mixed VC funds for about 16% in the sample of countries.

Figure 42 shows the size of VC funds by type of investors relative to total amount of investments for 23 Member States in 2017 and 2018 (Croatia, Slovakia, Czech Republic, Malta and Cyprus were excluded as we could not retrieve information on VC investments in these countries for 2017 and 2018). The data show that in EU both the share of government VC investments and the share of private VC investments have decreased from 51% in 2017 to 46% in 2018 and from 24% in 2017 to 16% in 2018 respectively. The four measures of VC investments also vary significantly across countries and over time. Figure 42 shows that in some countries (e.g., UK, France, Netherlands, Luxembourg) the private sector plays a major role in the VC industry in the last two years, whereas in some other countries (e.g., Hungary, Poland, Bulgaria, Italy) the direct public support is bigger than the private sector support.

[38] The program provided generous tax benefits to retail investors in mutual funds that invested in private entrepreneurial firms.

[39] Invest Europe classifies VC investors in 13 groups. These are: academic institutions, banks, capital markets, corporate investors, endowments & foundations, family offices, fund of funds, government agencies, insurance companies, other asset managers, pension funds, private individuals and sovereign wealth funds.

[40] Pension funds include those made by government entities, private companies, and non-profit organizations. Funds-of funds (FOFs) are group of private and public intermediaries that instead of investing directly in companies, invest in other private equity funds.

[41] Generally as public investors intervene in situations where market failure exits, they tend to make relatively small investments. Therefore, the amount of investment turns out be a less accurate measure than the number of investment. However, since this latter measure is not available in our Invest Europe database, we used the amount of investments.

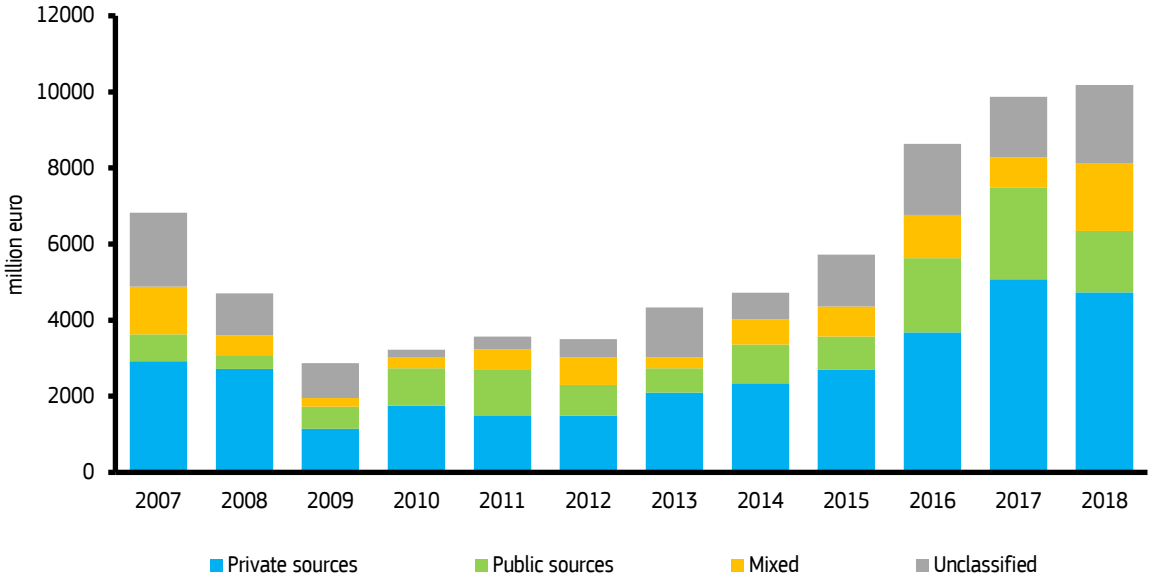


Figure 41: VC Funds raised by source in EU 28 Member States (Million euro), 2007-2018 (Invest Europe data)

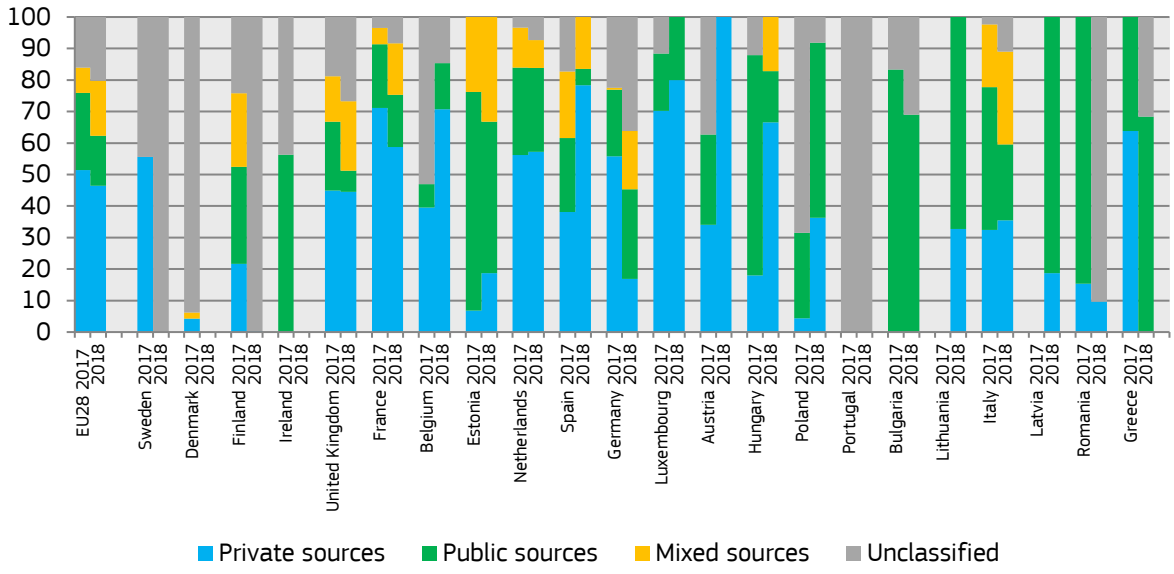


Figure 42: VC Funds raised by source as % of total VC investment, 2007 and 2018 (Invest Europe data)

Box 5: Introductory information on the differences between Invest Europe and Venture Source database

In this section, numbers, diagrams and statements are largely built on statistics from Invest Europe (formerly EVCA, the European Private Equity & Venture Capital Association). Invest Europe monitors direct private equity investment funds that primarily focus on investments in Europe. The funds included in the statistics are private equity funds making direct private equity investments, mezzanine private equity funds, co-investment funds and rescue/turnaround funds. Invest Europe private equity statistics do not include infrastructure funds, real estate funds, private debt funds, distressed debt funds, primary funds-of-funds, secondary funds-of-funds and private equity / VC-type activities that are not conducted by private equity funds. Also not included are activities of business angels and hedge funds as well as corporate acquisitions outside of dedicated corporate venture programmes. Finally, Invest Europe data do not include accelerators and incubators.

The second factor of difference is that most of the collected information from Invest Europe is sourced directly from private equity funds, whereas Venture Source data are sourced directly from VC-backed companies. This implies that Invest Europe data depend less on public sources like Venture Source data provider to derive investment amounts and

numbers.

Another factor of difference between the Invest Europe and Venture Source database is in the definition and interpretation of investment stages. The Venture Source database provides a more complete description of investment stages, along with sub-categories (e.g., VC seed, VC 1 round, VC 2 round, VC 3 round, VC 4th, VC 5th, VC 7th, VC 8th, VC 9th, and VC later) compared to Invest Europe. Thus, the three categories "seed", "start-up", and "later-stage" are not the same between Venture Source and Invest Europe. For example, in Invest Europe, the first category includes the first round of financing received by the company from a VC fund, although many of these companies receive previous rounds from business angels or incubators/accelerators that are not included in Invest Europe statistics. The third category "later-stage" in Invest Europe includes the 3th and the 4th VC round only. Please note that Invest Europe do not count "growth capital" investments in the total VC, causing an overlap from VC-backed companies that go on to attract growth investments at a more mature stage. On the other side, Venture Source has a clear definition of financing rounds.

For all these reasons, Invest Europe statistics can differ from the numbers reported by other data providers such as Venture Source data.

5.4. Government equity programmes

According to data gathered from 20 national experts, government equity programmes targeting HGEs differ across EU countries. A large number of equity programmes in place in our sample of EU Member States fall into three categories: (i) direct investment through government funds, (ii) fund-of funds, and (iii) public/private co-investments.

According to the available data, 16 out of 20 EU countries covered by the questionnaire have direct public equity funds; 7 have fund-of-fund programmes; and 5 have co-investment funds. Moreover, 8 countries indicated they have evaluated their equity programmes. The data collected also show that more than 50% of the equity programmes have sector requirements (ICT, biotech and clean tech are the most targeted sectors) and 65% of programmes target specific stages (mainly start-up and growth stages). A few of them (30%) have age and size requirements. Section 5.4 will discuss in-depth the eligibility rules of our government equity programmes.

Table 6: Types of government supported equity financial instruments in countries who responded to JRC questionnaire[42]

Country	Public Equity Funds	Fund of Funds	Co-investment Funds	Equity Assessment
Austria	X	X		X
Belgium	X			
Cyprus			X	
Croatia	X			
Czech Republic		X		
Estonia			X	
Finland	X	X		X
France	X			
Germany	X	X	X	X
Greece	X			
Hungary	X			X
Italy	X			X
Netherlands	X	X	X	X
Latvia	X			
Lithuania	X			

[42] The Questionnaire can be made available upon request.

Poland	X			
Portugal	X			
Slovakia			X	
Spain	X	X		X
Sweden	X	X		X

Three major types of government equity programme supporting HGEs emerge from data gathered in 2019 by the JRC: a) Direct public funds, b) Fund of funds, and c) Co-investment Funds.

a) Direct public funds

These are public-equity funds, which invest directly in portfolio companies to incentivise private VC investment in a country. As a result, many of these programmes require co-investment by private investors.

Tesi (Finnish Industry Investment Ltd) is a government-owned investment company that invests in HGEs, both directly and via funds. In 2018, Tesi committed EUR 62M to support start-ups and HGEs (Box 6).

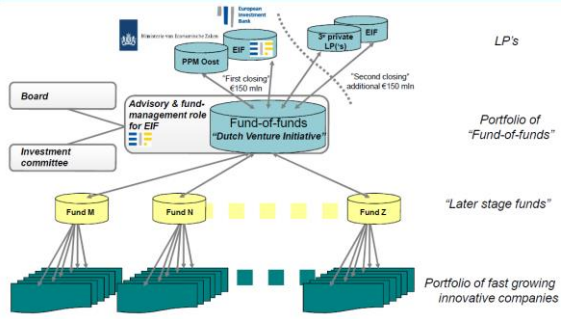
Box 6: A. Finish Industry Investment Ltd (TESI)

Classification: Direct equity/co-investment	**Year launched:** 1995
Size: 36 professionals (in Helsinki)	**Geographic scope:** National
Stage: Start-up, Growth and Expansion	**Sector:** ICT and digitalisation, health technologies, and clean-tech.
Overview: TESI invests in companies that seek to grow and to expand internationally. TESI prioritises Finnish firms or companies operating in Finland, but they also invest in foreign companies if the capital is used for business development in Finland. TESI aims to improve Finland's VC/PE market. They also invest hand-in-hand with private investors.	
Structure: In 2018, direct investments comprised first-round investments of MEUR 52 and follow-on investments of MEUR 10. The focus of venture investments was fast-growing deep tech companies, such as ICEYE and Dispelix. TESI operates on market terms and makes its investments on the same terms and conditions as private investors. **Source:** *https://vuosikertomus.tesi.fi/2018/en/*	

b) Fund of funds

Rather than investing directly in portfolio companies, a fund of funds (FOF) invests public money in other private-equity funds. For example, the public Dutch Venture Initiative (DVI) invests exclusively in other VC and equity funds through FOFs (see Box 7). These FOFs can be quite large: by end of 2017, the DVI-II has committed capital of EUR 103.5M, and it leveraged EUR 780 million of capital from different funds. FOFs appeal mostly to wealthy individuals and regional institutions that are not large enough to support a diversified portfolio of Limited Partners commitments. By pooling their resources in a FOF, a group of smaller investors can gain access to a diversified portfolio of funds and take advantage of the contacts and skills of the specialised FOF intermediary.

Box 7: B. Dutch Venture Initiative II (DVI-II)

Classification: Fund-of-funds	**Year launched:** 2016
Size: Not found	**Geographic scope:** National
Stage: Early and development stages	**Sector:** ICT, clean-tech, med-tech, renewable energy and life sciences
Overview: The Dutch Venture Initiative II (DVI-II) aims at investing in fast growing and/or innovative companies in high-tech sectors.	
Structure: • DVI-II is a fund-of funds investing in VC/private equity funds focusing on Dutch fast growing innovative firms. • Sectors: High-tech, Clean-tech, ICT • Fund size: EUR 103.5M • Targeted portfolio of 7 different funds. • Run and advised by EIF  Source: Jan Dexel, Programme manager Venture Capital, Board member Netherlands Investment Agency (NIA) **Source:** https://www.eif.org/what_we_do/resources/dvi-II/index.htm,	

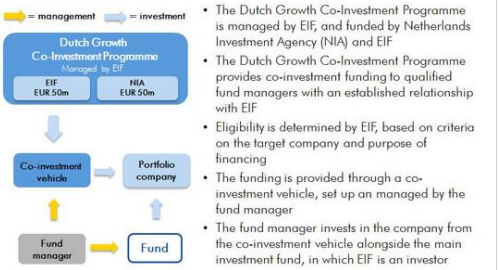
c) Co-investment funds

Co-investment funds use public money alongside private money. Typically, these programmes match public funds with those of private investors, who are approved under the scheme (see Box 8). This implies that, following their private investor partners, they have very low overhead costs compared to directly managed public sector funds. Moreover, by investing alongside private investors their ability to add value is greater.

Co-investment funds differ from other public sector investment equity programmes because the success (or failure) of the fund is entirely due to private investors' ability to choose investments. Indeed, the co-investment Fund does not undertake its own due diligence and, as long as the investments meet the broad criteria set for the Fund, it does not take part in the investment

decision, but it depends entirely on private investors' judgement. Co-investment funds are thus seen as a way not only to increase the supply of private equity capital in the venture/equity market but also to support successful private investors.

Box 8: C. Dutch Growth Co-Investment Programme

Classification: Co-investment Fund	**Year launched:** 2017
Size: Not found	**Geographic scope:** National
Stage: Growth	**Sector:** All
Overview: The objective of the Dutch Growth Co-Investment Programme is to support innovative Dutch enterprises, by providing co-investment funding alongside equity investment funds and private investors on market terms and conditions. It will focus mainly on SMEs and small midcaps with a strong growth profile, and is targeting the "second equity gap" that companies face when they move beyond the start-up stage and into the growth phase of their lifecycles.	
Structure: 	
Source:https://www.eif.org/what_we_do/resources/dutch-growth-co-investment-programme/index.htm	

5.5. Policy lessons from financing HGEs

The JRC recently conducted a series of studies to assess the effectiveness of national policies to support HG(I)Es performance by improving their access to finance. The studies provide some interesting insights on policy evaluation design, implementation and common evaluation challenges. While this section does not discuss in-depth the economic impact of policy instruments, it will provide a focus on policy design and potential relevance of four types of instruments for HGIEs.

a) Grants

According to our JRC report (Testa and Szkuta, 2018), grants and/or loans have great influence in supporting firm economic and innovative performance. More precisely, evidence from policy evaluations shows that between 18-55 percent of beneficiaries (from any R&D grants targeting potential scale-ups) report an increase in employment as a result of their participation in R&D programmes. Evidence from our collected econometric studies (see Testa and Szkuta, 2018) confirms that R&D grants targeting innovative firms with growth potential significantly increases the number of employees.

There is also evidence from our collected econometric studies that R&D grants for young innovative firms with growth potential significantly increases total sales and share of innovative sales. It shows that the percentage of surveyed beneficiaries (from any R&D grants targeting potential scale-ups) reporting an increase in total sales after the grant range between 33% and 92%. Furthermore, evidence shows that between 29-61 (values range) percent of granted firms were engaged in product or service innovation after receiving the grant. Econometric studies provide robust and valuable evidence of the positive effect of R&D grants on firm innovation measured by patent application.

When comparing the results from R&D grants for young innovative firms with growth potential with generic R&D grants and R&D subsidies, the effects are larger for R&D grants for young innovative firms with growth potential. Given that policy interest in supporting HGEs through grants remains high, a number of lessons can be learned from the study. In particular, it is clear that in order to ensure that the intended effects are achieved, there is the need to:

- Link R&D grants to growth aspiration and achievement of milestones;
- Involve coaching services (e.g. training, and mentoring advice) alongside the provision of appropriate capital;
- Require strong growth motivation from participants;
- Support firms' organizational capacity for growth.

Other empirical studies (see Gans and Stern, 2003; among others) on the impact of grants and venture capital on firms' performance confirm that grants and venture capital financing are found to contribute significantly to firm performance, controlling for other variables. A possible explanation for this result is that grants can make companies more investable, by de-risking them for private investors. However, evaluating the impact of grants is problematic largely because it is necessary to know at which point in the firm's development the evaluation is made. In addition, there is the need to distinguish between how much of the firm performance can be attributed to the grant and how much to the VC investment. This again highlights the need to understand the financing of HGEs over time.

b) Fiscal/Tax incentives

Very few EU countries have some form of fiscal incentives in place targeting "young innovative companies". Indeed, the JRC evidence and findings suggest that older and larger firms benefit mostly from R&D tax incentive schemes.

When looking closely to young innovative companies with growth potential, the report (Testa and Szkuta, 2018) reveals that there are variations in the impact on different sectors and types of R&D firms. For example, the high take-up of the Jeune Entreprise Innovante scheme by new or emerging sectors, such as in ICT, where firms represent the majority of beneficiaries, highlights the importance of the funding for this particular sectors (although these types of companies may also represent a higher share of new companies overall). Yet, other findings by (Bodas Freitas et al., 2017) assess the impact of R&D tax credits on firms'

innovative sales in different firms grouped by the taxonomy of R&D in Italy and France. It is shown that a particularly strong effect occurs in specialised and supplied sectors in both countries. From a policy perspective, as highlighted by the greater participation rates and effectiveness achieved by the schemes on Belgium and France, which explicitly target young innovative companies, it is then recommended to broaden the uptake of tax credit measures to scale-up companies.

c) Equity financing instruments

According to a recent study (Szkuta and Stamenov, 2017), equity instruments have significant impact on employment and turnover growth, while there is limited evidence to date on the effects on innovation, perhaps due to the fact that the innovativeness of the company is one of the entry criteria for such scheme. Moreover, despite the fact that not many countries have evaluated these equity programme with robust and proper methodologies[43] (such as counterfactual analysis), it is clear that i) the effects on economic performance are highly concentrated among the top 5-15% of supported firms delivering the vast majority of returns, and ii) evaluated instruments have a strong sectoral focus, with ICT and biotechnology capturing most of the funding. Interestingly, the findings suggest the design, management and incentive structures of these instruments are critical. In particular, adding value services (e.g. networking and coaching) and employing experienced fund managers is important as well as having larger fund size and flexible geographical boundaries.

Finally, policy could learn from some "failure" examples. Gilson (2003) writes about the unsuccessful German WFG programme to set up a Venture Capital market in Germany, which is referred to as "one early German failure that got every element wrong". The mistakes include providing expensive government guarantees against downside losses, and insufficient incentives for investors to become actively involved in the nascent ventures. Care should therefore be taken to get the incentive structure right.

d) Loan guarantee instruments

The evaluation evidence for loan guarantee instruments is relatively scarce. Nevertheless, an EIF Working paper (Bertoni et al., 2018) assesses the real performance effects of EU-guaranteed loans to SMEs disbursed in France during the years 2002 to 2016. The study estimates that on average, French SMEs benefitting from EU-guaranteed loans experienced additional 9% asset growth, 7% sales growth, and 8% employment growth compared to the control group. The economic significance of the effect is typically stronger for smaller and younger firms.

[43] An important exception is the recent study from Pavlova and Signore (2019) exploring the impact of EIF VC on the financial growth of young and innovative firms in Europe. Interestingly, the authors find that start-ups supported by the EIF show faster growth in terms of assets compared to non VC-backed firms.

6. Conclusions and next steps

6.1. Recap of main insights and findings

The premise of this report is that while HGEs are considered to be key to economic development and industrial renewal, there is a paucity of evidence to optimally inform whether or not, and if so on what, public policy should act.

The report builds on published literature which has shown *inter alia* that HGEs are responsible for a large share of job creation (Hallak and Harasztosi, 2019) and productivity gains (Haltiwanger et al., 2016), and that they can leverage efficiency and competitiveness gains in the sector and region in which they are located (Decker et al., 2016; Monteiro, 2019). It proceeds to compile a data and analysis based picture, shedding light on many relevant dimensions of the HGE phenomenon in Europe. At the centre of the approach is a tailored - both comprehensive and succinct – 'HGE indicator framework', providing policymakers with a broad and multi-level overview to inform potential HGE-targeted policy.

For the report to be a useful input for policy, and to the European Semester process in particular, it contains cross-country, cross-sector and notably country-specific analyses of available data sets and indicators relevant to HGEs, including a focus on financing growth. This sheds light on the conditions in Member States affecting HGE development (see Figure 1*: Relative performance of Member States* and the Country Factsheets in the Annex). Wherever possible, data visualisations and empirical analyses in HGEs Country Factsheets have been broken down to the regional (NUTS-2) and industry levels (NACE 2-digit), to provide country-specific and internationally comparable insights.

In short, this report provides: (i) a synthetic EU-wide comparative discussion of the data and indicators pertinent to the demographics and financing of HGEs and a selection of the most important framework conditions as well as of mostly financing-related policy measures; and (ii) in the Annex, summary country-specific analysis in the form of HGEs Country Factsheets for 21 Member States.

Demographics

As shown in Chapter 3, the number of HGEs per Member State roughly correlates to the size of the national economies. However, the country-specific proportion of HGEs of all active firms varies widely around the EU average. Year-to-year variability in the ranking of this proportion by Member State may be linked to business-environment specificities as well as to unpredictable factors giving rise to high growth in enterprises.

The time evolution of the regional HGE proportion of all active enterprises shows different national trends. Across all regions there is no systematic correlation between the number / proportion of HGEs in regions and the corresponding level of regional innovativeness.

HGEs occur across the entire business economy although with a varying sectoral intensity. Not only are HGEs ubiquitous, they also account for a sizeable proportion of all active firms, varying from 7% to 20% across industries in 2016 – the overall average was around 11%. Their share tends to be higher in knowledge-intensive service industries than in manufacturing-related ones.

The share of HGEs has been growing disproportionally. The average share of HGEs among the EU28 firm population increased from 9.2% to 10.7% between 2014 and 2016. Since the number of HGEs in the EU grew during the aforementioned period, this indicates that HGEs growth outperformed general enterprise growth.

HGEs are responsible for most net employment growth in the EU. From 2015 to 2016 they accounted for 53% of net employment growth (between 2014 and 2015 the figure was 90%!) though they only make up 11% of enterprises in the business economy.

Financing

In Chapter 4 figures on financing growth are shown, with the aim to provide a synoptic discussion of the range of financing means employed by firms with high growth potential.

While debt dominates the financing of firm growth, VC is availed of more often by HGEs than other firms. Even though VC finance is rarely used, it seems particularly suited to financing potential high-growth firms with high-risk and high-innovation profiles.

The geographical distribution of VC investment volumes shows the expected concentration in major urban hubs and hinterlands. However, data also show that the regional distribution of start-up VC is more evenly spread than that of seed-stage and later-stage.

41% of VC investments in the EU in 2017 went to medium-sized companies (50-249 employees), followed by small-sized companies (29%, 10-49 employees), and large companies (22%, >249 employees). Only 8% went to micro-sized companies (less than 10 employees).

Policy measures

Chapter 5 provided a discussion on existing policy measures within and across Member States and – when information is available in form of policy evaluation studies – their impact.

Just a few national policy measures specifically target HGEs *per se*. HGE-favourable measures tend to focus more explicitly on young innovative SMEs with growth potential. Eligibility criteria for availing of such measures vary but most relate to firm size, revenue, age (less than 7-10 years old) and some metrics of innovativeness. In this regard, some policy measures actually have an explicit high-tech focus.

Even though most non VC-related measures do not target specific sectors, most beneficiaries still tend to be active in high-tech sectors like ICT, health and clean-tech. Policy interest in supporting HGEs through grants (e.g. for R&D) remains high though the effects of such

grants on realising growth aspirations remain to be shown.

National policy mixes supporting access to finance for young innovative companies with growth potential in the EU are quite diversified. As far as debt-based support instruments are concerned, loans and loan guarantees are used by all countries. Governments are also equity (VC) investors in many European countries, but the type and degree of their involvement varies. In some countries, governments invest directly in companies (alone or in syndication with private investors) while in others they channel funds to companies indirectly as limited partners in privately-managed VC funds (e.g. so-called funds of funds).

Tax incentives are much rarer except in the UK where they have long been used to support VC investments. A few Member States (e.g. BE, FR) have some form of fiscal incentives in place targeting "young innovative companies".

On average, between 2007 and 2018, public funds accounted for 25% of VC investment in the EU, mixed public-private funds for 16% and private funds for 59%. Over this period, the shares of public and private VC investments increased respectively from 10% to 15% and from 43% to 46%. In volume terms, public VC investments in the EU more than doubled from 2017 to 2018 (from EUR 703 million to EUR 1.7 billion). In some countries (DE, PL, BG, ET, LT, LV, EL) direct public VC investment is bigger than that of the private sector.

More than 50% of public VC programmes have sector requirements (mostly ICT, biotech and clean tech) and 65% target specific stages (mainly start-up and growth stages). A few of them (30%) have age and size requirements.

Few countries have properly evaluated their public VC programmes. In spite of that, such programmes are evolving by adding networking and coaching features, employing experienced fund managers, increasing fund size and having flexible geographical boundaries. Recent academic literature also notes a shift in government-backed VC, from direct funding sometimes matched by private funds (e.g. Finnish Industry Investment) to private VC-led hybrid co-funding (e.g. the Enterprise Capital Funds in the UK or the Dutch Venture Initiative in the NL).

6.2. Next steps

In developing future directions for this work, a reasoned and substantiated discussion for policy and academic research advancements in the field of high-growth entrepreneurship is needed, which takes into account results emerging from a recent surge in relevant policy-orientated research, analysis in the academic and grey literature (see for instance Camerani and Guerini (2019); Hulthén & Graff (2019) and Nordic Innovation (2019)). Moreover, other on-going work could further shape the next steps, including related work streams by the OECD, EUROSTAT, EIF, EIB and others.

In conjunction with this, the current HGE indicator framework approach could be further developed aiming to increase its quality and relevance as a monitoring tool and source of valuable input to policy processes such as the European Semester. The 'framework conditions' part of the indicator set in particular could be further developed in the next stages of this work, for instance, by adding a component reflecting internationalisation and digitalisation aspects which can be condto high growth.

An important part of this discussion must be to keep sight of the bigger picture in terms of the role HGEs play in furthering economic, environmental and social sustainability, well-being and prosperity for our societies and what policy intervention rationales spring from this.

Areas for possible investigation might include:

- the role of HGEs in fostering and contributing to durable economic development and industrial renewal, as well as to the social and environmental imperatives of the Sustainable Development Goals
- factors and processes of change influencing HGE development, such as the nature and impacts of evolving business, market trends and technological developments – this could include evolving forms of HGE finance and the policy levers available to support or steer this
- the effects of administrative, fiscal and regulatory requirements, as well as other socio-political institutions, on HGEs and their ecosystems, along with the relevant cultural, social and other immaterial factors
- identifying implicit and explicit policy assumptions from relevant grey and scientific literature and policy praxis and scientifically assessing their robustness, with the aim of improving well-grounded knowledge of the HGEs phenomenon.

In summary, a good understanding of high-growth entrepreneurship is important for better designed policies addressing and facilitating sustainable growth of all forms of enterprises whether HGEs, start-ups, scale-ups, SMEs, mid-caps, etc. Further research is needed to understand factors at play in particular environments and contexts that enable growth, what happens before and after high-growth periods and what leads to such periods being repeated. There is still much to learn about HGEs.

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List of boxes

List of figures

List of tables

Annexes

Annex 1. The innovative character of HGEs

Vértesy et al., (2017) published a detailed study of different possible definitions of growth and innovation with respect to the question of how to quantify the numbers of innovative HGEs by sector and by country. They showed that variability in measures of growth and innovativeness mean that that the proportion of the total enterprise population could range from 0.1% to 30%[44] but they also settled on an overall estimation that, in 2012, about 7% of enterprises in Europe could be considered to be innovative HGEs. A more recent study by Ferrando et al. (2019)[45] found an 8% share of HGEs, reporting that they are mainly mid-sized companies with a relatively strong innovative profile. Elsewhere, the literature reports that HGEs *per se* are generally highly innovative irrespective of the overall innovative character of their sector (Brown et al., 2017), they tend to be younger than average - most having been in business for at least a couple of years - and they are not necessarily more common in high-tech sectors (Goswami et al., 2019).

This section makes an attempt at describing the demographics of high-growth *innovative* enterprises (HGIEs) in the EU. Such descriptions are typically constrained by methodological and data limitations, given that firms need to be described at the same time according to two dimensions: high-growth as well as innovation performance. Selecting firms in both dimensions require normative judgements. Obtaining statistics is a highly data-demanding task, necessitating, ideally, time series data on key balance sheet information, such as the number of employees or turnover, as well as information on the innovative activities of the same companies. These two are rarely available simultaneously for a large set of companies, because business registries (the typical source of company growth statistics) do not capture innovation, and innovation surveys (such as the Community Innovation Surveys (CIS), the widely-used sources for innovation statistics) typically refer to only a 2-year period.

One possible approach is to identify HGEs within *innovative* sectors. To this end, the following graphs show the HGE shares of the overall enterprise populations: for "innovation intensive" sectors (Figure 43); and for the "50% most innovative sectors" (Figure 44).

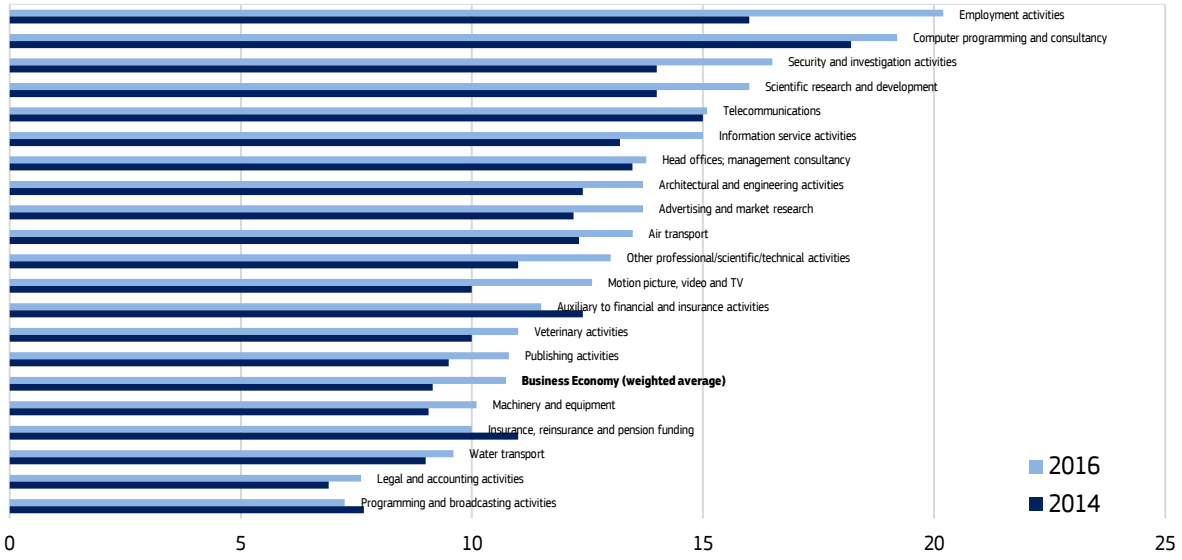


Figure 43: Industry shares of HGEs (defined by high and medium-high tech manufacturing and knowledge-intensive services) among all active firms in the industry for the EU28 in 2014 and 2016. Sources: JRC elaboration based on Eurostat (2019).

The **innovation-intensive sectors** are based on Eurostat's definitions of *high and medium-high tech manufacturing* and *knowledge-intensive services* (European Commission, 2019a). Eurostat defines each category by a specific NACE code, which is used to create a subset of industries that approximate HGEs since these particular sectors may be deemed to produce most innovation activity within the economy (Costa et al., 2016b).[46] The resulting subset of HGEs tends to be within sectors with a higher share of HGEs compared to the business economy average. Three reasons might explain this. First, the methodology for identifying HGEs in combination with data availability favours the selection of *knowledge-*

[44] See also (Daunfeldt et al., 2015; Moreno and Coad, 2015) for related discussions.
[45] Based on the European Investment Bank (EIB) Group's 2016-17 Survey on Investment and Investment Finance of non-financial firms in the EU and a sample size of 152,000 firm-years.
[46] Given that Eurostat does not provide the granularity of HGEs across all industries at NACE two-digit level, not all *high and medium high tech manufacturing* as well as *knowledge-intensive services* can be identified (see details in Table 9 in the Annex).

intensive services, resulting in services-dominated spectrum of HGEs. Second, operating within service-based sectors favours rapid scale-up and growth compared to product-related sectors. Third, HGEs benefit from and even require interaction as well as the transfer of knowledge across firms, thereby generating network effects and path-dependencies resulting in a concentration of HGEs within these sectors.

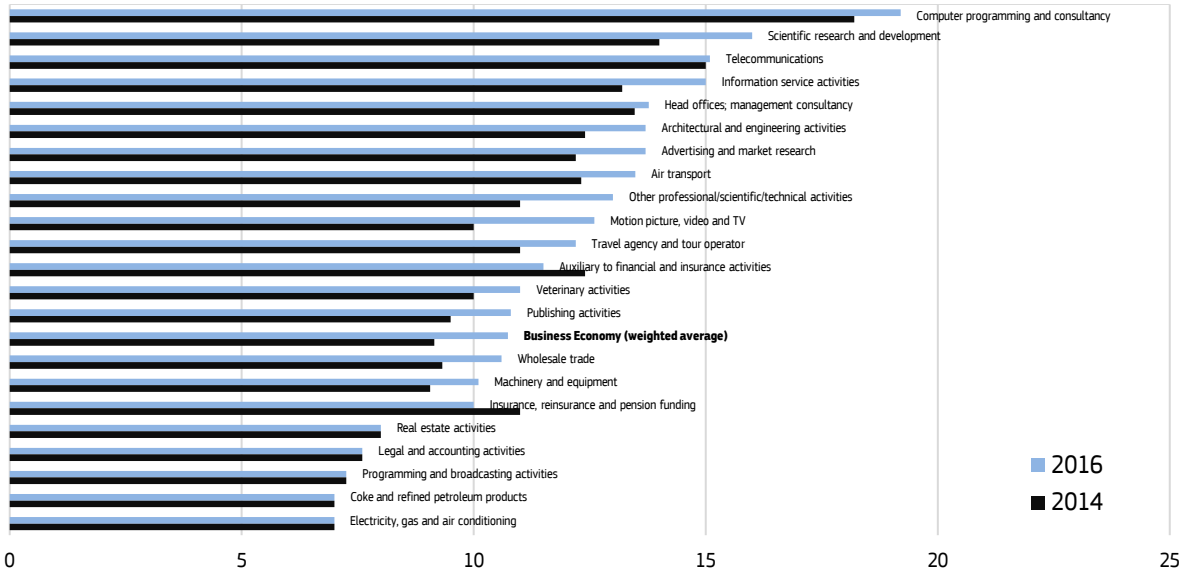


Figure 44: Industry shares of HGEs (defined by 50% most innovative sectors) among all active firms in the industry for the EU28 in 2014 and 2016. Sources: JRC elaboration based on Eurostat (2019).

The **50% 'most innovative' sectors** is taken from the European Innovation Scoreboard (European Commission, 2019b). It is based on a taxonomy combining innovation-related activities at the firm level using information from the Community Innovation Survey linked with data on Knowledge Intensive Activities (OECD, 2011).

Most sectors overlap across both approaches with a few exceptions[47] yielding a similar subset of firms and with proportions similar to those in Figure 12 (in the main body of the report). Both approaches show that innovative HGEs occur in all sectors and constitute a considerable proportion of firms in the business economy. Segarra-Blasco et al. (2018) have studied the links in EU countries between high-growth entrepreneurship and country-specific innovation characteristics. This work finds that for core EU Member States such as Germany, technological innovations are more likely to promote high-growth, compared to Mediterranean countries where non-technological innovations are a more important determinant. In the case of more recent EU Member States, the study found that firm characteristics and international trade are more significant as high-growth determinants.

Another approach is to identify HGIEs based on firm-level data.[48] The statistics presented below were computed based on a pooled sample of EU companies covered in the CIS 2012 confidential microdata accessible at Eurostat's Safe Centre, and refer to the 2010-2012 period. While the dataset allows a more sophisticated characterization of not only the innovation profile of HGEs, but also applying alternative definitions to identify high growth, its limitations should also be kept in mind. First, that contrary to HGEs figures defined in the business demography statistics, which look at average growth over a 3-year window, CIS data allow a shorter, 2-year window only, making data more sensitive to temporary growth spurts. Second, the precision of self-reported information on size (employment or turnover) is likely to be weaker than size information based on business registers.

Table 7 provides important insights into the demographics of HGIEs expressed as a share in the population of firms in the business economy. The left two columns apply the annual average growth of 10% (following the Eurostat definition), expressed in terms of both employees (baseline definition) and sales (turnover). Since HGEs may also be selected by taking into consideration the growth distribution of companies and their identification, i.e. the top 10% or top 25% fastest growing firms, Columns 4 to 6 serve to give readers an idea about the impact of changing the definition on the HGIE demographics. Different innovation profiles of companies are shown in the rows of the table – i.e., distinguishing different types of innovations (technological and non-technological and product or process in particular) as well as applying thresholds based on the degree of novelty (to capture, for instance, radical innovations) or whether the firm is exporting to foreign markets.

For instance, while it is found that HGIEs represent about 7.4% of EU companies if the baseline high-growth definition is combined with the introduction of any kind of innovations, only about 5.2% of firms are HGIEs if the requirement is

[47] The *innovation-intensity* approach uniquely identifies Employment activities; Security and investigation activities; and Water transport as innovative, where only the *50% 'most innovative' sectors* identifies Coke and refined petroleum products; Electricity, gas and air conditioning; Real estate activities; Travel agency and tour operator; and Wholesale trade as innovative sectors.

[48] This part of the Section has benefitted substantially from input provided by Daniel Vertesy (JRC).

stricter – that is, the introduction of technological innovation – but merely 3.8% if product innovators are considered. It is also clear from the table that on average, the baseline Eurostat definition for high growth selects a somewhat larger number of companies than what belong to the top 25% fastest growing ones.

Qualifying innovators by the degree of novelty of innovations further restricts the number of HGIEs. For instance, only 0.8% of firms are radical innovators that introduced a new-to-the-world product innovation, considering the baseline definition, yet, it can be seen that most of these firms are exporters.

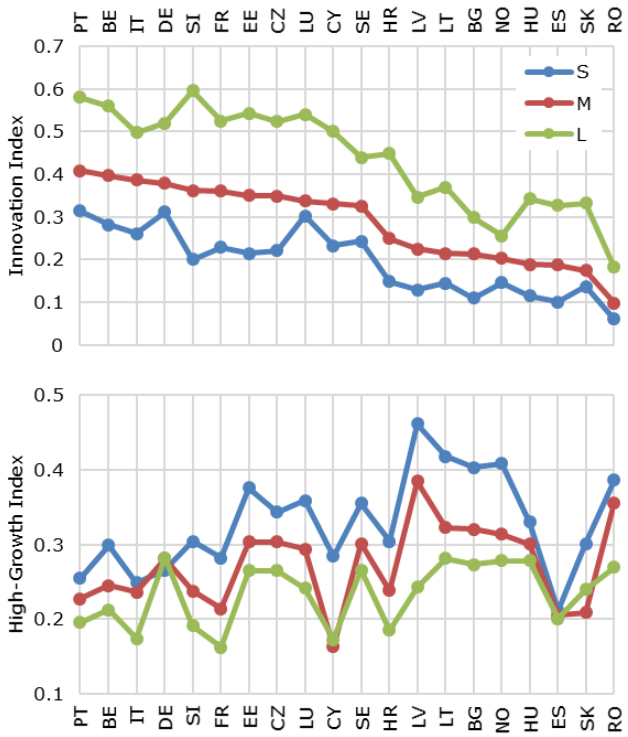


Figure 45: Innovation and high-growth performance of companies across Europe, by firm size.

Note: The Innovation and High-Growth indices aggregate key definitions defining innovation and growth performance of European were computed based on Vértesy et al. (2017). Size classes were defined by number of employees: S = 10-19; M = 20-250; L = 250+. Sources: Authors' calculations using CIS 2012 microdata, based on Vértesy et al. (2017).

Figure 45 highlights differences in the distribution of HGIEs across countries by the three main size classes. Average high-growth and innovative performance of companies are measured using composite indices, which is one way to overcome the arbitrariness of defining the two dimensions. (The indices combine the most commonly used definition; higher values indicate stronger, the lower weaker average performance – for details about the calculation of the indices, please refer to Vértesy et al., 2017).

Looking at the upper and lower panels of Figure 45, a certain trend is visible, suggesting a negative relationship between the two concepts – countries in which companies report the strongest innovation performance have relatively less HGEs, and vice versa. A similar reverse pattern is visible for size classes: small firms are typically the weakest performers in terms of innovation, but have the highest rate of HGEs, large firms show just the opposite trend. In terms of innovation performance, the gap between large- and medium-sized firms is typically larger than between small- and medium-sized ones. However, such a pattern is not observable for high-growth performance.

Some countries show a different trend compared to the average. For instance, there is little variation in high-growth performance across size classes in Germany, Spain or Hungary, and Slovakian medium-sized firms are outperformed by large ones in this dimension.

Table 7: Share of High-growth, innovative companies in the business economy in Europe, by definitions of innovation and high-growth.

	>10% annual average growth		**Among top 10% growth (by size class, growing firms) in terms of**		**Among top 25% growth (by size class, growing firms) in terms of**	
Innovators	**Employees**	**Sales**	**Employees**	**Sales**	**Employees**	**Sales**
Type of innovation						
Product innovators	3.8%	7.5%	1.6%	1.1%	3.2%	4.3%
Process innovators	3.8%	7.5%	1.6%	1.2%	3.3%	4.3%
Product or process innovators (technological innovation)	5.2%	10.2%	2.2%	1.6%	4.4%	5.8%
Organizational or Marketing innovations (non-technological innovation)	5.9%	10.8%	2.5%	1.9%	4.9%	6.2%
Non-technological innovations ONLY (no technological innovation)	2.2%	3.8%	0.9%	0.8%	1.8%	2.2%
Any kind of innovation (technological & non-technological)	7.4%	14.0%	3.2%	2.3%	6.2%	8.0%
Degree of novelty						
New to firm technological innovation	2.7%	5.4%	1.2%	0.8%	2.3%	3.1%
New to market technological innovation	2.5%	5.0%	1.1%	0.7%	2.1%	2.9%
New to country technological innovation	1.3%	2.7%	0.6%	0.4%	1.1%	1.6%
New to world (or Europe) technological innovation (radical innovators)	0.8%	1.7%	0.4%	0.3%	0.7%	1.1%
Radical innovators who are exporters	0.7%	1.6%	0.4%	0.2%	0.6%	1.0%
New to firm or market innovation represent at least 50% of sales	1.0%	1.7%	0.5%	0.3%	0.8%	1.1%
New to market Innovation represent at least 50% of sales	0.4%	0.7%	0.2%	0.1%	0.3%	0.5%
New to market Innovation represent at least 25% of sales	0.8%	1.4%	0.4%	0.2%	0.6%	0.9%

Note: this is based on a pooled, weighted sample of 96,960 firms in 20 European countries (BE, BG, CY, CZ, DE, EE, ES, FR, HR, HU, IT, LT, LU, LV, NO, PT, RO, SE, SI, SK), growth period refers to the period covered in CIS2012 (2010-2012).
Source: Authors' calculations using CIS 2012 microdata, based on Vértesy et al. (2017)

Annex 2. Datasets used and their constraints

Table 8 below provides details on the datasets used in this report. Even though numerous other datasets exist, in particular on the firm level (e.g., Bureau van Dijk ORBIS database, business registry data, survey data), priority was given to publicly available sources within the European Commission. Future research may, however, make use of additional data sources that would complement the analyses of this report.

While the 'HGEs indicator framework' was designed to inform the European Semester process and support country-specific analyses, it is not set in stone and may be further developed as new evidence and data sources on the factors relevant for HGEs become available. It is also important to acknowledge the limitations of the 'HGEs indicator framework'.

General limitations: The indicator framework is constrained by data availability and quality (see Table 8 below), as well as by the scientific evidence base underlying it. As Costa et al. (2016a) point out, policy makers and statisticians may have a picture of HGEs in mind that may not necessarily be representative of the majority of HGEs. This is further reflected in published research on how to predict HGEs (Coad and Srhoj, 2019). Comparing Member States to the EU average might be useful for the purposes of a macroeconomic coordination exercise of the European Semester process. However, it may be inadequate for particular factors, for which HGEs compete globally. For instance, the relative level of VC in one Member State might be higher than in another, but globally speaking, both levels might be relatively low compared to the US or China. Thus, a comparison among Member States may not provide an adequate picture of the relative performance vis-à-vis countries outside of the EU.

Correlation vs causality*:* While certain highly correlated indicators may point in the same or opposing directions, this does not necessarily imply a causal relationship. This is particularly important since some indicators have been selected to proxy multiple factors related to HGEs. Thus, deriving causal inference from a specific indicator may be misleading.

Complexity*:* While a country-level indicator framework can provide an overview and comparison of factors relevant to the development of HGEs, important local specificities may not be captured. Wherever possible, regional data are used to provide a more granular picture of HGEs, but data availability is a frequent bottleneck. Also, the temporal dissimilarities are important to keep in mind: Firstly, not all indicators are available for the same year; Secondly, an increase in one indicator may trigger a change in another with a time lag. Thus, interlinkages between indicators may be more complex than a simple interpretation of the indicator framework may suggest.

Table 8: Overview of data sources used in this report.

Data source	*Details*	*Indicators*
Eurostat Business Demography Dataset	Description: The annual Business Demography Dataset collection covers variables which explain the characteristics and demography of the business population. The dataset also provides information on HGEs by NUTS-2 region and NACE industry classification (two-digit level for the business economy). Most data are available between 2012 and 2017. The Commission implementing regulation (EU) No 439/2014 sets the definition and compulsory collection of data on HGEs with at least 10 employees in the beginning of their growth and having average annualised growth in number of employees greater than 10% per annum, over a three year period. An enterprise is the smallest combination of legal units that is an organisational unit producing goods or services, which benefits from a certain degree of autonomy in decision-making, especially for the allocation of its current resources. An enterprise carries out one or more activities at one or more locations. An enterprise may be a sole legal unit Limitations: Several data gaps exist and impede a well-aligned cross-regional and cross-sectoral analysis of HGEs for overlapping time periods. Additionally, the industry breakdown by region is only available at the one-digit NACE code level for the business economy, thus restricting the identification of HGEs among the superset of HGEs. An additional limitation is that data for the most recent year become available with a T-2 time lag. Also, there is no distinction between 'independent' firms and those owned by larger enterprises and/or conglomerates. There is also no distinction between HGEs that grow due to spin-offs of existing firms or due to merges and acquisitions (and thus potentially simply shifting exiting economic activity).	• HGIEs employment share (number of employees) • HGEs share (firm numbers) • HGEs average size • Derived indicators for identifying HGEs
European Investment Bank Survey on	Description: The annual EIB Group Survey on Investment and Investment Finance (EIBIS) is an EU-wide survey that gathers	• HGEs availability to finance

Investment and Investment Finance	qualitative and quantitative information on investment activities by both small businesses (with between 5 and 250 employees) and larger corporates (with more than 250 employees), their financing requirements and the difficulties they face. The survey involves interviews with some 12 500 businesses in total. Using a stratified sampling methodology, it is designed to be representative at the EU level; 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). All survey respondents are sampled from the Bureau van Dijk ORBIS database; survey answers can be matched to reported firm balance sheet and profit and loss data. It is designed to build a panel of enterprise data. To this end, all firms that participated in the first wave of the survey are re-interviewed in the following survey waves. To compensate for panel attrition and to ensure cross-sectional representativeness, panel firms are complemented in each wave with a re-fresher sample of new survey firms. The survey collects data on firm characteristics and firm performance, past investment activities and future plans, sources of finance, financing issues and other challenges that businesses face. Most questions refer to the "last financial year" and therefore the reference year for each round of the survey is the one before the survey was carried out (e.g. "2015" for the round carried out in 2016). To ensure robust year-to-year comparisons, the questionnaire changes only marginally over time. The survey tailored to this report comprises 35,206 observations and uses the following definition to identify HGEs: 3 years employment growth above 33% (i.e., equivalent of three consecutive years of a 10% annual growth rate) and number of employees at least 10 at the beginning of the period. A robustness check applying the 20% definition produced similar results. Limitations: Due to the sampling of the survey (linking survey data with financial statement data may lead to reduced levels of the sample population), HGEs in the sample may not be fully representative for the entire population of HGEs, especially in Member States with lower shares of HGEs.	• HGEs human capital • HGEs labour market regulation • HGEs business regulation and taxation
Venture Source	Description: The main source of data for VC activity is Venture Source. Venture Source is a commercial database maintained by Dow Jones. (Nepelski and Piroli, 2016) present a detailed discussion of the database and its potential use for economic, managerial, and policy-oriented research. Venture Source has several advantages. It is updated on a daily basis; it contains information on portfolio companies, venture capitalists acting as general partners of the fund, and investors acting as limited partners; it is structured in an accessible way. Companies are classified into four-level hierarchy: industry group, industry segment, industry code and industry sub-code. For example, under the "Healthcare" industry groups, there are four Industry segments (Biopharmaceuticals, Healthcare Services, Medical Devices, and Medical Software and Information Services), 31 "Industry Code", and 31 "Industry Sub-code". As a simple classification and drawing closely on the work of Nepelski and Piroli (2016), the VC-backed companies are divided into three stages: seed-stage, start-up stage, and later-stage. *Seed Stage Financing:* This stage is a relatively small amount of capital provided to an inventor or entrepreneur to prove a concept. If the initial steps are successful, this may involve	• Venture Capital seed stage • Venture Capital early stage • Venture Capital later stage

	product development, market research, building a management team, and developing a business plan. *Start-up Stage Financing:* This stage provides financing to companies completing development where products are mostly in testing or pilot production. Usually this stage involves the first and the second round of financing. *Later Stage Financing:* The company is now producing and shipping and has growing accounts receivable and inventories. It may or may not be showing a profit, but are more likely to be profitable than in previous stages of development. Limitations: Venture Source statistics can differ from the numbers reported by other data providers (such as Invest Europe) for differences related to methodology, definition, interpretation of the VC/PE fund and investment stages. For example, Venture Source statistics include PE/VC type activities that are not conducted by PE funds. Activities such as those of business angels, hedge funds, and corporate venture programmes are included.	
European Innovation Scoreboard; Regional Innovation Scoreboard	Description: The annual European Innovation Scoreboard (EIS) and its pendant the Regional Innovation Scoreboard (RIS) provide a comparative assessment of the research and innovation performance of the EU Member States, their regions and the relative strengths and weaknesses of their research and innovation systems. It helps Member States and regions assess areas in which they need to concentrate their efforts to boost their innovation performance. The EIS comprises (i) framework conditions capturing the main drivers of innovation performance external to the firm (i.e., human resources, attractive research systems, innovation-friendly environment), (ii) investments made in both the public and business sector (i.e., finance and support, firm investments), (iii) innovation activities capturing different aspects of innovation in the business sector (i.e., innovators, linkages, intellectual assets) and (iv) impacts capturing the effects of firms' innovation activities (i.e., employment impacts, sales impacts). The RIS is a comparative assessment of regional innovation based on the European innovation scoreboard methodology, using 18 of the latter's 27 indicators. In provides a more detailed breakdown of performance groups with contextual data that can be used to analyse and compare structural economic, business and socio-demographic structure differences between regions. Limitations: One limitation relates to the direct link between the indicators and HGEs (see the principle of tailored to HGEs). There are general limitations of the specific indicators, which are found in the methodological reports underlying the EIS[49] and the RIS[50].	• HGIEs employment share • SME innovators • Innovative entrepreneurship • Linkages among SME innovators • Most innovative region
European Investment Fund SME Access to Finance Index	Description: The SME Access to Finance Index from the European Investment Fund is a composite index consisting of access to loans (% of SMEs using bank loans; % of SMEs using grants or subsidised bank loans; % of SMEs not applying for a bank loan because of possible rejection; interest rate for loans under EUR 250k; interest rate spread under EUR 250k vs over EUR 1m), credit and leasing (% of SMEs using credit lines; % of SMEs not applying for credit lines because of possible rejection; median interest rate charged to SMEs for credit lines; % of SMEs using leasing or hire-purchase), equity (VC investments/GDP; VC availability index; value of IPO	• SME access to loans • SME access to equity

[49] https://ec.europa.eu/docsroom/documents/36282 (last accessed September 2019).
[50] https://ec.europa.eu/docsroom/documents/35946 (last accessed September 2019).

	market/GDP; % of SMEs using equity capital) and macro factors (gap between actual and potential GDP; strength of legal rights index; depth of credit information index; availability of financial services index; bank non-performing loans to total gross loans; % of SMEs "feeling that there are no financing obstacles"). Limitations: The limitation most relevant to this report is that the data refer to SMEs and not HGEs. While being related, they may not be representative for HGEs. Limitations related to the index itself can be found in the underlying EIF report.[51]	
Global Entrepreneurship Monitor	Description: The Global Entrepreneurship Monitor GEM represents a primary source of data, generated through an Adult Population Survey of at least 2,000 randomly selected adults (18-64 years of age) in each economy. In addition, national teams collect expert opinions about components of the external entrepreneurship context through a National Expert Survey. GEM provides a set of indicators on entrepreneurship, allowing for the construction of profiles of entrepreneurship in each economy studied. GEM's Adult Population Survey captures both informal and formal activity. GEM tracks societal attitudes and perceptions toward entrepreneurship. Limitations: While related to the broader context of HGEs, only few indicators are directly covering HGEs. General limitations of the indicators can be found in the methodological paper of GEM.[52]	• Entrepreneurial skills
Community Innovation Survey	Description: The Community Innovation Survey (CIS) of the European Commission provide firm-level information on innovation statistics are part of the EU science and technology statistics. The CIS surveys are carried out with two years' frequency by EU Member States and number of other European countries. Compiling CIS data is voluntary to the countries, which means that in different surveys years different countries are involved. The CIS is a harmonised survey of innovation activity in enterprises, designed to provide information on the innovativeness of sectors by type of enterprises, on the different types of innovation and on various aspects of the development of an innovation, such as the objectives, the sources of information, the public funding, the innovation expenditures etc. The CIS provides statistics broken down by countries, type of innovators, economic activities and size classes. Limitations: In addition to general concerns about representativeness and the quality of answers by firms, no information on firm age is provided. Moreover, not all EU Member States participate in the survey, including some countries only for certain year, making cross-country and over-time analyses challenging. Furthermore, there may be measurement errors present in the firm size categories of the CIS. Nevertheless, it is one of the most frequently used firm-level data for analysing innovative activities in Europe.	• Identification of the innovative character of HGEs (not part of the HGE indicator framework)

[51] https://www.eif.org/news_centre/publications/EIF_Working_Paper_2018_47.htm (last accessed September 2019).
[52] https://gemconsortium.org/report/gem-2018-2019-global-report (last accessed September 2019).

Annex 3. Identification of HGIEs

Table 9: Identification of HGIEs.

NACE codes	Available data on HGEs	High or medium-high tech manufacturing, and knowledge-intensive services	50% *most innovative* industries
B-N_X_K642 - Business economy except activities of holding companies			
B - Mining and quarrying			
B06 - Extraction of crude petroleum and natural gas			
B09 - Mining support service activities			
C - Manufacturing			
C11 - Manufacture of beverages			
C12 - Manufacture of tobacco products			
C15 - Manufacture of leather and related products			
C16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials			
C19 - Manufacture of coke and refined petroleum products			
C20 - Manufacture of chemicals and chemical products			
C21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations			
C22 - Manufacture of rubber and plastic products			
C23 - Manufacture of other non-metallic mineral products			
C26 - Manufacture of computer, electronic and optical products			
C27 - Manufacture of electrical equipment			
C28 - Manufacture of machinery and equipment n.e.c.			
C29 - Manufacture of motor vehicles, trailers and semi-trailers			
C30 - Manufacture of other transport equipment			
C32 - Other manufacturing			
C33 - Repair and installation of machinery and equipment			
D - Electricity, gas, steam and air conditioning supply			
E - Water supply; sewerage, waste management and remediation activities			
E39 - Remediation activities and other waste management services			
F - Construction			
G - Wholesale and retail trade; repair of motor vehicles and motorcycles			
G45 - Wholesale and retail trade and repair of motor vehicles and motorcycles			
G46 - Wholesale trade, except of motor vehicles and motorcycles			
G47 - Retail trade, except of motor vehicles and motorcycles			
H - Transportation and storage			
H49 - Land transport and transport via pipelines			
H50 - Water transport			
H51 - Air transport			
H52 - Warehousing and support activities for transportation			
H53 - Postal and courier activities			
I - Accommodation and food service activities			
I55 - Accommodation			
I56 - Food and beverage service activities			
J - Information and communication			
J58 - Publishing activities			

J59 - Motion picture, video and television programme production, sound recording and music publishing activities			
J60 - Programming and broadcasting activities			
J61 - Telecommunications			
J62 - Computer programming, consultancy and related activities			
J63 - Information service activities			
K - Financial and insurance activities			
K64 - Financial service activities, except insurance and pension funding (implicit)			
K65 - Insurance, reinsurance and pension funding, except compulsory social security			
K66 - Activities auxiliary to financial services and insurance activities			
L - Real estate activities			
M - Professional, scientific and technical activities			
M69 - Legal and accounting activities			
M70 - Activities of head offices; management consultancy activities			
M71 - Architectural and engineering activities; technical testing and analysis			
M72 - Scientific research and development			
M73 - Advertising and market research			
M74 - Other professional, scientific and technical activities			
M75 - Veterinary activities			
N - Administrative and support service activities			
N77 - Rental and leasing activities			
N78 - Employment activities			
N79 - Travel agency, tour operator reservation service and related activities			
N80 - Security and investigation activities			
N81 - Services to buildings and landscape activities			
N82 - Office administrative, office support and other business support activities			
N84-R93 - Public administration and defence, compulsory social security; Education; Human health and social work activities; Arts, entertainment and recreation			
S95 - Repair of computers and personal and household goods			

Annex 4. HGE Country Factsheets

This Annex provides 21 individual country factsheets, summarising the key insights gained from the analyses in this report tailored to Member State specificities. The factsheets also draw on expert knowledge from the JRC Innovation Country Reports. The 'HGE indicator framework' introduced in this report is included in each factsheet. Detailed information on individual framework indicators can be found in Table 2 of this report.

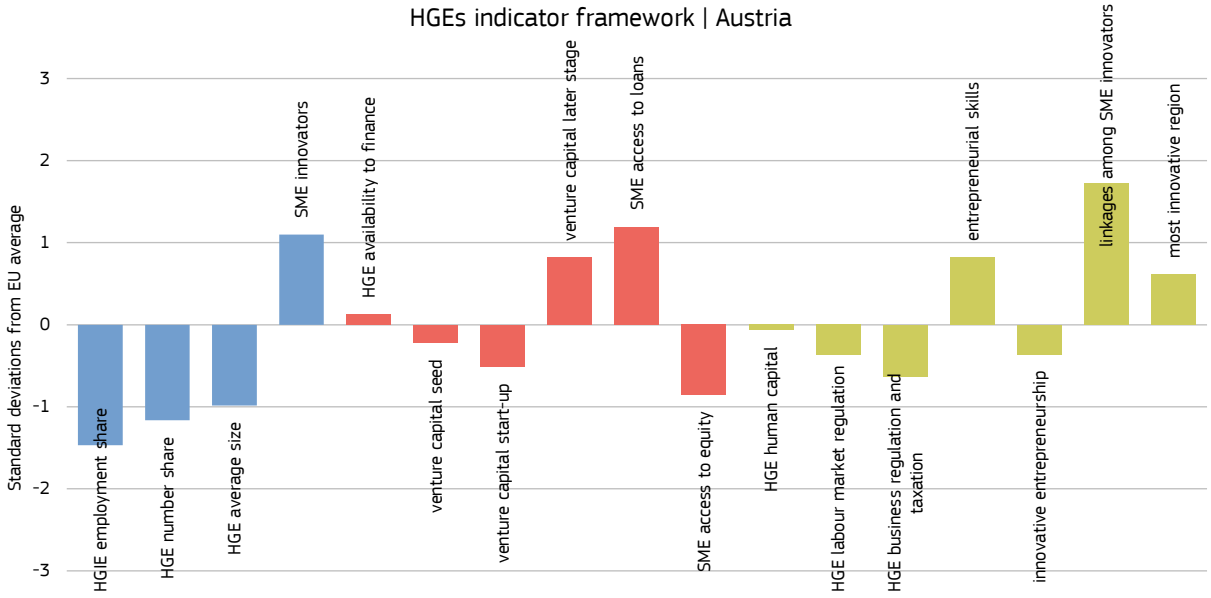
A4.1 High Growth Enterprises Factsheet – Austria (AT)

1. Executive summary

AT is characterised by low and slow dynamics in high-growth enterprises (HGEs[53]) compared to the EU average. Technological leadership in some HGEs also does not translate itself into economic benefits. Some of the factors that enable HGEs in AT to benefit commercially from their own technology can be shaped by its management. Other factors depend much more on the product market and the regulatory regime. They also require more start-up capital and professional experience from venture capitalists to better seize their technical or market opportunities. They also need to develop more linkages with other firms, which both creates the opportunity and demand for higher level of innovation.

Formal policies should encourage and support entrepreneurship by providing linkages with research organisation, suppliers, and universities. Financial support also needs to be better targeted and monitored. The effects of such policies depend very much on whether they target different stages of development and help HGEs to exploit new market opportunities.

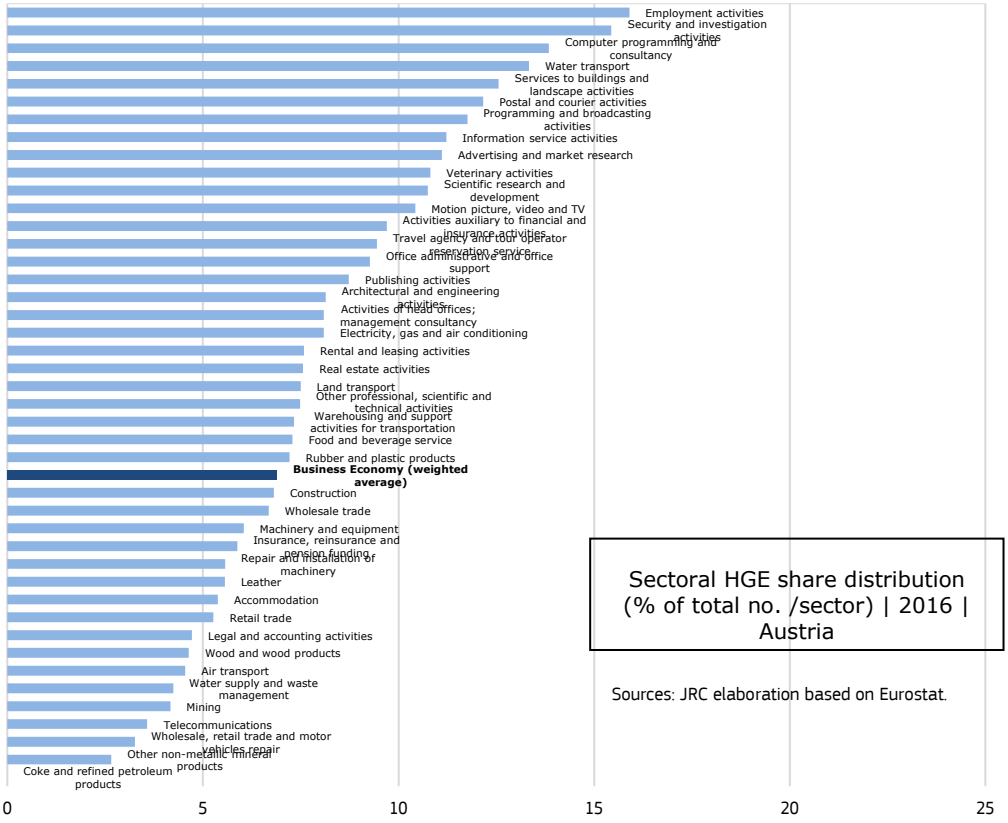
2. HGEs indicator framework



- AT performs below the EU average in fast growing innovative companies (in terms of employment share, share and average size), while it performs above the EU average in the share of innovative SMEs.
- In AT, there is a high access to finance for both HGEs and SMEs compared to the EU average. Regarding venture capital, on average, Austrian VC funds tend to invest more in later stage companies compared to other European countries. On the other hand, the early stage companies require more VC funding to growth. This may show a potential venture funding gap, between the initial stage and the scale-up stage.
- Although HGEs in AT possess skills and capabilities to create and develop new businesses, tend to cluster in most innovative regions, and develop linkages with SMEs, they require highly qualified personnel and a more supportive environment. Some sectors, like healthcare, are highly regulated in certain directions, and most HGEs need support/assistance to commercialise their innovation.

[53] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

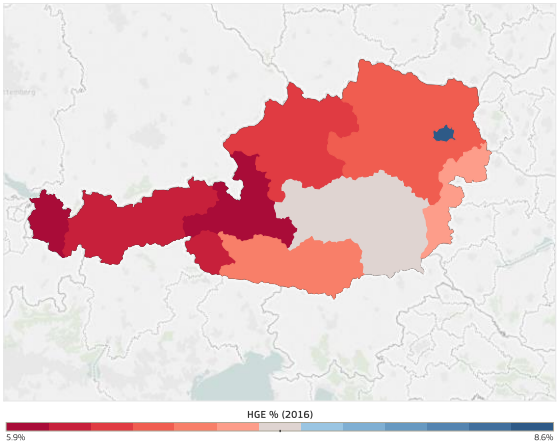
3. Firm demographics and sectoral decomposition



Sectoral HGE share distribution (% of total no. /sector) | 2016 | Austria

Sources: JRC elaboration based on Eurostat.

- The average share of HGEs in AT is about 7% in the business economy versus 11% in the EU 28.
- The highest shares of HGEs are found in knowledge intensive services (e.g. employment activities; computer programming, consultancy and related activities; information service activities; scientific research and development).
- The highest share of HGEs among active enterprises is concentrated in Vienna.

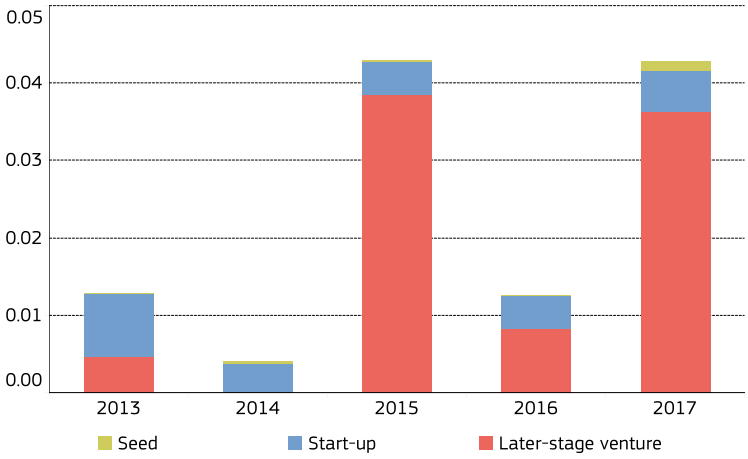


HGE share (% of active enterprises) across NUTS3 regions | 2016 | Austria

Sources: JRC elaboration based on Eurostat.

4. Financing HGEs and start-ups: the role of venture capital

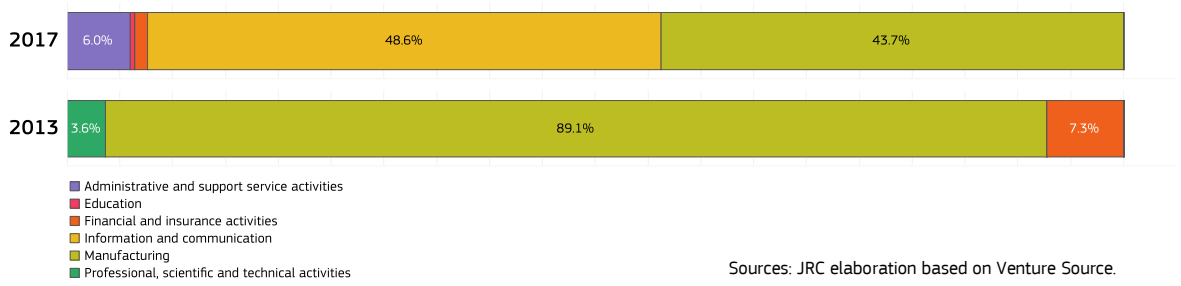
Venture capital by stage of financing (in % of GDP) | Austria | 2013-2017



Sources: JRC elaboration based on Venture Source.

- On average, over the last 5 years, venture capital investment only accounts for 0.02% in AT.
- There is a bias for finance for scale-up companies, rather than seed and start-up companies. Later stage investment as a percentage of GDP has increased substantially in 2015 and in 2017 (accounting for about 0.04% of GDP), whereas early stage venture capital investment as a percentage of GDP has remained fairly stable over the last five years.

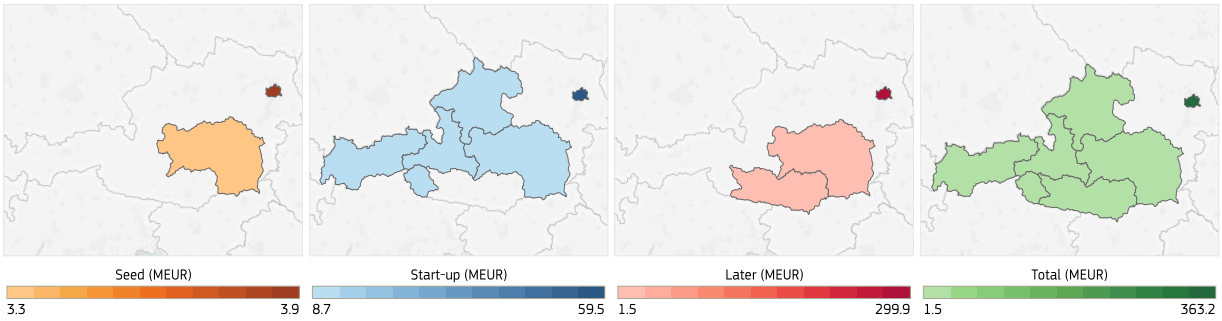
Sectoral distribution of VC investment (in %) | Austria | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- Compared to 2013, ICT firms tend to have the highest share of venture capital in 2017. In contrast, the share of VC-backed companies operating in manufacturing sector and in financial and insurance sectors has decreased from 89% to 44% and from 7% to 1% respectively.
- In formulating and executing their innovation strategies, HGEs cannot ignore the regional VC ecosystem in which they are embedded. In Austria, over the period 2013-2017, Vienna is the major hub for VC-backed companies (across all stages of financing).

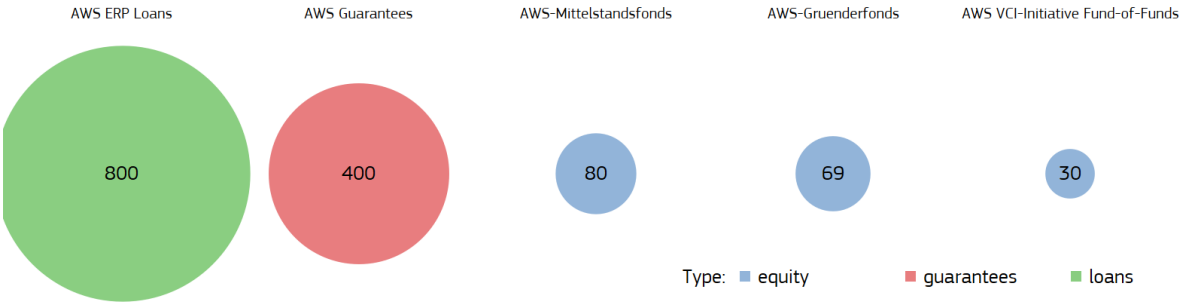
Regional distribution of VC investment by stage of financing (in MEUR) | Austria | 2013-2017



Sources: JRC elaboration based on Venture Source.

5. Finance-related policy measures

Financial instruments Austria (MEUR)



- In AT, there are a number of public support instruments targeting HGEs with a relevant emphasis on a direct policy support – R&D grants, loans and equity incentives – while indirect R&D tax credit schemes do not specifically focus on HGIEs.
- Notwithstanding a relatively wide range of HGIE public support tools in AT, only a handful of them is evaluated on a regularly basis. One study (the Evaluation of Aws guarantee programmes by Enichlmair et al. 2017[54]) suggests a more dynamic turnover increases of treated (supported) companies compared to the non-treated control group.
- HGEs needs a more supportive environment in terms of institutions and policies. Different stages in life-cycle should be financially supported and some sectors like healthcare should be less highly regulated in certain directions.

[54] Enichlmair C., Robubi A. and Ruhland S. (2017), Kontrollgurppenvergleich mittels Propensity Score Matching (PSM) auf Basis der Bilanzdatenbank (BDB). Presentation by Sascha Ruhland at Spring Meeting of the DeGeVal in Vienna on 19 May 2017.

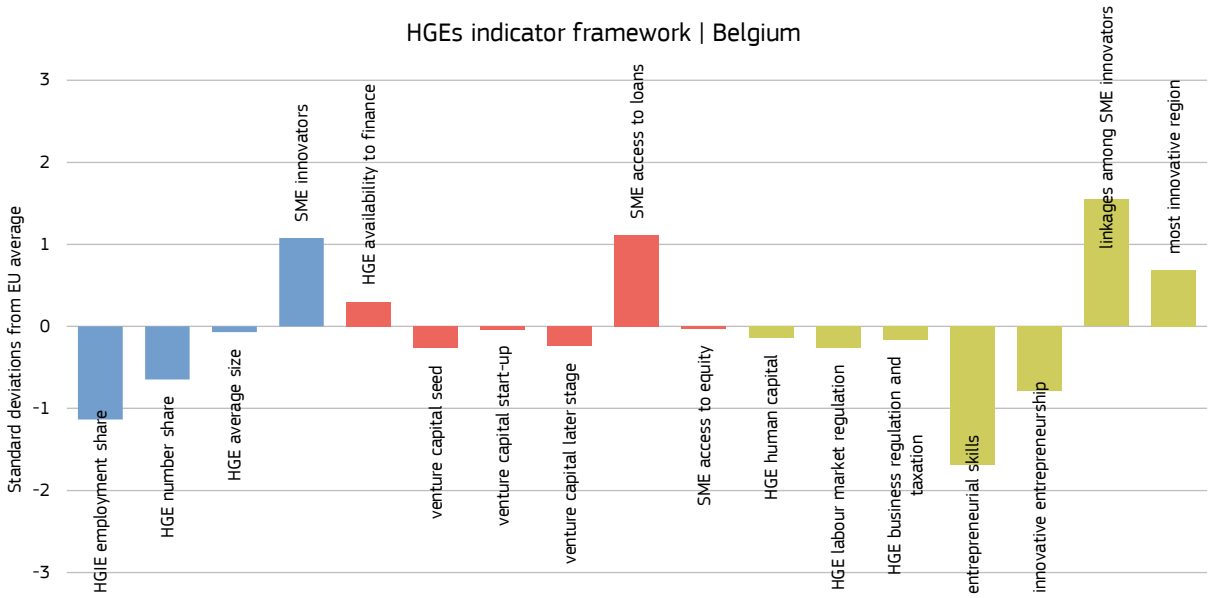
A4.2 High Growth Enterprises Factsheet – Belgium (BE)

1. Executive summary

With the exception of few sectors, such as electricity, water supply and waste management, and administrative and support activities, the share of high growth enterprises (HGEs[55]) is lower than the EU average. Apart from this, high-growth firms tend to be younger than the average Belgian firm, and they tend to occur among firms of all sizes and ages. Venture capital (VC) investment in BE was on average equal to 0.03% of GDP and typically lower than in FR and the UK for the period 2014-2017. Sectors attracting most of VC capital are manufacturing, ICT, and professional, scientific and technical activities. With regards to access to finance, since BE VC funds are relatively small, scale-ups tend to look for other sources of funding in the later stages.

Turning to the regulatory framework, BE ranks below the EU average in most indicators. The main barrier to entrepreneurial activities remains to be the weak culture for entrepreneurship. A noteworthy initiative to address this issue and the broader entrepreneurial ecosystem, is the proposal of the Flemish Advisory Council for Innovation and Enterprise (VARIO, 2018) to increase the number of serial entrepreneurs through both a long-term (entrepreneurship education) and short-term strategy (attract entrepreneurs from abroad by means of 'start-up' – or 'scale-up' visa).

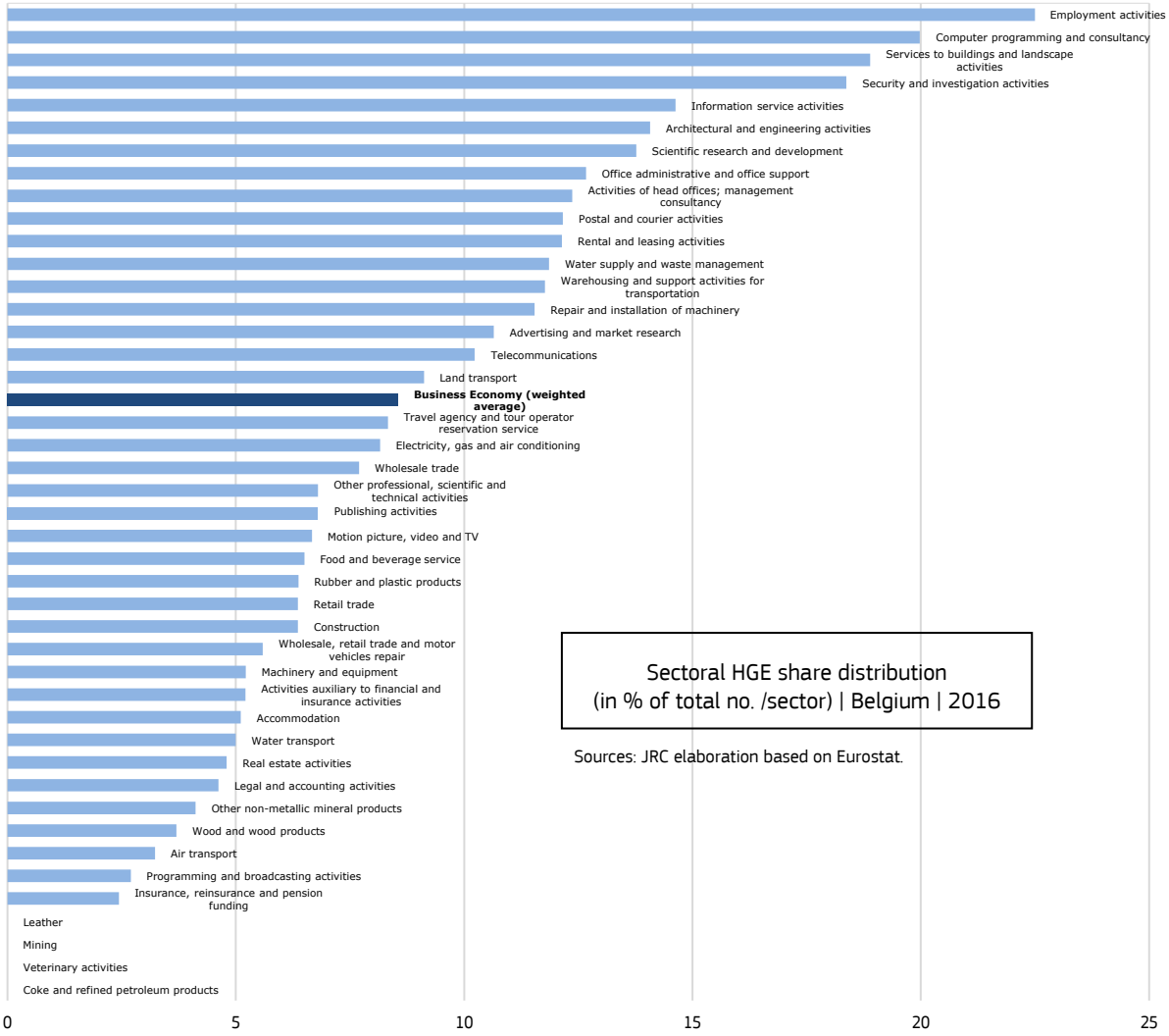
2. HGEs indicator framework



- Compared to the EU average, BE underperforms in terms of the share of HGE in the business economy (especially involving contribution to the employment). The share of innovative SMEs is above the EU average.
- Concerning the financing environment, the accessibility to loans for SMEs and the perceived availability to finance for BE are above the EU average. Despite that, the VC and equity markets are not sufficiently developed, as the lower values in the graph shows.
- While the innovative SMEs are better interconnected than the EU average and some of its regions are among the most innovative ones, the average HGE regulation (labor market, fiscal policy, etc.) of BE is low. In particular, the lack of entrepreneurial skills and innovative entrepreneurship can undermine BE firms' ability to grow fast.

[55] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

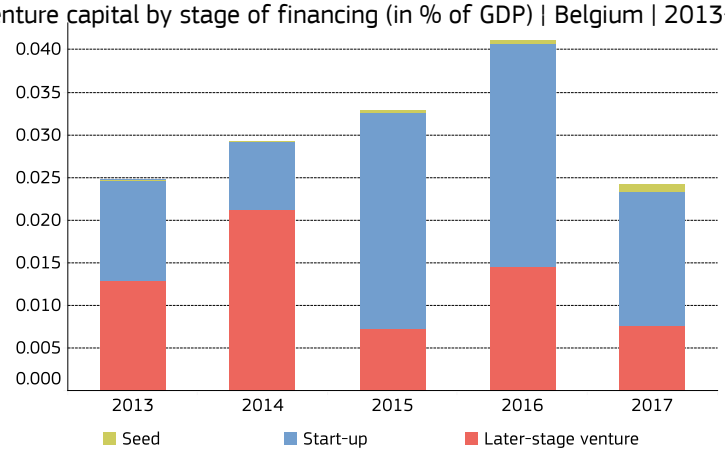
3. Firm demographics and sectoral decomposition



- The average share of HGEs in BE is about 9% in the business economy versus 11% in the EU.
- The sector of employment activities accounts for the highest share of HGEs (23%), while the sectors of leather, mining, veterinary activities, coke/petroleum and insurance do not have any HGEs.
- In BE, the knowledge-intensive sectors are predominant in the sectorial distribution of HGEs. Activities like programming, security and investigation, information service and engineering activities each entail more than 14% of HGEs.

4. Financing HGEs and start-ups: the role of venture capital

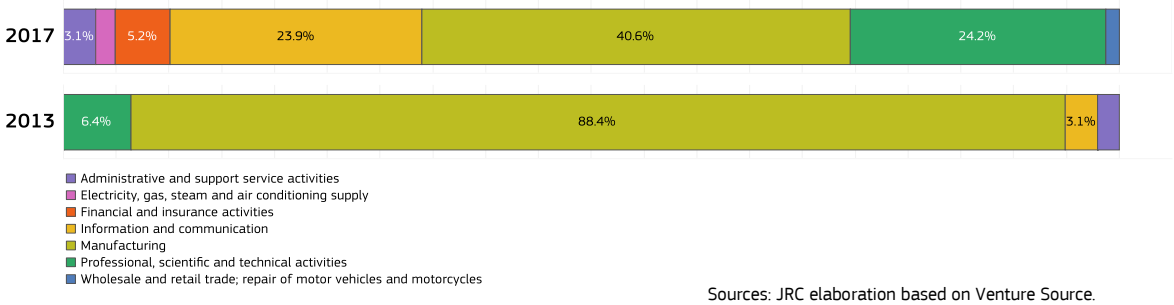
Venture capital by stage of financing (in % of GDP) | Belgium | 2013-2017



Sources: JRC elaboration based on Venture Source.

- VC investments in BE have grown significantly from 2013 (0.025% of GDP) to 2016 (slightly over 0.04% of GDP), although 2017 has seen a sudden drop back to the level of 2013.
- VC investments in BE have seen different trajectories for the different stage of the financing process. Seed financing still accounts for a very small share of VC, but has grown since 2013. Investments in start-ups doubled from 2013 to 2016 but declined again in 2017. Scale-up investments reduced from around 0.013% of GDP in 2013 to 0.008% of GDP in 2017. They account for about 1/3 of VC investments in 2016-2017, with the lion's share of VC targeted at start-ups.

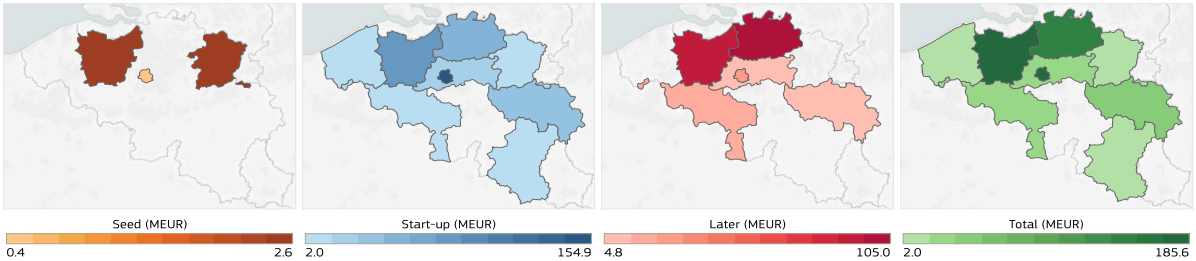
Sectoral distribution of VC investment (in %) | Belgium | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- The sectoral distribution of VC investment in BE has become much more diversified since 2013 (when manufacturing was absorbing almost the 90% of the total investments).
- In 2017, the predominant sector for VC investment was still manufacturing, but sectors such as information and communication and professional, scientific and technical activities constituted almost 50% of the total investment. Small shares of VC are allocated to the financial sector, alongside with the administrative and electricity/gas sector.

Regional distribution of VC investment by stage of financing (in MEUR) | Belgium | 2013-2017



Sources: JRC elaboration based on Venture Source.

- In terms of the geographical distribution of VC, the highest concentrations are found in the Brussels Capital Region and the provinces of Antwerp and East Flanders across 2013 and 2017.

5. Finance-related policy measures

Instrument	Investment volume per project (€)	Type
Tax shelter for scale-ups	up to 100k	tax incentive
PMV risk capital (Flemish Region)	125,000 to 5 million	equity
finance.brussels (GIMB/SRIB): 'financing of growth companies'-scheme (Brussels Capital Region)	up to 5 million	loans and equity
Business Angel Network (BAN) Vlaanderen (Flemish Region)	25,000 to 250,000	equity
SME growth subsidy ("KMO groeisubsidie") (Flemish Region)	50k	grants
DGO6 (Walloon region)		grants and loans
Easy'up (Novallia) (Walloon region)	500k	subordinated loans
SRIW (Société Régionale d'Investissement de Wallonie)		equity and loans
Invests (Sowalfin) (Walloon region)		equity
Innoviris (Region of Brussels Capital)		grants

- There are multiple finance-related policy measures that could foster the sector (even if not specifically targeted at HGEs). They range from tax incentives to equity support and loans programmes.
- Innovation policy is a regional authority, with SMEs targeted through different instruments that typically do not condition on the type of firm or the sector.
- According to a study on BE innovative firms (Neicu et al. 2015[56]), it seems that in BE the policy mix of tax credits and R&D support for SMEs has a more effective R&D effect for the firms than tax credit instruments alone.

[56] Neicu, D., Teirlinck, P., & Kelchtermans, S. (2016). Dipping in the policy mix: do R&D subsidies foster behavioral additionality effects of R&D tax credits? Economics of Innovation and New Technology, 25(3), 218-239.

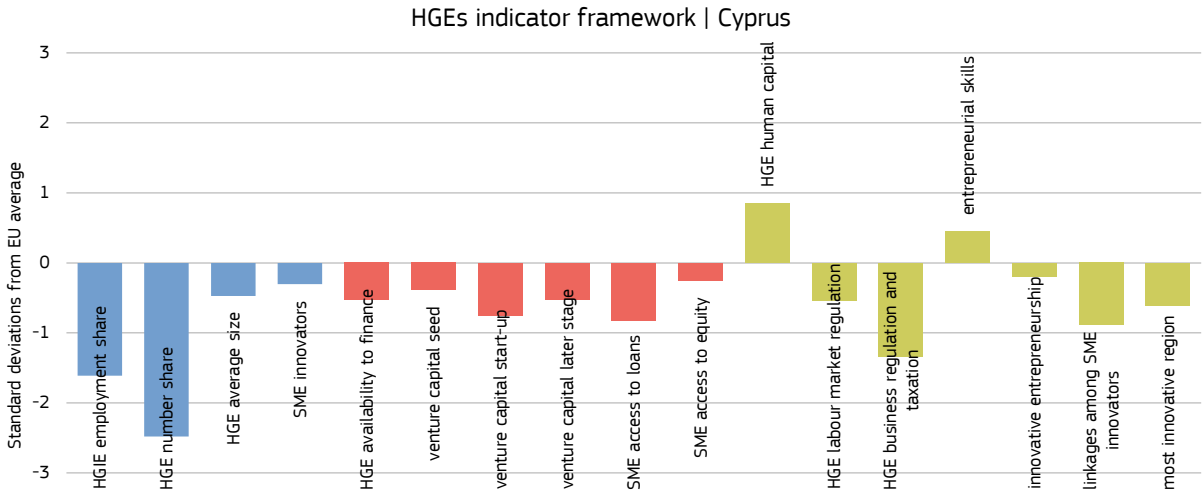
A4.3 High Growth Enterprises Factsheet – Cyprus (CY)

1. Executive summary

CY overall underperforms in factors determining the development of high growth enterprises (HGEs[57]). The employment and number share of HGEs in CY are far below the EU average. The generally weak performance of the innovation ecosystem in CY impedes the development of HGEs. The emergence of HGEs is also impaired by the below-EU average accessibility to finance and most framework conditions with the notable exception of entrepreneurial skills and HGE-related human capital. The latter aspects could partly explain the flow of venture capital (VC) towards CY, although with a high variation in the stage of financing. The availability of staff with the right skills is an important condition for investments by HGEs. CY performs above the EU average for this indicator. The possession of adequate skills is also reflected by the higher than EU average proportion of the working-age population who believe they have the required skills and knowledge to start a business. The sectoral distribution of VC investments is not diversified, but rather concentrated in a few sectors such as ICT in 2013 as well as financial and insurance activities and education in 2016. The most significant stage for VC financing over the years 2013-2016 is related to start-ups.

The conditions for HGEs could improve by supporting the development of a VC market and relevant HGE framework conditions. Furthermore, CY is far below the EU average in terms of the share of employment held by HGEs. In addition, access to finance indicators are also underperforming with respect to the EU overall. The financing gap is an aspect that CY could address to improve the overall performance of the country. The CY scores regarding business regulation and taxation show additional constraints for investment decisions by HGEs.

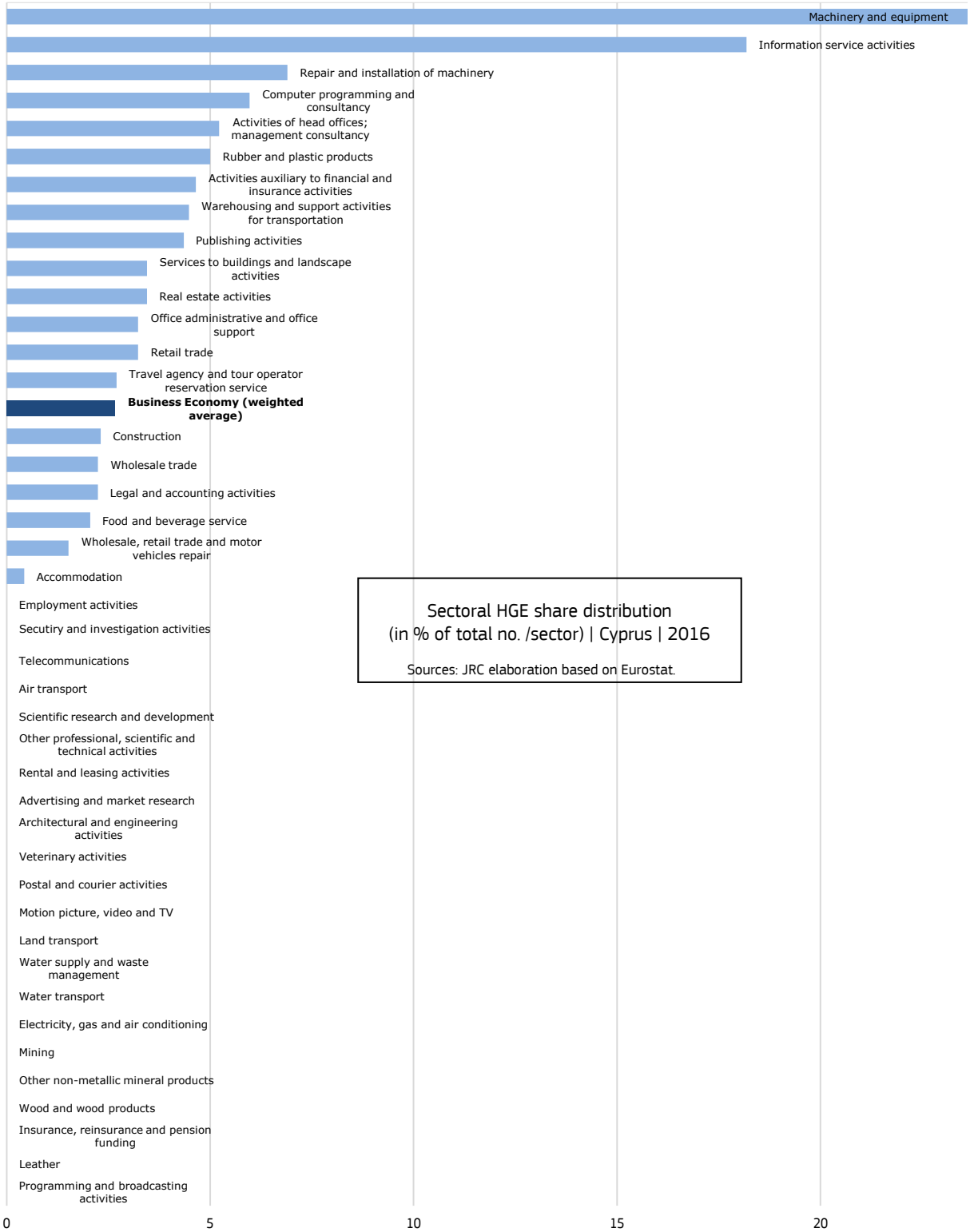
2. HGEs indicator framework



- CY performs below the EU average in several indicators, especially in terms of its percentage share of HGEs of enterprises with at least 10 employees, HGE business regulation and taxation, and linkages among SME innovators.
- The presence of HGEs could improve through the availability of HGE-related human capital and entrepreneurial skills.
- CY could further improve the conditions for HGEs by supporting the development of a VC market and the regulatory environment related to HGEs, and enhance the overall linkages among SME innovators.

[57] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

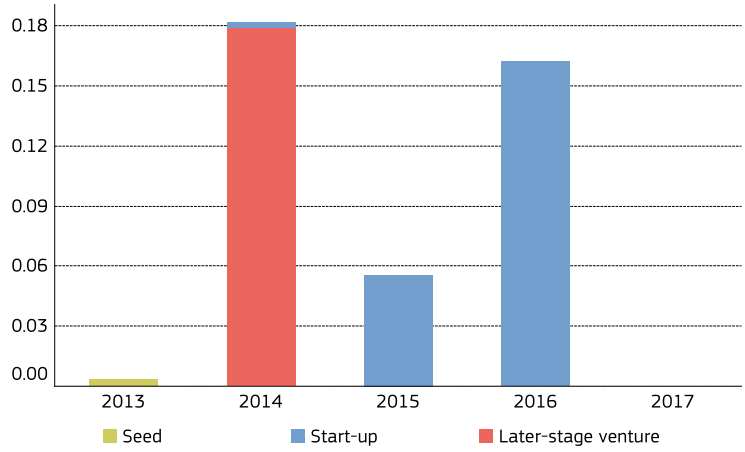
3. Firm demographics and sectoral decomposition



- The average share of HGEs in CY is around 3% across the business economy, ranging from 0.4% in accommodation and 25% in machinery and equipment.
- The highest shares of HGEs are found in medium-high tech industries such as machinery and equipment; knowledge-intensive industries as information service activities; and medium-low technology sectors such as repair and installation of machinery.

4. Financing HGEs and start-ups: the role of venture capital[58]

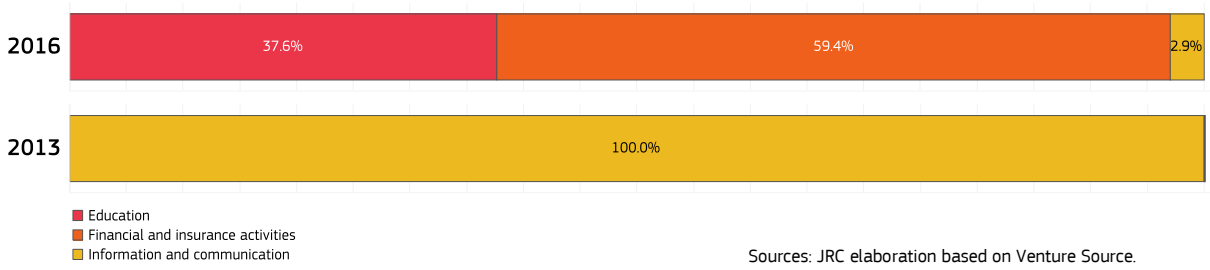
Venture capital by stage of financing (in % of GDP) | Cyprus | 2013-2017



Sources: JRC elaboration based on Venture Source.

- CY has overall increased VC investments as a share of GDP since 2013 until 2016, but has experienced a reduction in 2015 with respect to 2014. Generally, there are stark year-on-year changes in VC investments, both in terms of the amount as well as the distribution among stages of financing.
- The share of start-up ventures has substantially increased in CY, particularly during 2016. Later stage ventures appear only in 2014. The size of investments in seed companies is minimal and present only in 2013.

Sectoral distribution of VC investment (in %) | Cyprus | 2013 & 2016

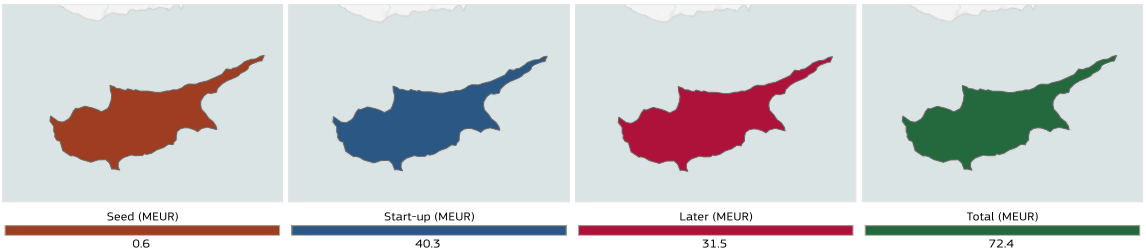


Sources: JRC elaboration based on Venture Source.

- The sectoral distribution of VC investments is not diversified, only very few sectors receive most investments, such as ICT in 2013, and financial and insurance activities as well as education in 2016.
- The sectoral distribution of VC investments did change substantially across time.

Regional distribution of VC investment by stage of financing (in MEUR) | Cyprus | 2013-2016

[58] It would appear how CY receives no VC during 2017, however such an outcome is heavily contingent on data availability and missing values.



Sources: JRC elaboration based on Venture Source.

- Over the period 2013-2016, there is a prevalence of start-up VC investment with respect to all stages of financing.

5. Finance-related policy measures

Policy Measure	Duration	Target	Value (€)
Government Guarantees to the European Investment Bank	2 to 12 years	Businesses incorporated and operating in CY, employing up to 3000 employees	€1.5m up to €12.5m
Risk Sharing Loans (through the Cyprus Entrepreneurship Fund)	N/A	SMEs	€140m
Guarantees/Risk Sharing through InnovFin SME Guarantee	N/A	SMEs and mid-caps (250-499 employees)	€20m
Tax incentives introduced by the Ministry of Finance	5 years	Innovative businesses and start-ups.	Relief up to 50% of an investor's taxable income, and a deduction of up to €150.000 per year

- Aside from R&I grants which address the needs of HGEs[59], the main publicly supported financing instruments are:
- Government Guarantees to the European Investment Bank (EIB) for loans of €1 billion in collaboration with Cyprus-based commercial banks. The beneficiaries of the scheme are Cypriot businesses incorporated and operating in CY and employing up to 3,000 employees. The loan amount ranges from €1.5m up to €12.5m in each case with a duration of 2 to 12 years. The financing terms include low interest rates, choice of fixed or floating rate, long repayment periods, grace periods of up to 2 years for repayment of principal, more favourable interest rate - 0.5% lower - to enterprises that meet the "Job for Youth" criteria, pricing set according to the enterprise's risk. All economic sectors are eligible except weapons and arms, gambling, tobacco, pure real estate development activity and pure financial activities (e.g. trading in financial instruments).
- Risk Sharing Loans (through the Cyprus Entrepreneurship Fund) in collaboration with the EIB and the private sector banks of CY. The scheme budget is at €140 million.
- Guarantees/Risk Sharing through InnovFin SME Guarantee with a budget of €20 million.
- Tax incentives. The Ministry of Finance has introduced tax incentives to encourage investment in innovative businesses and start-ups. The incentives provide tax relief on investments of up to 50% of an investor's taxable income, and a deduction of up to €150,000 per year which an investor can spread over a 5-year period. The incentives apply to investments in innovative companies in the form of shares, loans or grant guarantees.

[59]Most participations in the national funding scheme for R&I come from enterprises.

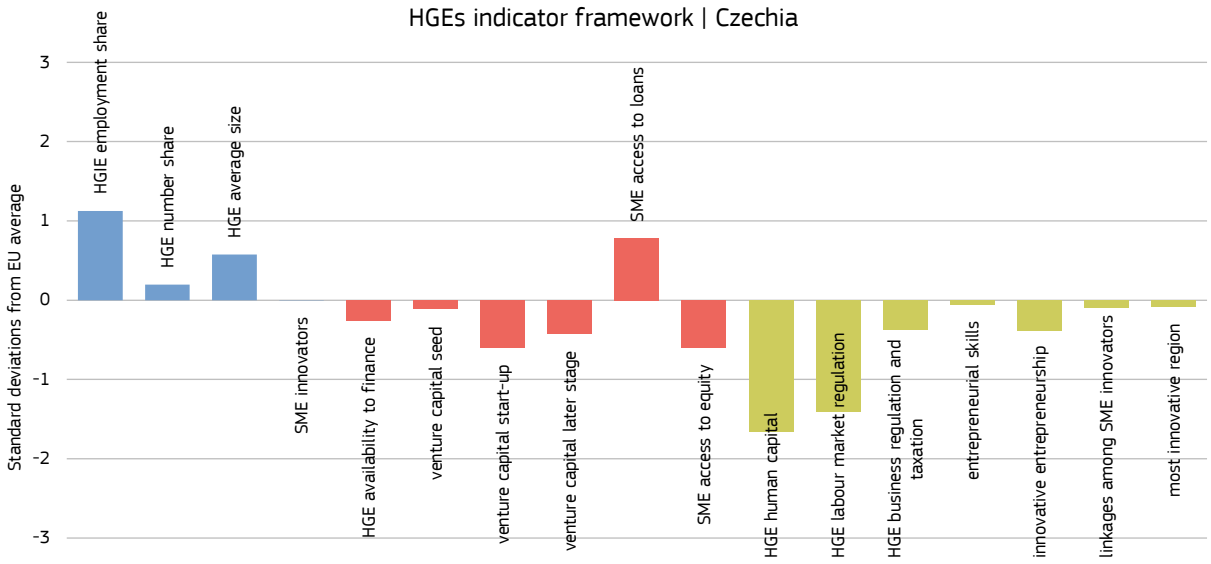
A4.4 High Growth Enterprises Factsheet – Czechia (CZ)

1. Executive summary

High growth enterprises (HGEs[60]) in CZ are performing above EU average, strongly contributing to the employment share. The highest share of HGEs can be found mainly in knowledge-intensive services. Although venture capital (VC) investments as a percentage of GDP are negligible, they reached the highest share in 2014, it decreased in 2015 and 2016, and then it slightly recovered in 2017. Most VC investments can be found in IT, financial and insurance activities and manufacturing, which represent a strong investment potential in CZ, and they tend to concentrate in South Bohemian region and Prague.

The overall business framework environment for CZ is below EU average. The lower level of human capital quality, less favourable market regulation and taxation, without good enough entrepreneurial approaches and innovation clusters, makes it harder for firms to grow fast. In general, CZ does not present an adequate financing environment, underperforming in terms of all the framework indicators. In particular, the equity market seems quite underdeveloped, while the generally easier access to loans may compensate this gap. Start-ups and scale-ups are not explicitly supported in CZ programmes. Thus, new policy programmes might be needed to influence the national system of innovation and create a local competitive environment for the emergence of HGEs.

2. HGEs indicator framework

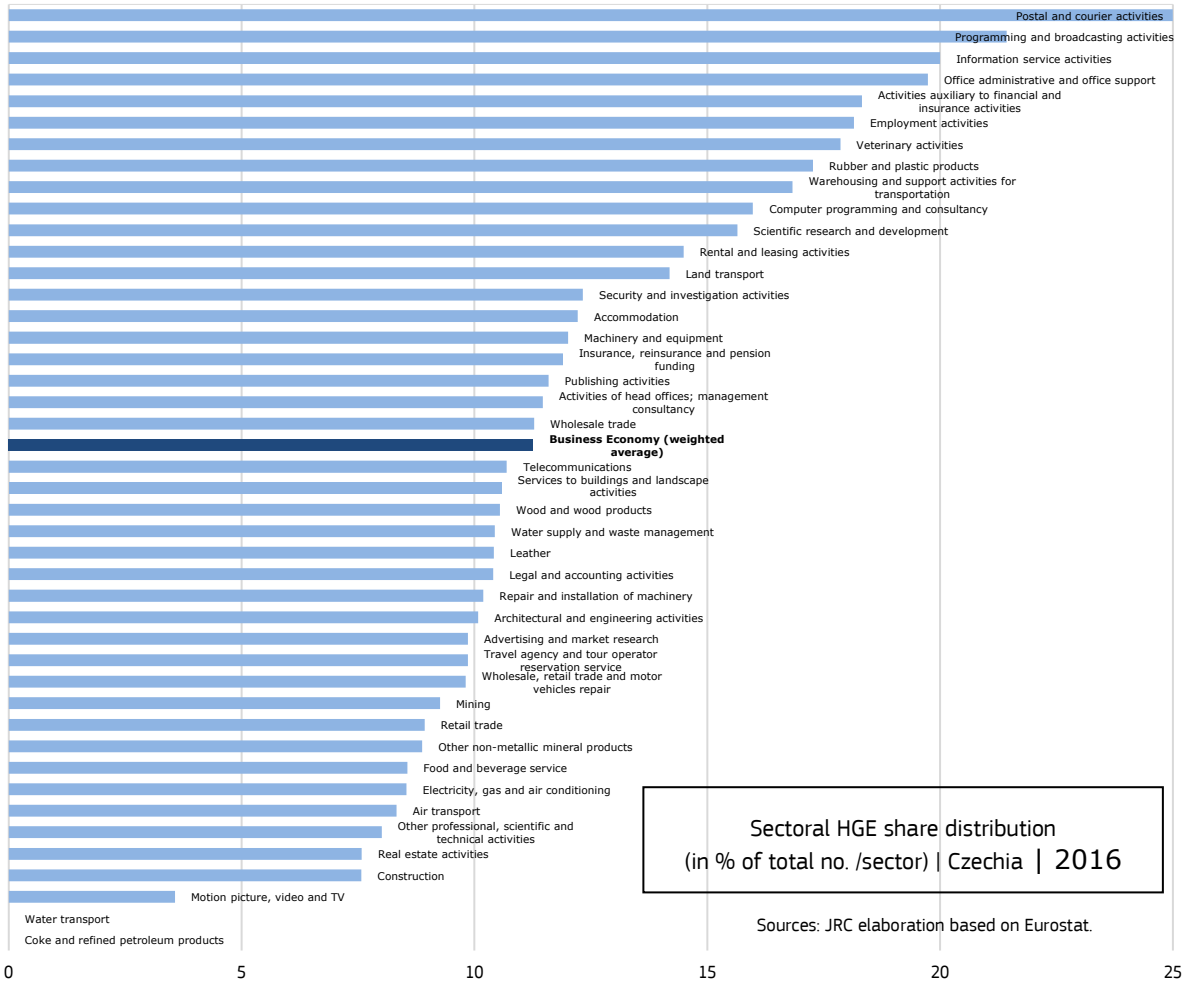


- HGEs in CZ are performing above EU average, strongly contributing to the employment share. The same positive pattern does not appear for the SMEs innovation environment.
- In general, CZ does not present an easing financing environment, underperforming in all the framework indicators. In particular, the equity market seems quite underdeveloped, while the generally easier access to loans seems to compensate this gap.
- The overall business framework environment for CZ is below EU average. The lower level of human capital quality, less favourable market regulation and taxation, without good enough entrepreneurial approaches and innovation clusters, makes it harder for firms to grow fast.

[60] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

- There seems to be a contradiction between the relatively good HGEs performance and the poorer financing and framework conditions. A higher GDP growth than EU's one (3% against 2%) in 2018 may be a partial explanation, other than the relatively good export growth (around 15% in 2013-2018). Also, CZ is highly integrated into global value chains, which could also explain part of it.

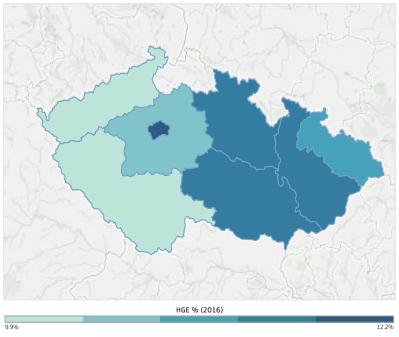
3. Firm demographics and sectoral decomposition



Sectoral HGE share distribution
(in % of total no. /sector) | Czechia | 2016

Sources: JRC elaboration based on Eurostat.

- The average share of HGEs in CZ is about 11% in the business economy. This value is in line with the 11% across the EU.
- The highest share of HGEs among active enterprises is postal activities (25%), while the lowest values pertain to motion picture, video and TV (3%).
- The knowledge-intensive sectors are predominant in the sectorial distribution of HGEs of CZ. Activities like programming, information service, office support and employment activities entail each around 20% of active firms.



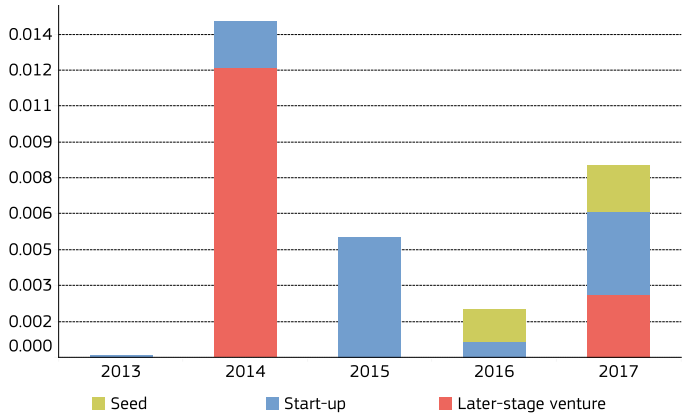
HGE share (% of active enterprises) across NUTS II regions | 2016 | Czechia

Sources: JRC elaboration based on Eurostat.

- In terms of geographical concentration, HGEs are relatively homogeneously distributed in all the CZ regions, with a higher percentage in Prague and in North-east, South-east and Central Moravia regions.

4. Financing HGEs and start-ups: the role of venture capital

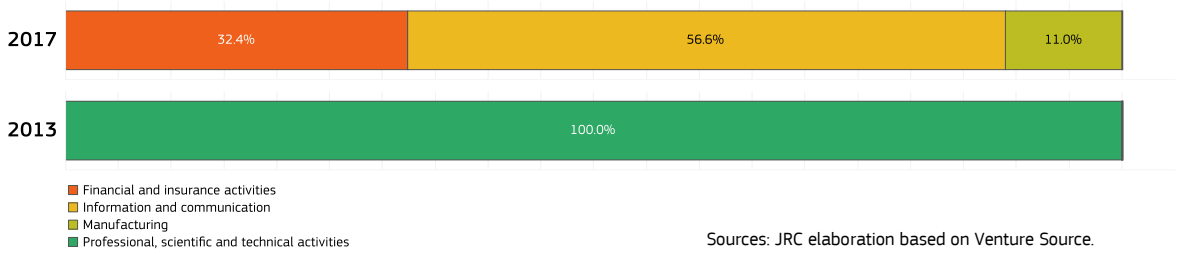
Venture capital by stage of financing (in % of GDP) | Czechia | 2013-2017



Sources: JRC elaboration based on Venture Source.

- VC investments (still low compared to the EU statistics) have undertaken an unstable trajectory in the recent years. Despite a relative boom (from 0 to 0.014% of GDP) in 2014, the level of investments slowed down in 2015/2016 to increase see another increase in 2017. It is worth noting here that this is mainly due to the lack of VC data information on different stages of financing.
- The boom and consequent drop evident in 2013 was due to the substantial investment in later-stage VC, which then dropped in the subsequent years to slowly grow again in 2017.
- Seed capital investments are only a very recent phenomenon, while the start-up environment was financed more constantly starting from 2013. The structure of VC investments is more balanced according to stage of financing in 2017.

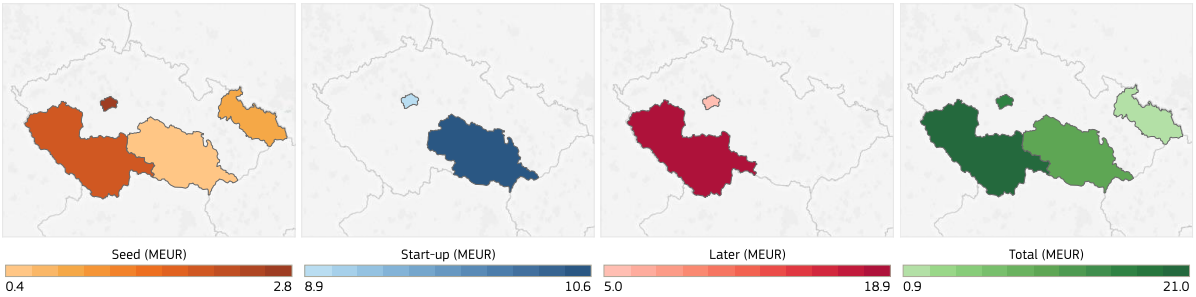
Sectoral distribution of VC investment (in %) | Czechia | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- The sectoral distribution of CZ VC investments in 2017 see the predominant position of information and communication (56.6%), with smaller investments made in finance and insurance (32.4%) and manufacturing (11%).
- The level of investments in VC in 2013 were so low that the sectorial comparison with 2017 is not much indicative. All of the VC invested was in professional, scientific and technical activities.

Regional distribution of VC investment by stage of financing (in MEUR) | Czechia | 2013-2017



Sources: JRC elaboration based on Venture Source.

- During the period 2013-2017, the VC investment distribution across region shows different patterns according to the investment phase. The southern and western regions of Bohemia were more prominent for seed and scale-up investments, while South-Moravia was a central hub for start-up financing. Across the investment stages, Prague represented always a consistent regional venture capital pole.

5. Finance-related policy measures

Instrument	Investment volume per year (MEUR)	Type
Portfolio guarantee for SMEs (ZARUKA programme 2015-2023)	93	guarantees
Preferential loan under EXPANZE programme	233	loans
Central Europe Fund of Funds (CFOF) 2018-2021	24	equity
CzechAccelerator	N/A	mixed
Activities and tools realized by regional innovation centres (eg. JIC Platinn programme)	N/A	mixed

- The need for financing SMEs and try to rise the number of HGEs is aimed to be addressed by the CZ government with a few main policy measure, in the forms of guarantees, loan programs and equity support. These, though, are not targeted, in a coherent framework, to address HGEs, but firms in their early stages of growth.
- The Zaruka programme aims at guaranteeing 70% of the principal of a loan, up to CZK 4 million. It started in 2015 with the support of the European Investment Fund.
- The most important finance-related policy measure in CZ (for investment volume) is the preferential loan available under EXPANZE programme. The loan amount ranges from 1 million CZK to 45 million (can be higher for special supported activities). Even though at least 20% of eligible expenses have to be financed by a commercial bank, the State support this measure, allowing the SME not to pay interests by subsidizing them to different extents according to the region/activity.
- The CzechAccellerator and JIC Platinn programme are less important programme meant to provide technical or managerial support to the SMEs or helping them in the networking process. The CFOF, instead, is an EIF lead fund to boost equity investments for SMEs.
- CZ financial measures for HGEs are mainly national (apart from the JIC Platinn programme and other regional instruments with less importance). There are no specific sector targeted, aside from the industrial products.

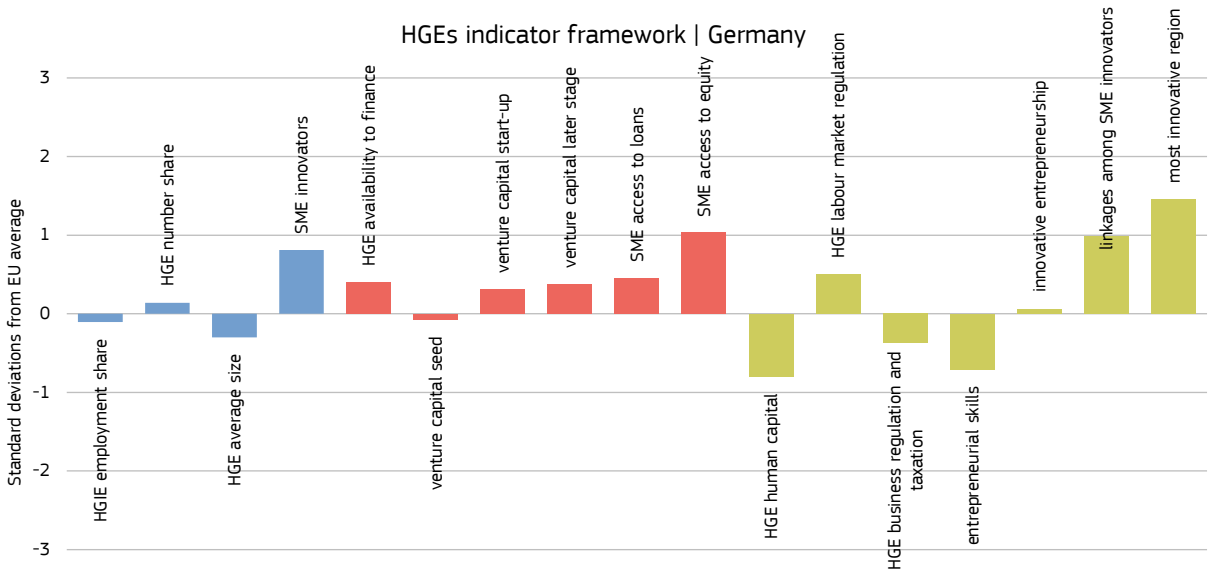
A4.5 High Growth Enterprises Factsheet – Germany (DE)

1. Executive summary

DE overall performs well in factors determining the development of high growth enterprises (HGEs[61]). The employment and number share of HGEs in DE roughly corresponds to the EU average. The generally strong performance of the innovation ecosystem in DE supports the development of HGEs. The emergence of HGEs is also favoured by the improved accessibility to finance, as suggested by evaluation studies of existing public financing programmes. This is also reflected in the overall increase in venture capital available in DE in recent years, thereby partly addressing previous shortcomings in equity finance. The sectoral distribution of venture capital investments is diversified, but certain sectors stand out, such as ICT and manufacturing. There is a strong concentration of venture capital in two major hubs (Berlin and the Munich area) across all stages of financing, which may also be related to the relatively strong innovation performance by both regions vis-à-vis the EU average. Despite progress, the venture capital markets in DE remain relatively underdeveloped, especially in comparison to the US and UK.

The conditions for HGEs could further improve by supporting the development of relevant entrepreneurial skills. The availability of staff with the right skills is considered an obstacle for investments by HGEs. DE performs below the EU average for this indicator. The lack of adequate skills is also reflected by the low proportion of the working-age population who believe they have the required skills and knowledge to start a business. These issues are partly rooted in demographic changes, as the cohort of people with the most entrepreneurial activity (aged 30 to 50) has been shrinking over the last decades. Furthermore, DE faces a general shortage of qualified labour for particular professions. In response, the federal government's Skilled Labour Strategy (*Fachkräftestrategie*) aims to retrain the labour force to meet the demand for new skills and to attract skilled labour from abroad through administrative simplification and inclusive education programmes. Business regulation and taxation may also be a limiting factor for investment decisions by HGEs.

2. HGEs indicator framework



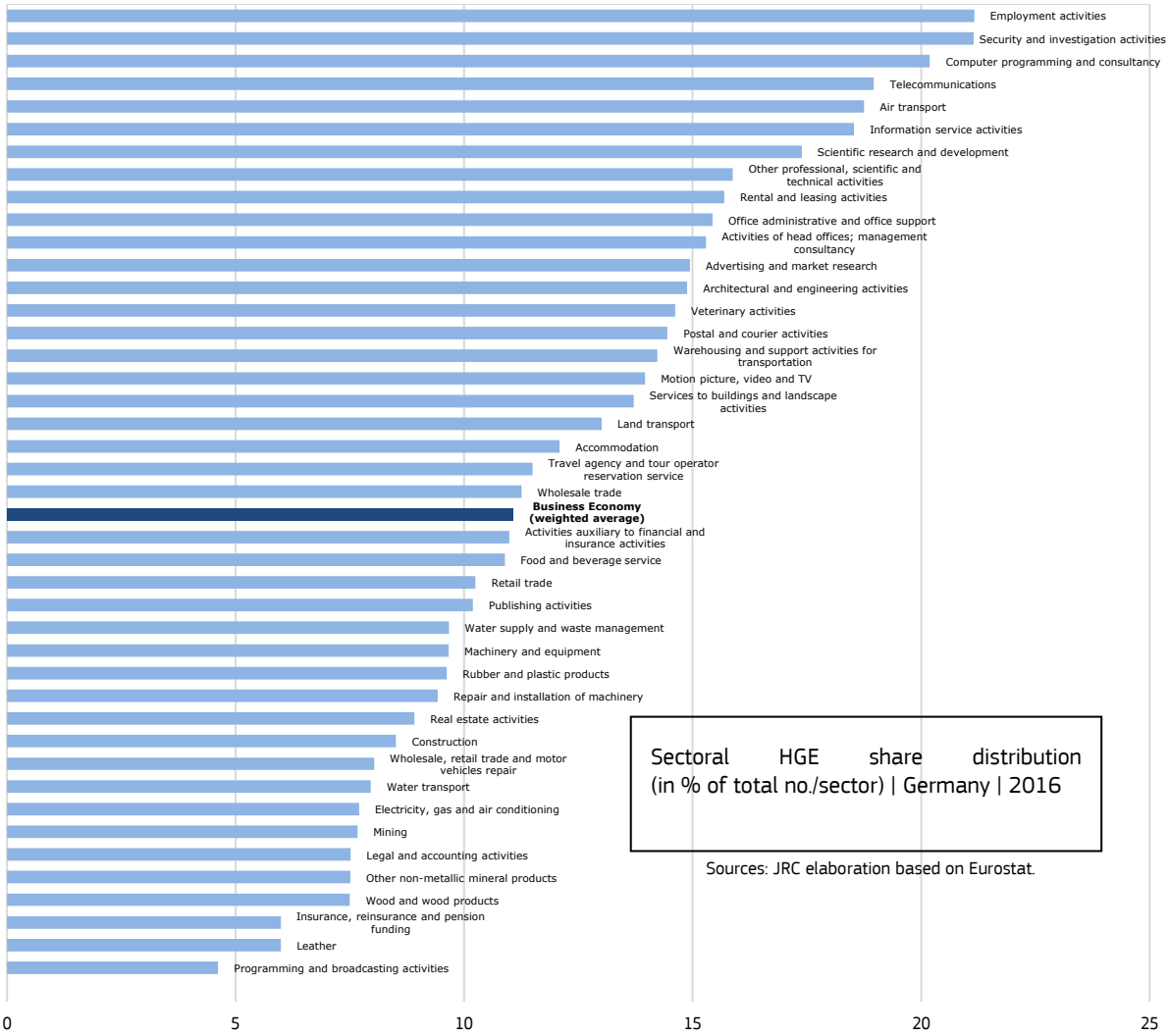
- DE performs above the EU average in several indicators, especially in terms of its most innovative region, SME access to equity, linkages among SME innovators and SME innovators.
- The emergence of HGEs is favoured particularly by the availability of finance and the overall strong performing

[61] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

innovation ecosystem in DE.

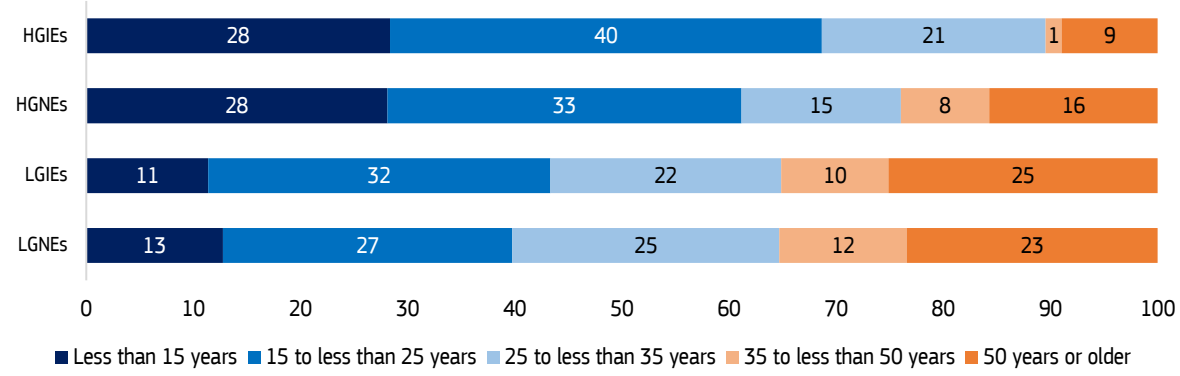
- DE could further improve the conditions for HGEs by supporting the development of the right skills related to HGEs and enhance the overall entrepreneurial skills available across the working-age population.

3. Firm demographics and sectoral decomposition



- The average share of HGEs in DE is around 11% across the business economy, ranging from 4.6% in programming and broadcasting activities to 21.2% in employment activities.
- The highest shares of HGEs are found in knowledge-intensive industries, particularly in employment activities as well as ICT and research-related sectors.

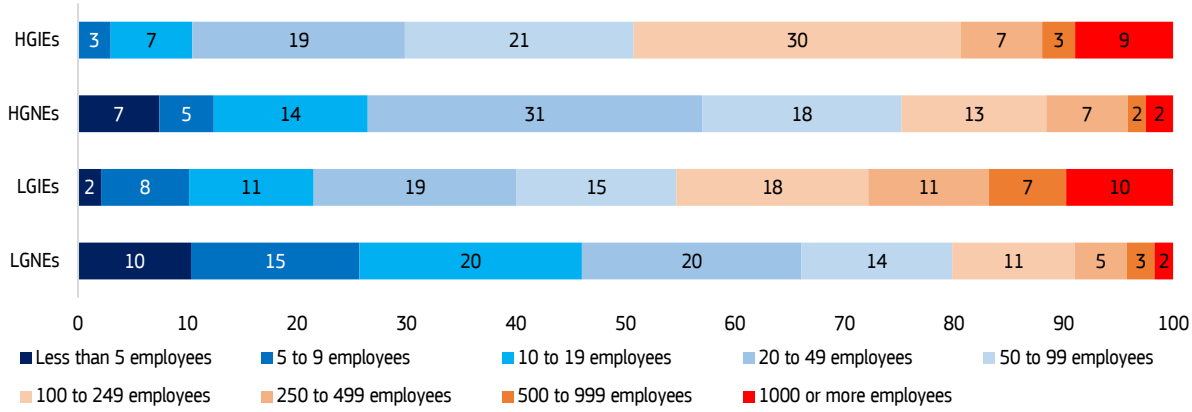
Age distribution of HGEs and other types of firms (in %) | Germany | 2016



Note: HGIEs (high growth innovative enterprises; 2% of all firms); HGNEs (high growth not innovative enterprises; 4% of all firms); LGIEs (low growth innovative enterprises; 23% of all firms); LGNEs (low growth not innovative enterprises; 71% of all firms). High growth is defined as an average annual employment growth rate of at least 10% during 2000-2008 and 2010-2016. Innovative is defined as continuously doing in-house R&D or introducing a new-to-the-market innovation. Firms with fewer than 10 employees are also considered.

Sources: JRC elaboration based on Mannheim Innovation Panel and Pellens et al., 2020.

Size distribution of HGEs and other types of firms (in %) | Germany | 2016



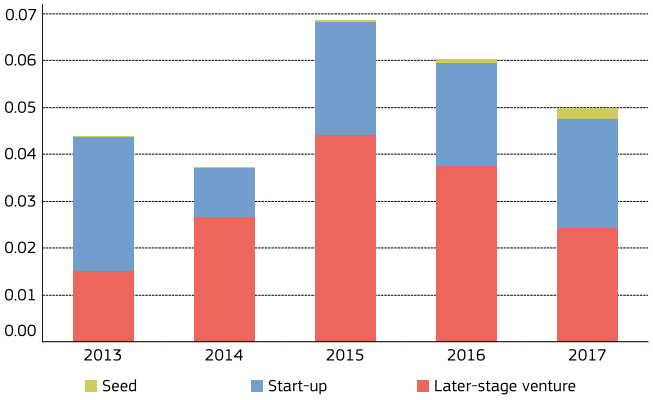
Note: HGIEs (high growth innovative enterprises; 2% of all firms); HGNEs (high growth not innovative enterprises; 4% of all firms); LGIEs (low growth innovative enterprises; 23% of all firms); LGNEs (low growth not innovative enterprises; 71% of all firms). High growth is defined as an average annual employment growth rate of at least 10% during 2000-2008 and 2010-2016. Innovative is defined as continuously doing in-house R&D or introducing a new-to-the-market innovation. Firms with fewer than 10 employees are also considered.

Sources: JRC elaboration based on Mannheim Innovation Panel and Pellens et al., 2020.

- (Innovative) HGEs tend to be substantially younger compared to their low growth counterparts. Innovative HGEs consist of a lower share of firms above 35 years old compared to HGEs that are not innovative.
- Among innovative HGEs, 80% of firms are SMEs, compared to 88% of not innovative HGEs, 73% of innovative low growth companies and 90% of not innovative low growth enterprises.

4. Financing HGEs and start-ups: the role of venture capital

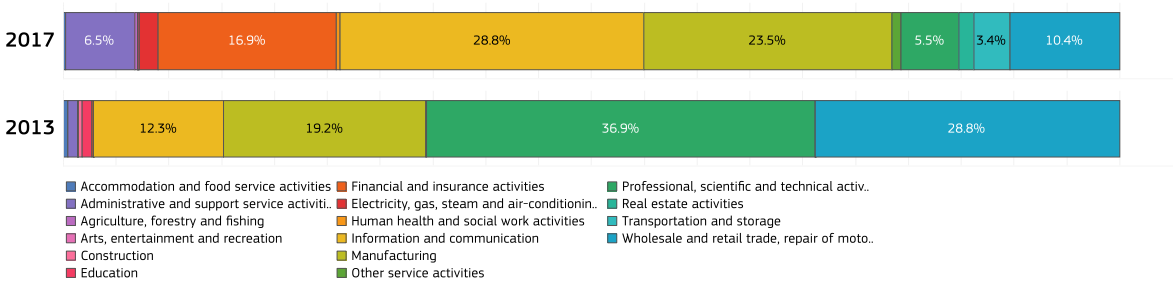
Venture capital by stage of financing (in % of GDP) | Germany | 2013-2017



Sources: JRC elaboration based on Venture Source.

- DE has overall increased venture capital investments as a share of GDP since 2013, but has seen a reduction since 2015.
- The share of later-stage ventures has substantially increased in DE despite a recent drop in 2017. The size of investments in seed companies is increasing in line with the EU average but remains relatively modest.

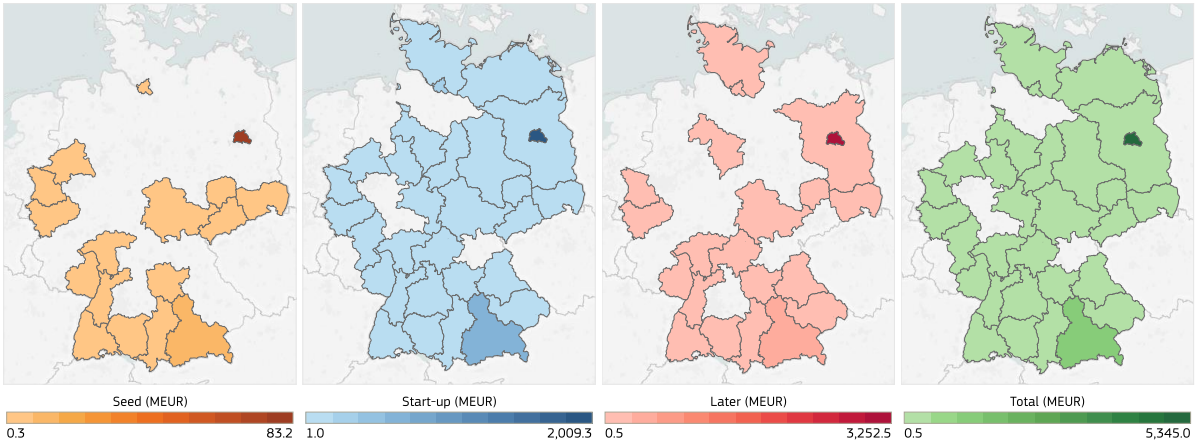
Sectoral distribution of VC investment (in %) | Germany | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- The sectoral distribution of venture capital investments is diversified, but certain sectors receive most investments, such as ICT, manufacturing, financial and insurance activities, and wholesale and retail trade.
- The sectoral distribution of venture capital investments can change substantially across time.

Regional distribution of VC investment by stage of financing (in MEUR) | Germany | 2013-2017

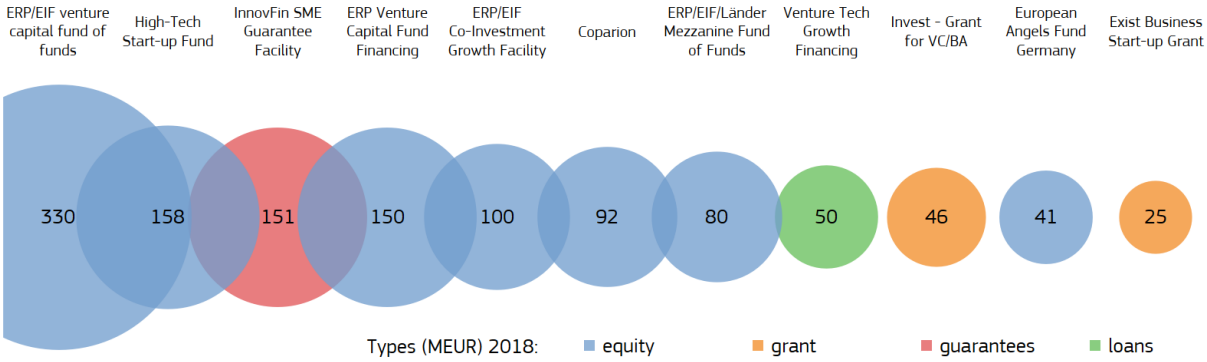


Sources: JRC elaboration based on Venture Source.

- Over the period 2013-2017, there is a strong concentration of venture capital in two major hubs (Berlin accounting for two-thirds of total VC investments and the Munich area for around 12%) across all stages of financing.
- The start-up stage funding is most distributed across regions in DE, whereas seed stage venture capital is most concentrated within a few regions.

5. Finance-related policy measures

Financial instruments Germany



Programme/Effect	High-Tech Start-up Fund[62]	INVEST[63]
Employment	Moderate effect	Funded companies have more employees
Turnover	Moderate effect	Funded companies have lower turnover
Innovation	N/A	Funded companies are more innovative

[62] Geyer, A. Heimer, T., Treperman, J. (2016). Evaluation des High-Tech Gründerfonds. Technopolis, Wien. Available at: https://www.bmwi.de/Redaktion/DE/Downloads/E/evaluation-des-high-tech-gruenderfonds.pdf?__blob=publicationFile&v=6 (last accessed on 05/09/2019).

[63] Gottschalk, S., Egeln, J., Herrmann, F., Hupperts, S., Reuss, K., Köhler, M., Bersch, J., Wagner, S. (2016). Evaluation des Förderprogramms „Invest – Zuschuss für Wagniskapital". Projektbericht an das Bundesministerium für Wirtschaft und Energie (BMWi). Zentrum für Europäische Wirtschaftsforschung, Mannheim. Available at: http://ftp.zew.de/pub/zew-docs/gutachten/Evaluation_INVEST_20160616.pdf (last accessed on 05/09/2019).

- The public financing programmes share a focus on young innovative SMEs with strong growth potential across all sectors of the economy.
- The ERP Fund of Funds and the High-Tech Start-up Fund (HTGF) may be viewed as the main publicly supported financial instrument for HGEs. An evaluation study finds that HTGF-funded firms report higher turnover and employment growth than other firms. However, the study is not using a control group of firms, which could distort the findings. HTGF appears to have cemented a dominant position as the most active seed stage investor in DE. According to evaluation evidence, the programme led to substantial crowding in of private investment, mainly through the signalling effect of the fund's investments.
- Unlike other public programmes aimed at promoting venture capital investments, the INVEST programme allows private investors to choose which businesses to invest in. This can be linked to the clear focus on business angels rather than on institutional venture capital investors. An evaluation study suggests that funded companies have more employees, lower turnover and are more innovative.
- Over the last decade, public financing programmes have improved access to early stage finance. Tighter links between entrepreneurs and investors through investment in incubators, accelerators and business angel networks have built a stronger entrepreneurial culture and made DE more attractive to local and international investors.

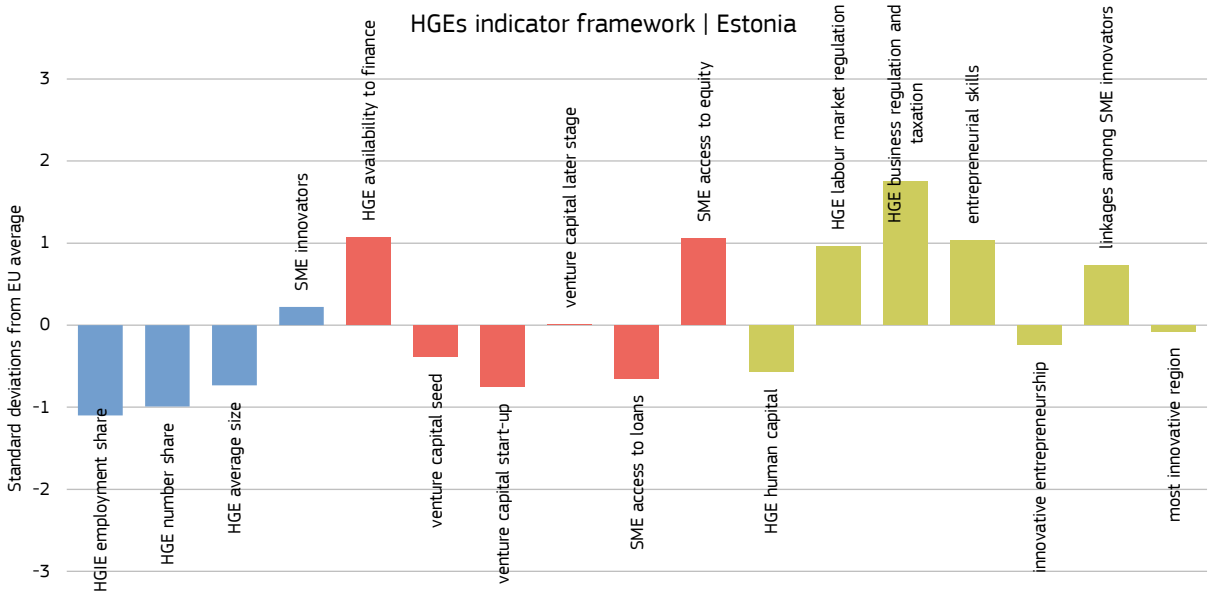
A4.6 High Growth Enterprises Factsheet – Estonia (EE)

1. Executive summary

EE performs relatively well on a number of factors determining the development of high growth enterprises (HGEs[64]), including the regulatory environment, entrepreneurial skills and availability of finance. EE offers quite favourable conditions for entrepreneurs to start their companies and to allow them to grow. The Ease of Doing Business index by the World Bank (2019) sets EE at the 16th position worldwide (and 5th in the EU). Among the main assets of EE are a liberal economic policy and a well-developed entrepreneurial ecosystem. Good entrepreneurial competencies are also beneficial for establishing companies with growth potential and attracting investors. Enterprises can benefit from digital government services that allow companies to establish themselves in a very short time. EE allows companies to operate online as modern IT solutions are in place (e.g., state e-services, e-banking, e-ID card and a digital signature legally equal to a handwritten signature). Nevertheless, the e-Residency programme that allows individuals to start businesses without living in EE is frequently criticized for making EE more vulnerable to money laundering activities. For a small economy, EE has a high number of 'unicorns': Skype (messaging software), Playtech (gambling software), Bolt (Taxify) (ride-hailing), and TransferWise (money transfer), testifying to its success in creating a vibrant start-up environment.

However, the HGEs firm demography does not reflect the above-mentioned favourable conditions. The share of companies that belong to the HGE category and their employment share are lower in EE when compared to the EU average. This could be due to the fact that in the Estonian business ecosystem, the majority of enterprises are micro companies with fewer than 10 employees (in line with other EU Member States), and their growth is hindered by the size of the EE market. All companies which want to grow eventually need to start exporting their goods or services.

2. HGEs indicator framework

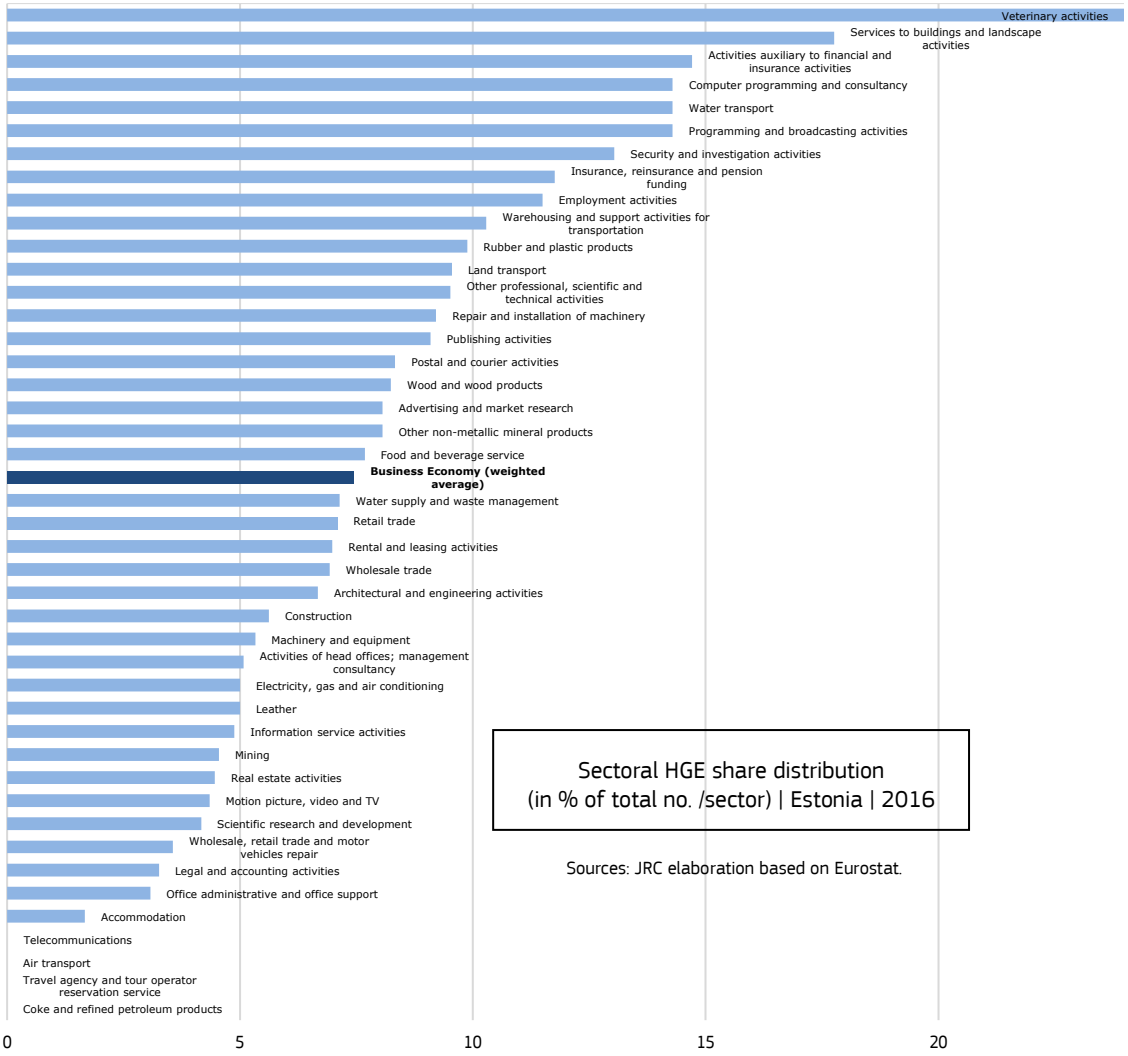


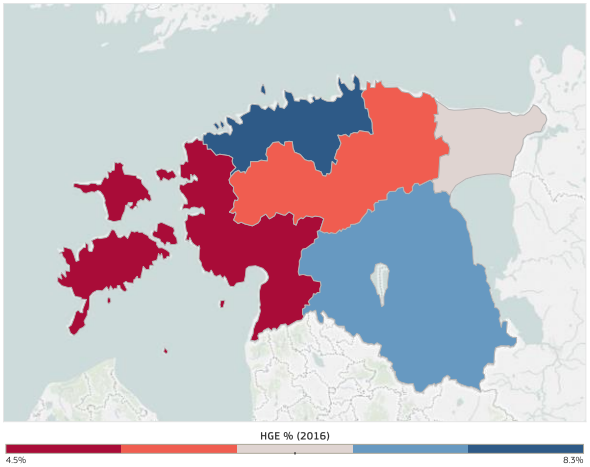
- Despite the good availability of finance to HGEs and access to equity for SMEs, the share of companies that belong to the HGE category and their employment share are lower in EE when compared to the EU average. The employment by HGEs currently stands at more than 34,500 employees in 2017.

[64] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

- HGEs in EE do not perceive labour market regulations or business regulations as investment barriers. Yet, results of the Econ EIBIS 2019 data show that the companies' investment activities could be impacted by the more pessimistic view of the situation by Estonian companies, as the share of companies stating that the economic climate will worsen over the next 12 months is higher than the EU average.
- The self-perception of Estonians shows that they feel that they have the required skills and knowledge to start a business, but companies in EE more frequently than companies in the EU report the lack of availability of staff with right skills as an investment barrier.

3. Firm demographics and sectoral decomposition





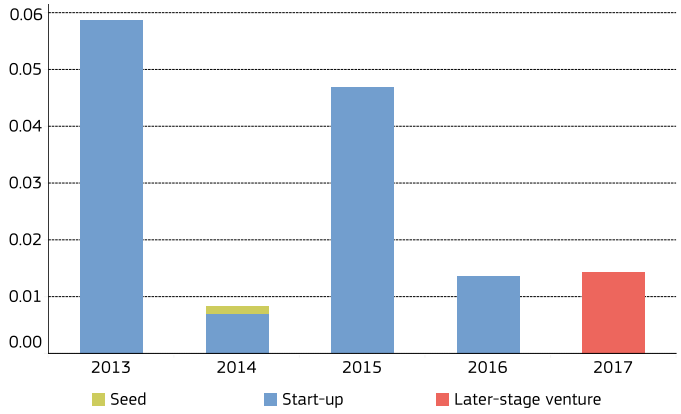
HGE share (% of active enterprises) across NUTS3 regions | 2016 | Estonia

Sources: JRC elaboration based on Eurostat

- The Eurostat statistics show that the average share of HGEs in the business economy is 7.5%. The highest shares of HGEs in EE were observed in the following sectors: veterinary activities, services to buildings and landscape activities, and activities auxiliary to financial and insurance activities.
- Enterprise Estonia, which is the main agency in charge of implementing the Estonian Entrepreneurship Growth Strategy 2014-2020, is reporting that in their portfolio of 'growth clients' there were mostly companies from metal industry, followed by food, ICT, and textiles.
- HGEs are mostly concentrated in the regions around Tallinn and Tartu.

4. Financing HGEs and start-ups: the role of venture capital

Venture capital by stage of financing (in % of GDP) | Estonia | 2013-2017



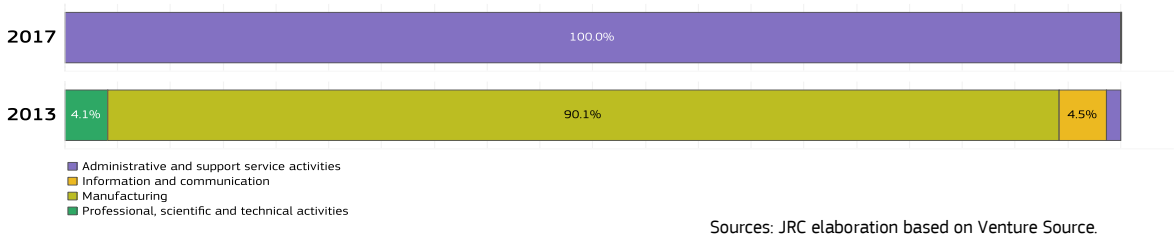
Sources: JRC elaboration based on Venture Source.

- The statistics on venture capital (VC) based on Venture Source show that most prominent VC investors in EE are focusing on seed and early stage of financing. The Estonian Venture Capital Association (EstVCA) data for 2016 shows that approximately 34% of total VC was spent on support of seed, start-up and early growth stages of companies, 26% on growth, 24% on expansion and 16% on buyout. Based on Invest Europe data, in 2018 the venture capital constituted 9% of total investments in Estonia, out of which 24% were spent to support seed stage of companies, 7% on start-ups and 69% on later stage ventures.
- The Eurofound study (2018) identified lack of support during the prototype phase of start-ups in EE. Also, the supply of VC for start-ups is considered to be limited and most investments do not exceed EUR 1 million[65].

[65] Future of manufacturing Startup Estonia – Internationalisation policy measure. https://euagenda.eu/upload/publications/untitled-191856-ea.pdf

- Startup Estonia data[66] shows that there has been an exponential growth of general investments into Estonian start-ups over the last decade: from EUR 7 million in 2008 to EUR 328 million in 2018. At the same time, the number of deals remains relatively low.

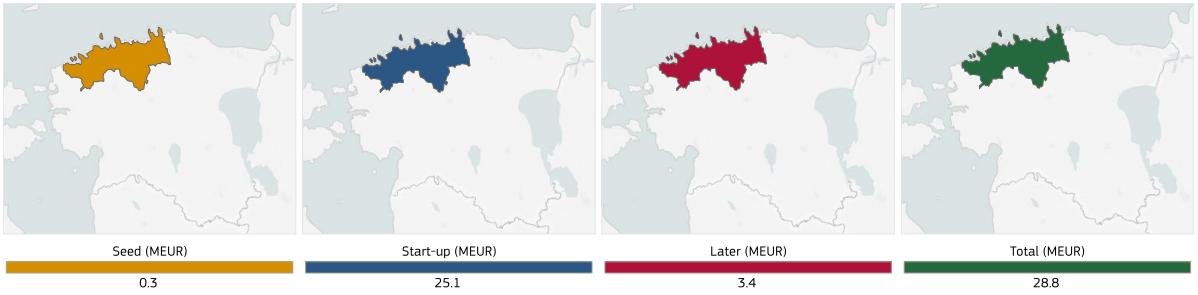
Sectoral distribution of VC investment (in %) | Estonia | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- The Venture Source data show significant change in the distribution of investment recipients by sector between 2013 and 2017. In 2013, the investments mainly occurred in the manufacturing sector, whilst in 2017 in the administrative and support service activities.

Regional distribution of VC investment by stage of financing (in MEUR) | Estonia | 2013-2017

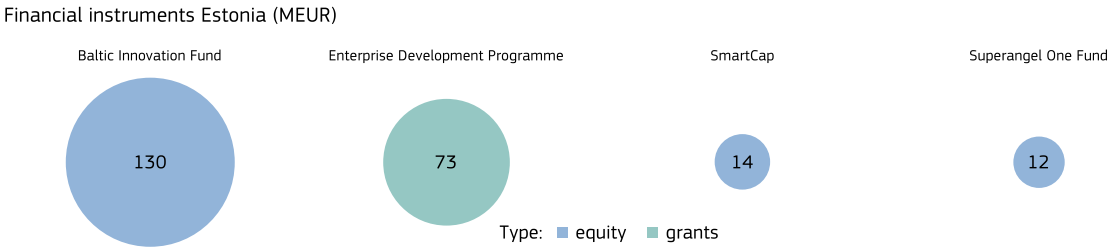


Sources: JRC elaboration based on Venture Source.

- In EE, the concentration of all stages of VC investments is observed mainly in the capital region. The greater attractiveness of Tallinn for investors could be related to the existence of infrastructure, easier access to talented workers, and other startups.
- This concentration could be also related to the impact of the previous functioning of Skype in Tallinn, which provided experience and capital and helped in the development of the entrepreneurial ecosystem. The former Skype employees have been perceived as the most important factor in the later evolution of EE's start-up ecosystem after the company exited the market. The so called "Skype Mafia" companies whose founders include ex-Skypers includes such companies as Transferwise and Taxify (now Bolt).

[66] https://www.startupestonia.ee/blog/2018-records-for-the-estonian-startup-sector-new-wave-of-entrepreneurs-in-the-community

5. Finance-related policy measures



- EE's strategy for HGEs focuses on three pillars: supporting growth of manufacturing (exporting) companies, developing start-up environment and supporting companies in three smart specialisation areas (information and communication technology, a sectors; health technologies and services; enhancement of resources).
- The main publicly supported financial instruments for HGEs in EE is the Enterprise development programme run by Enterprise Estonia. Over the years 2014-2020, EUR 73 million in total will be spent on grants to enterprises. Public support covers 35-45% of a supported project (max EUR 500,000 per company). This policy area is led by one agency, Enterprise Estonia, and is supported by some horizontal policy measures such as tax exemption of re-invested enterprise profits.
- Other publicly supported financial instruments for HGE are:
  - *Baltic Innovation Fund* via national promotional institution *KredEx* has since 2014 invested EUR 163 million into 33 companies; 56% of the fund is still to be invested (the fund covers all three Baltic countries); it is a Fund-of-Fund initiative launched by the EIF in close co-operation with the Governments of LT, LV and EE in 2012 to boost equity investments made into Baltic SMEs with high growth potential.
  - *EstFund* this EUR 60 million Fund-of-Funds initiative was launched by EIF in March 2016 in close co-operation with KredEx and the Estonian Ministry of Economic Affairs and Communications to stimulate equity investments into innovative and high growth-focused enterprises in Estonia. This fund has since 2018 invested 4 million euros into 9 companies; 93% of fund still to be invested
  - *SmartCap* (formerly Early Fund II) operates as a fund of funds and invests into ES VC funds, which in turn, together with private investors, invest into early-phase Estonian technology companies with high international growth potential. The sole unitholder in Early Fund II is the Republic of EE. It has invested since 2014 EUR 14.4 million into 19 companies; under the *SmartCap* there is the *Superangel One* fund (Ärikiirendi SuperAngel) available, which started in 2018 with EUR 4.2 million from public funding, most of the fund still to be invested. The fund has a total of EUR 12 million. This business accelerator fund combines services to speed up SMEs growth with early stage risk capital investments. The fund helps 40-60 start-ups/scale-ups with high growth and export potential in the three smart specialisation areas (ICT, health technologies and services and efficient use of resources). The fund is managed by a private fund manager selected through a tender procedure.
- EE has two specific programmes to attract foreign investors in HGEs: start-up visa for non-EU entrepreneurs, (https://www.startupestonia.ee/visa) and the e-residency programme. The latter could be seen as attracting investors into HGEs as "e-residency enables digital entrepreneurs to start and manage an EU-based company online from anywhere in the world" (https://e-resident.gov.ee).

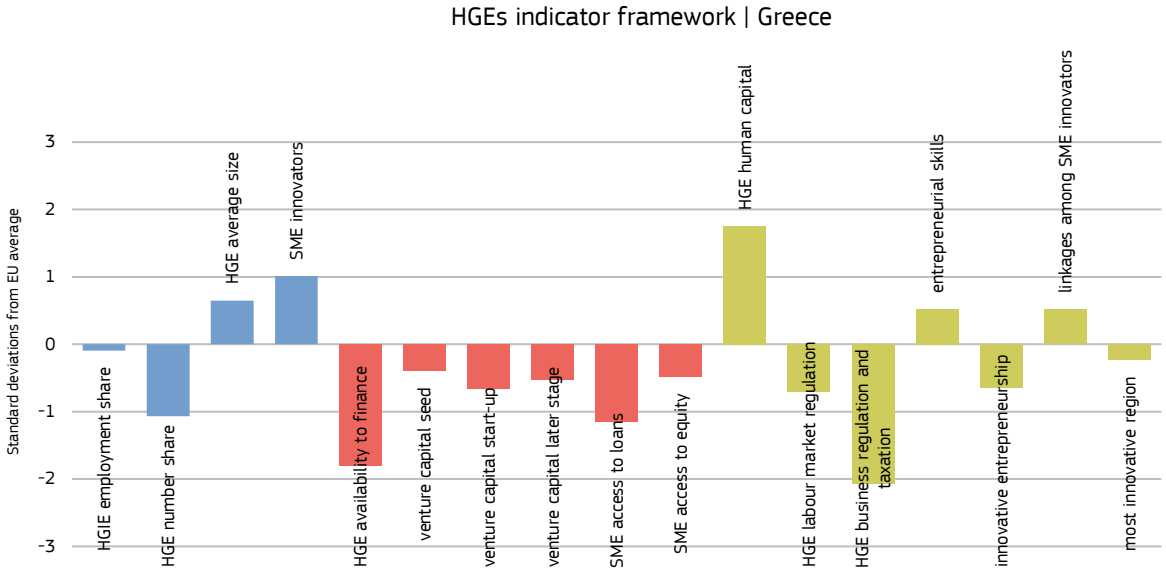
A4.7 High Growth Enterprises Factsheet – Greece (EL)

1. Executive summary

Above average scores on human capital and skills indicators and some others suggest the presence of latent potential for more HGEs[67] to emerge - notwithstanding the brain drain abroad in recent years of many highly-skilled and highly educated segments of the population. The positive effect of this potential may benefit from a differentiated policy approach in which priority measures are directed towards the main weaknesses in the business ecosystems. Policy programmes are being deployed and reinforced to help address the finance deficits and more such positive developments are expected in view of the policy priorities of the new government. However, a lack of sound evaluations of completed programmes and initiatives means that lessons cannot be learned from past experience and improvements made as well as repeating mistakes avoided.

Overall, however, the amount of high-growth entrepreneurship in EL as well as the factors influencing its development, lag with respect to EU averages. Access to growth-enabling finance appears to be the country's weakest performing area in this regard as shown by the scores for relevant financing indicators. Bank lending to SMEs remains expensive. While the willingness to lend and access to public financial support have improved, there is serious lack of equity ('business angel', venture capital, etc.) and other sources of finance such as crowdfunding. Even though the proportion of HGEs of the total firm population at 7.2% is below the EU average, an increase in the absolute number of HGEs (33% higher in 2016 than in 2014) is consistent with overall increased business activity and continued positive economic trends since the recovery started in 2017.

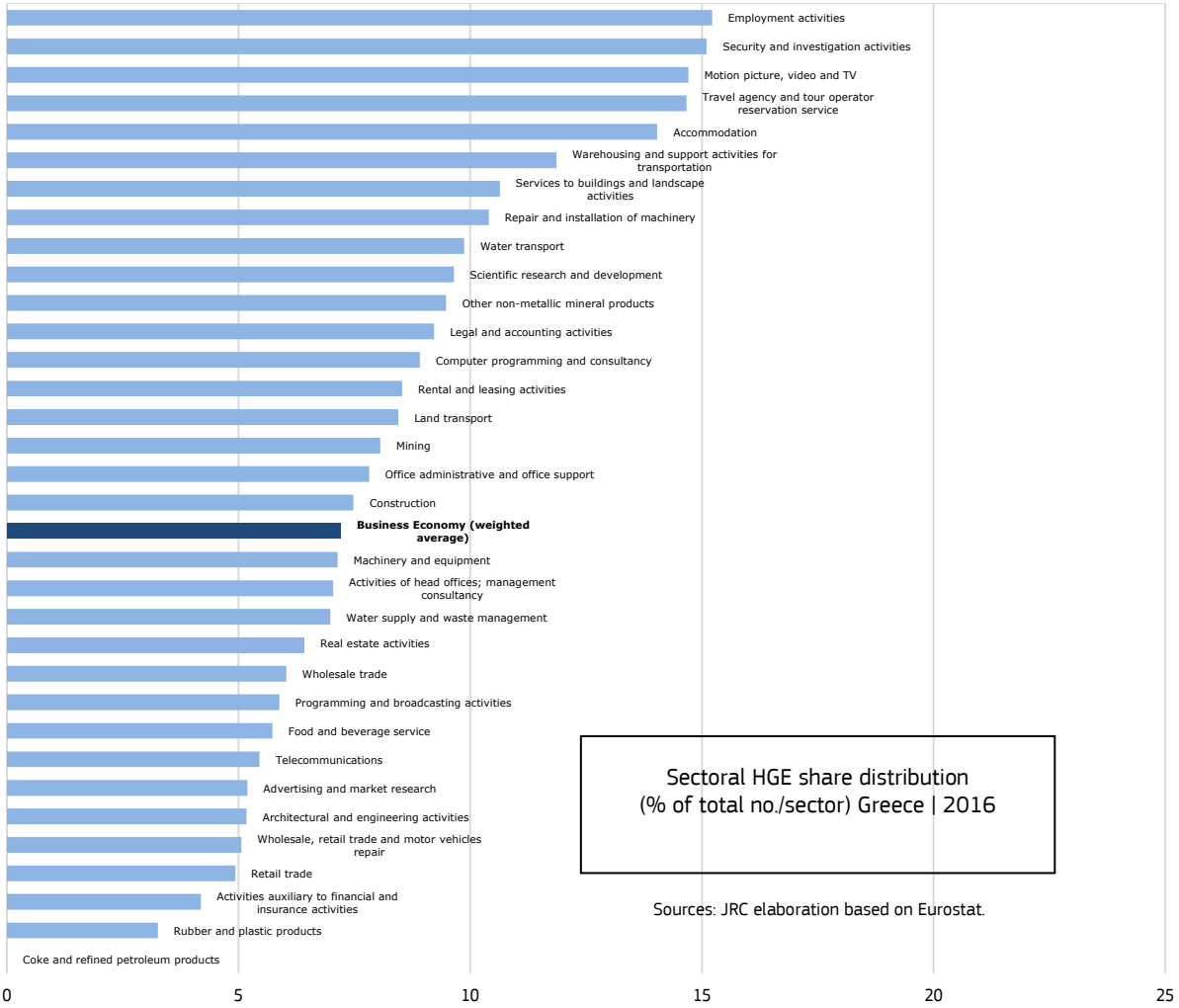
2. HGE indicator framework



- EL performs below average for most indicators, with financing HGEs and regulatory conditions appearing to be particularly unfavourable.
- Above average scores for SME innovators and HGE-relevant human capital and skills suggests the presence of HGE potential which could be realised should regulatory and finance issues be adequately addressed.

[67] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

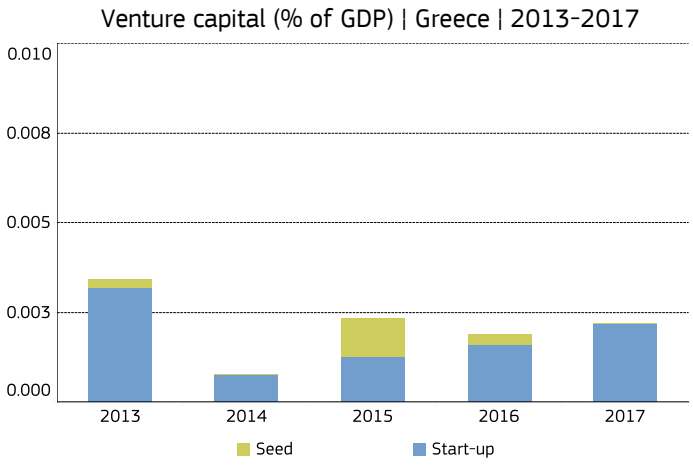
3. Firm demographics and sectoral decomposition



Sources: JRC elaboration based on Eurostat.

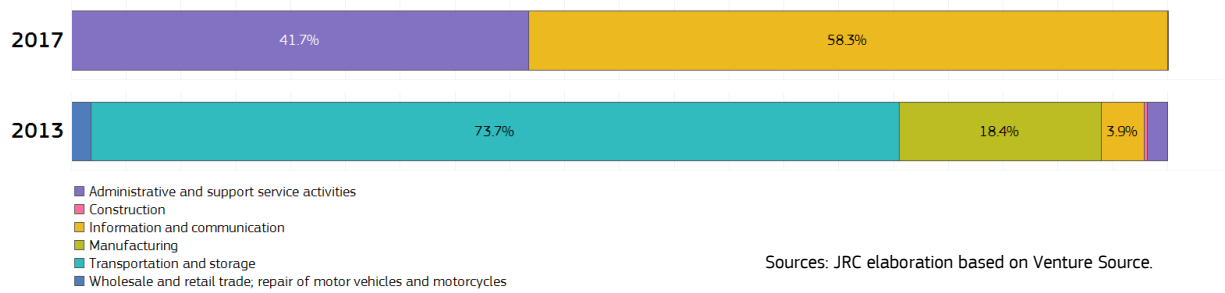
- The average share of HGEs in EL is 7.2% across the business economy – less than the EU average of 10.7%. By sector, it ranges from 3.3% in rubber and plastic products to just over 15.2% in employment activities.
- The distribution shows the wide sectoral incidence of HGEs with the highest proportions for a number of services sectors, as in other countries.

4. Financing HGEs and start-ups: the role of venture capital



Sources: JRC elaboration based on Venture Source.

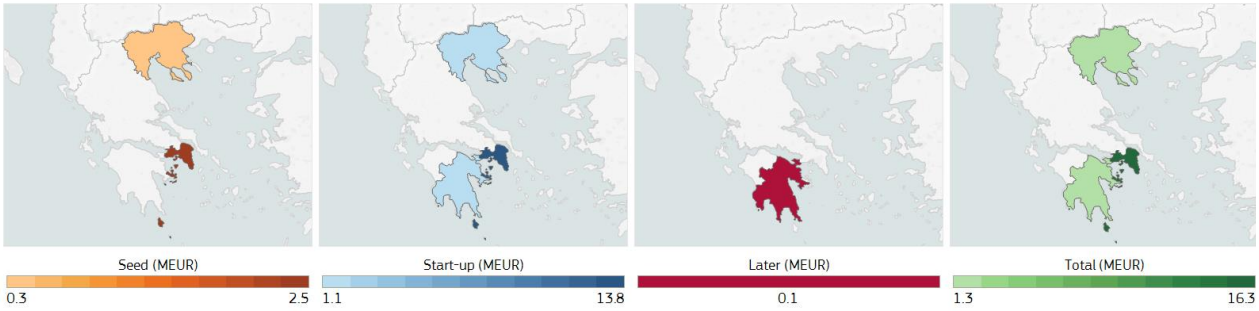
- The proportions of different types of VC investment as a percentage of GDP are very small - at least an order of magnitude smaller than average EU proportions, if not entirely absent, as is practically the case for later-stage VC.
- After a big drop in start-up VC from 2013 to 2014, it has grown again, at least up until 2017. There is no clear trend for seed VC.



Sources: JRC elaboration based on Venture Source.

- It is not possible to draw meaningful conclusions from the sectoral distribution of VC in Greece given the small numbers involved – i.e. €6.1 million in 2013 and €4.0 million in 2017 with the total number of deals being respectively ten and three – other than to point out that in 2013 VC backed firms in six different sectors suggesting a wide sectoral spread of high-growth enterprise potential.

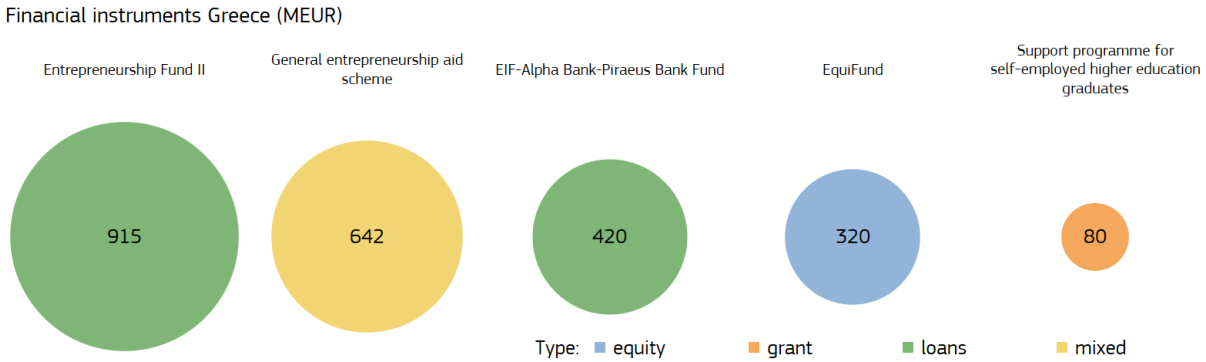
Map 1. Regional distribution of VC investment by stage of financing



Sources: JRC elaboration based on Venture Source.

- It is difficult to draw conclusions from the territorial distribution of VC-backed venture investments, though for seed and start-up ventures, where there are more deals than for later stage, the expected concentration in the Athens region is apparent.

5. Finance-related policy measures



- Although no policy measures exclusively support HGEs in Greece, relevant funds have been set up by EIF in cooperation with the government (e.g. Equifund - a €320 million fund-of-funds for start-ups and scale-ups (for technology transfer, accelerator, early stage/seed and growth stage private equity - its €210 million 'Growth Stage window' targets scale-ups.) and Greek banks (Alpha Bank and Piraeus Bank) that aims to mobilise €420 million to support more than 2,000 innovative Greek SMEs.
- Of lesser relevance to HGEs are: the Entrepreneurship Fund II launched in March 2019 with a total lending capital of €915 million (it aims to facilitate SME access to finance, improve loan conditions and fill the gaps in the financial market by offering business loans with favourable interest and interest-free loans with the support of banks); and the 'General entrepreneurship aid scheme to all enterprises in the tourism, manufacturing and services' sectors via a mix of tax exemptions and different types of subsidy.
- Other relevant measures include legislation aimed at reducing bureaucracy and decreasing corporate taxes. Such measures are expected to multiply following the July 2019 general election, as ease of doing business, access to finance and strengthening entrepreneurship are high on the agenda of the new government.

A4.8 High Growth Enterprises Factsheet – Spain (ES)

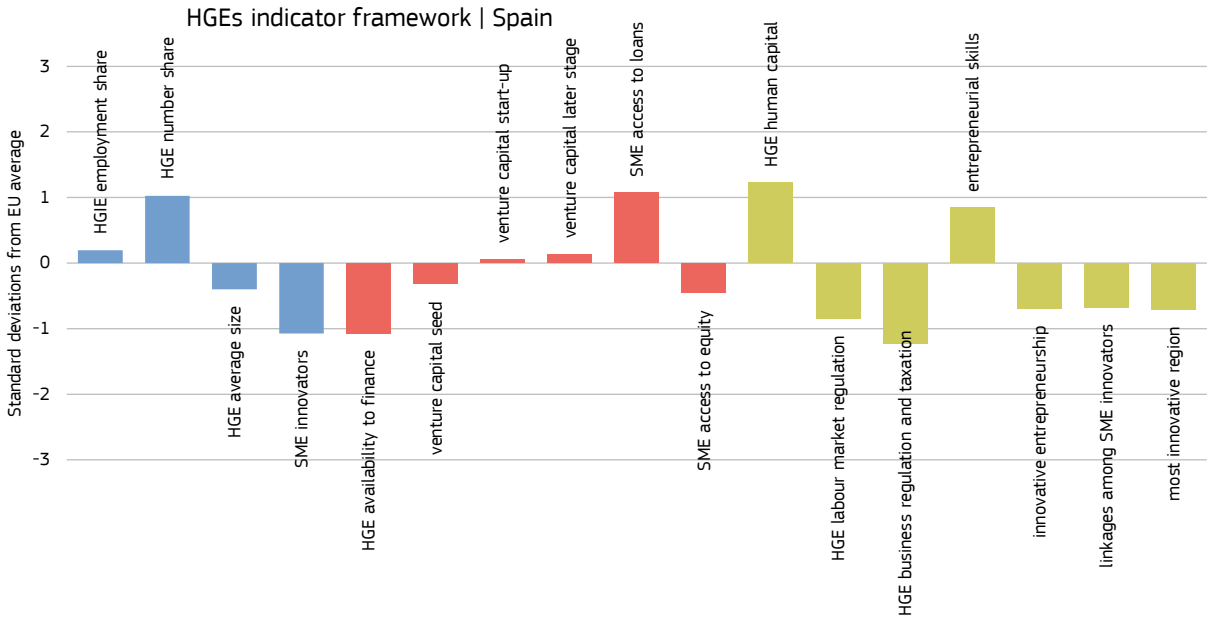
1. Executive summary

High growth enterprises (HGEs[68]) in ES follow an unequal distribution among industries. Only five sectors recruit more than half of total employment in HGEs: transportation and storage; employment activities; construction; accommodation and food services; and wholesale trade. Within this set of sectors only one of them (employment activities) is considered as knowledge-intensive.

Although the levels of investment in venture capital (VC) in ES are similar to those of neighbouring countries, they are still very far from the world leaders in this area, such as the United States and China. Concerning the development phases of VC-backed firms, VC investment in ES is more concentrated in the start-up phase, followed by the later stage venture in 2017. Being the riskiest investment, the availability of seed phase capital is traditionally much lower. Turning to the sectoral distribution of VC funds in ES, the transportation and storage sector is the largest recipient, having received 28% of total investment in 2017 followed by manufacturing, and administrative and support services activities.

In ES, policy interventions could be better targeted to increasing funding availability and its more even distribution across different stages of firm development. This is consistent with the policy implications provided by Haugh et al. (2017),[69] which point to the importance of an efficient allocation of capital which addresses the funding needs of new innovative firms. The regulatory framework in terms of the labour market, business and taxation is also an area of improvement.

2. HGEs indicator framework



- ES performs above the EU average in terms of the number of HGEs and the employment share of HGIEs, whereas it performs below the EU average in terms of the share of innovative SMEs as well as the average size of HGEs.[70]
- Compared to the EU average, ES venture capitalists provide slightly more funding to start-ups and scale-ups,

[68] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

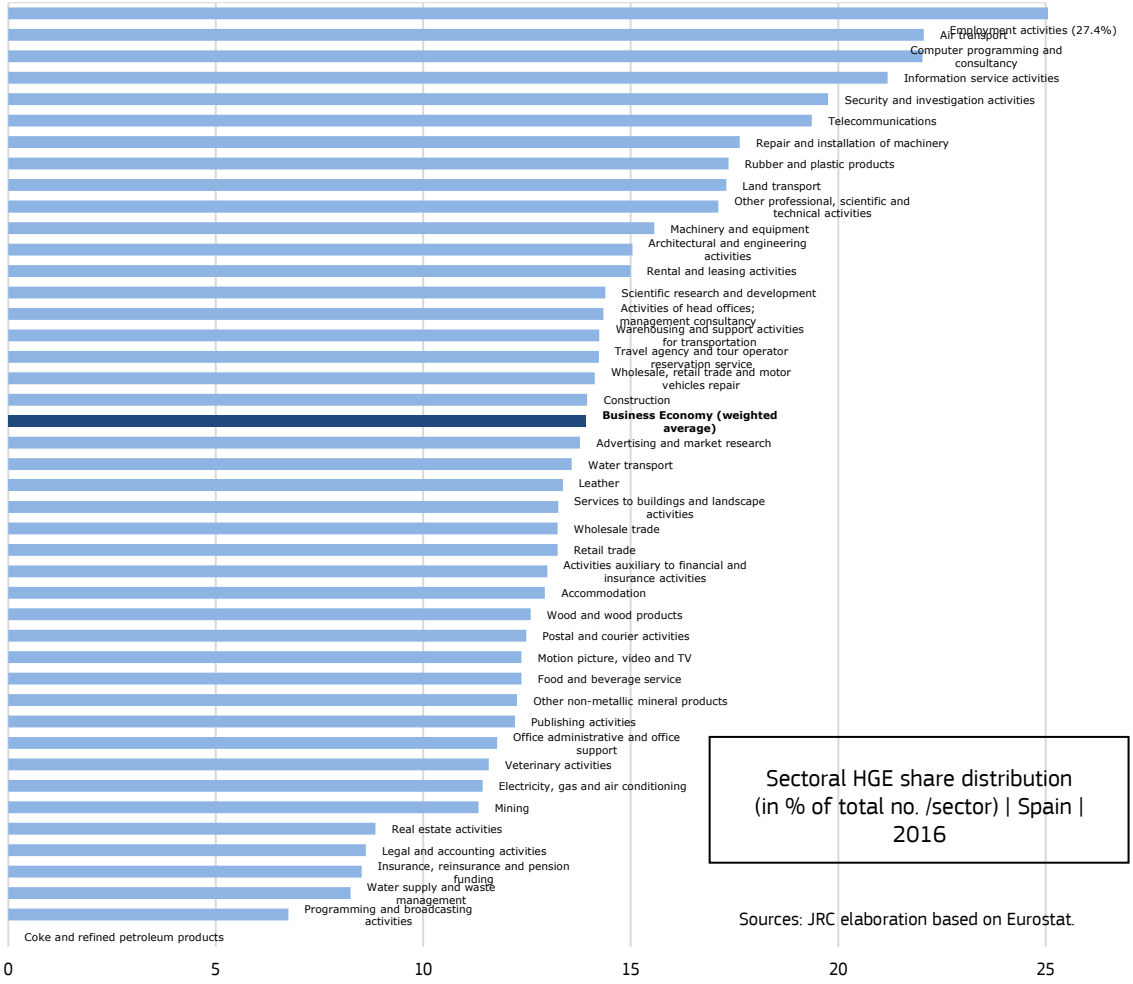
[69] Haugh, D., M. Adalet McGowan, D. Andrews, A. Caldera Sánchez, G. Fulop and P. García Perea (2017), 'Fostering innovative business investment in Spain', OECD Economics Department Working Paper 1387, OECD, Paris.

[70] Units are normalized using the standard deviation of the distribution of "differences" across countries with respect to the EU for each indicator. These differences should thus be interpreted the as "number of standard deviations away from the EU average".

whereas fewer of them tend to invest in seed companies. It also emerges that the typical source of finance for SMEs is loans, rather than equity.

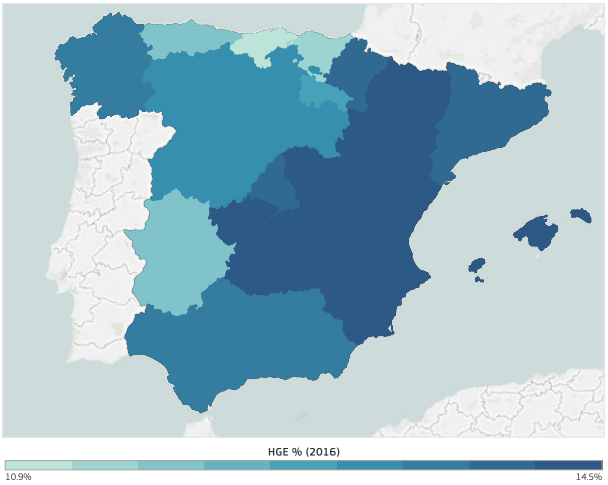
- Despite good performance in terms of human capital relative to the EU average, framework conditions (shown by the green bars) are not favourable for the emergence and development of both HGEs and innovative SMEs in ES. But ES entrepreneurs tend to believe more strongly that they have the required skills and knowledge to start a business than their EU counterparts.[71]

3. Firm demographics and sectoral decomposition



- The average share of HGEs in ES is around 14% across the business economy, ranging from 6.8% in programming and broadcasting activities to 27.4% in employment activities.
- The highest shares of HGEs are found in knowledge-intensive and high and medium-high tech manufacturing industries, particularly in ICT and research-related sectors in addition to employment activities.

[71] See definition of entrepreneurial skills in the Annex at the end of this document.



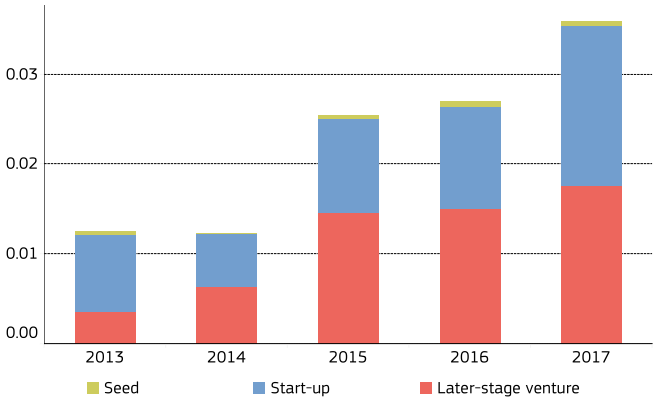
HGE share (% of active enterprises) across NUTS2 regions | 2016 | Spain

Sources: JRC elaboration based on Eurostat

- From a geographical point of view, the highest shares of HGEs among active enterprises are found in Comunidad Valenciana, Canary Islands[72], Balearic Islands, Aragon, Castilla La Mancha and Murcia.

4. Financing HGEs and start-ups: the role of venture capital

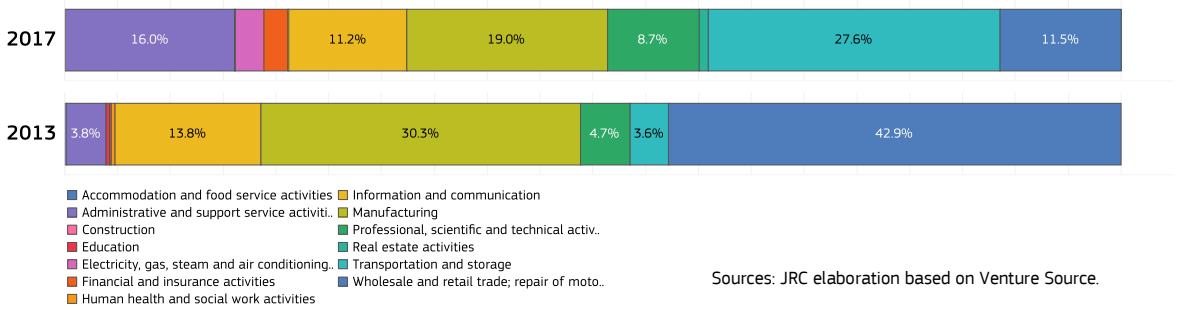
Venture capital by stage of financing (in % of GDP) | Spain | 2013-2017



Sources: JRC elaboration based on Venture Source.

- Despite the high level of entrepreneurial skills previously documented, ES's VC total investment represented only 0.02% of GDP in ES on average in the 2013-2017 period.
- The weight of VC investments has increased mainly for start-up and later-stages in the last five years.

Sectoral distribution of VC investment (in %) | Spain | 2013 & 2017

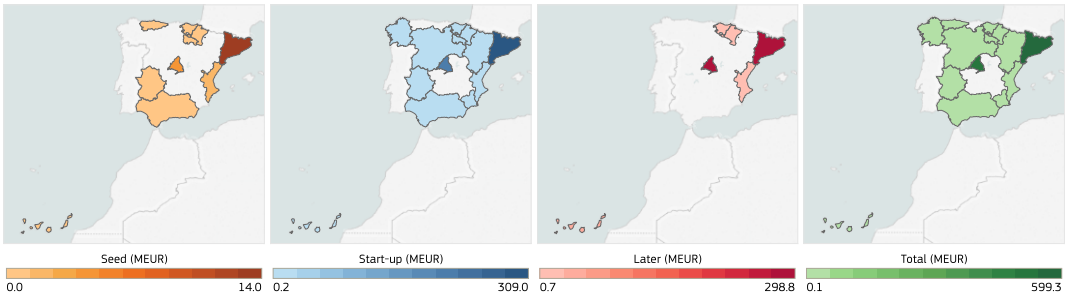


Sources: JRC elaboration based on Venture Source.

[72] Not shown on the map.

- Compared to 2013, in 2017 a larger share of VC investments went to firms in the transportation and storage sector, and administrative and support service activities.
- There are also significant variations in other sectors from 2013 to 2017. A lower share of firms in manufacturing and wholesale and retail sector received VC investments in 2017 compared to 2013, whereas firms in electricity businesses have started to be VC-backed only in 2017.

Regional distribution of VC investment by stage of financing (in million euros) | Spain | 2013-2017



Sources: JRC elaboration based on Venture Source.

- Over the period 2013-2017, a sizeable amount of VC investment concentrated in VC-backed companies located in Catalonia and Madrid.
- The regional distribution of start-up VC investment is more evenly distributed than that of seed and later stage.

5. Finance-related policy measures

Instrument	Type	Target population
CDTI Innvierte Programme	Fund-of-funds	Knowledge-intensive sector in all stages of financing
CDTI Innovation Line	loans	Firms or a group of firms or a consortium, including outsource centres, research institutes, and universities engaged in R&I projects.
Gauzatu Industry Programme	loans	-
Incentives for Business Angels	tax incentive for private equity	-
National Innovation Company-ENISA	loans	Innovative companies

- CDTI's Innvierte Programme aims at promoting entrepreneurial innovation through support for VC investment in technological or innovative companies. In 2019, the funds of the Innvierte programme doubled (from EUR 100 million in 2018 to EUR 200 million in 2019).
- CDTI line of innovation aims at companies (irrespective of size) having proved enough capacity at the technical, economic and financial levels to carry out proposed projects. Support is provided to projects that allow the adoption of new technologies at sectoral level. The loan has a variable interest rate depending on the source of the funds and the amortisation period chosen.
- ENISA has financing lines with Business Angels Networks, VC firms and the ES start up co-investment fund programme for innovative companies. The aim of the ES start up co-investment fund is to stimulate the seed capital sector in ES through the creation of a co-investment fund of up to EUR 40 million, contributed in equal parts by ENISA and a group of specialized investors, both Spanish and international. This co-investment fund is intended not just to be an instrument for the development of the ES VC market, but also to attract the interest of the most active specialized investors in other countries for the high enterprise potential that now exists in Spain. It finances up to EUR 1.5 million per operation.

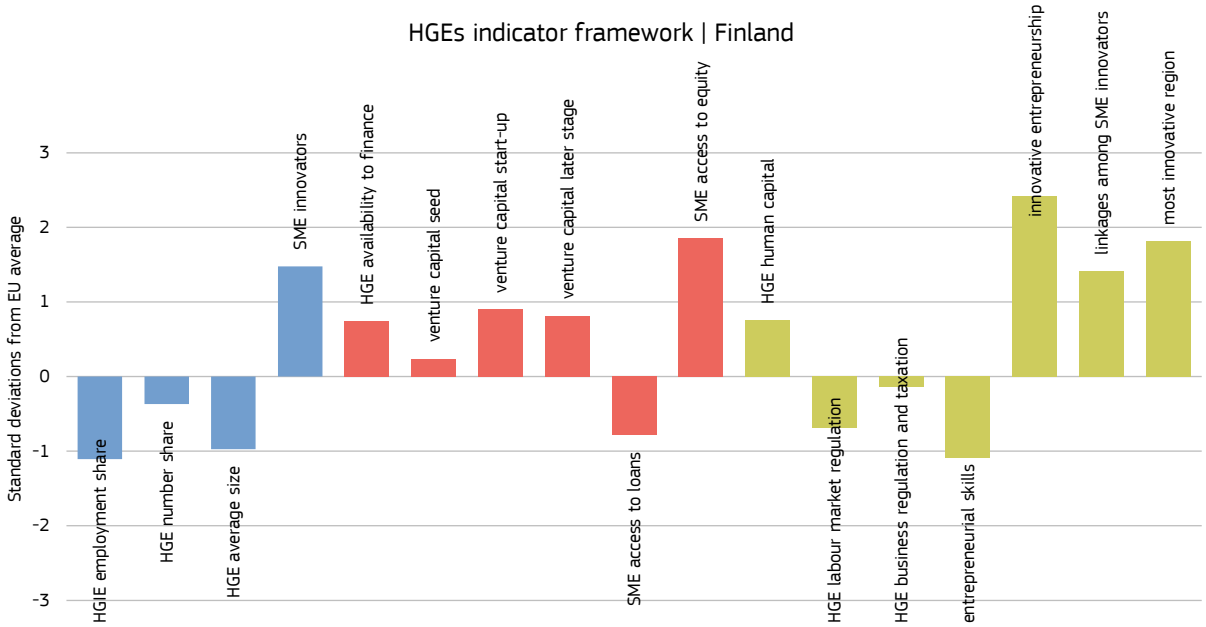
A4.9 High Growth Enterprises Factsheet – Finland (FI)

1. Executive summary

FI performs well in factors determining the development of high growth enterprises (HGEs[73]). In general, there is a strong performance of the innovation ecosystem. In fact, the HGEs indicator framework reveals that FI is one of the top performers in the EU. More specifically, the emergence of HGEs is favoured by the easy access to human capital and financing, the high incidence of innovative entrepreneurship, the privileged position of the capital city region as the most innovative in the EU and the existence and well-functioning of linkages among SME innovators. The highest shares of HGEs among active enterprises are found in the Helsinki-Uusimaa region and in North and East Finland. There is still margin to improvements, but the situation of HGEs has improved recently (the number of HGEs increased in 2017 after years of decline). This may be also due to the gradual increases in venture capital investments recorded since 2014. As a result, it can be seen that venture capital markets in FI remain well positioned vis-à-vis the EU average. The sectoral distribution of venture capital investments is concentrated in two sectors: information and communication, and manufacturing. There is also a strong concentration of venture capital in one mayor hub (Helsinki area) across all stages of financing, which may also be related to the strong innovation performance of this region in the EU context.

The HGIE employment share and the HGE number share remain below the EU average. Despite the strong performance of the innovation ecosystem in FI, the relative share of HGEs in Finland is still below EU average and well below its Nordic peers. Part of the explanation may be that the economic recovery after the financial crisis has been slower in Finland than in many other countries, which may have slowed down the scaling of Finnish HGEs as well. There are also some more deep-rooted challenges as well, as indicated by the indicators measuring entrepreneurial culture in general. But the situation has improved in the last year: after three years of decline between 2014-2016, the number of HGEs increased again in 2017. The conditions for HGEs could further be improved by supporting the development of relevant entrepreneurial skills, facilitating SME access to loans and promoting changes in HGE-relevant labour market regulation.

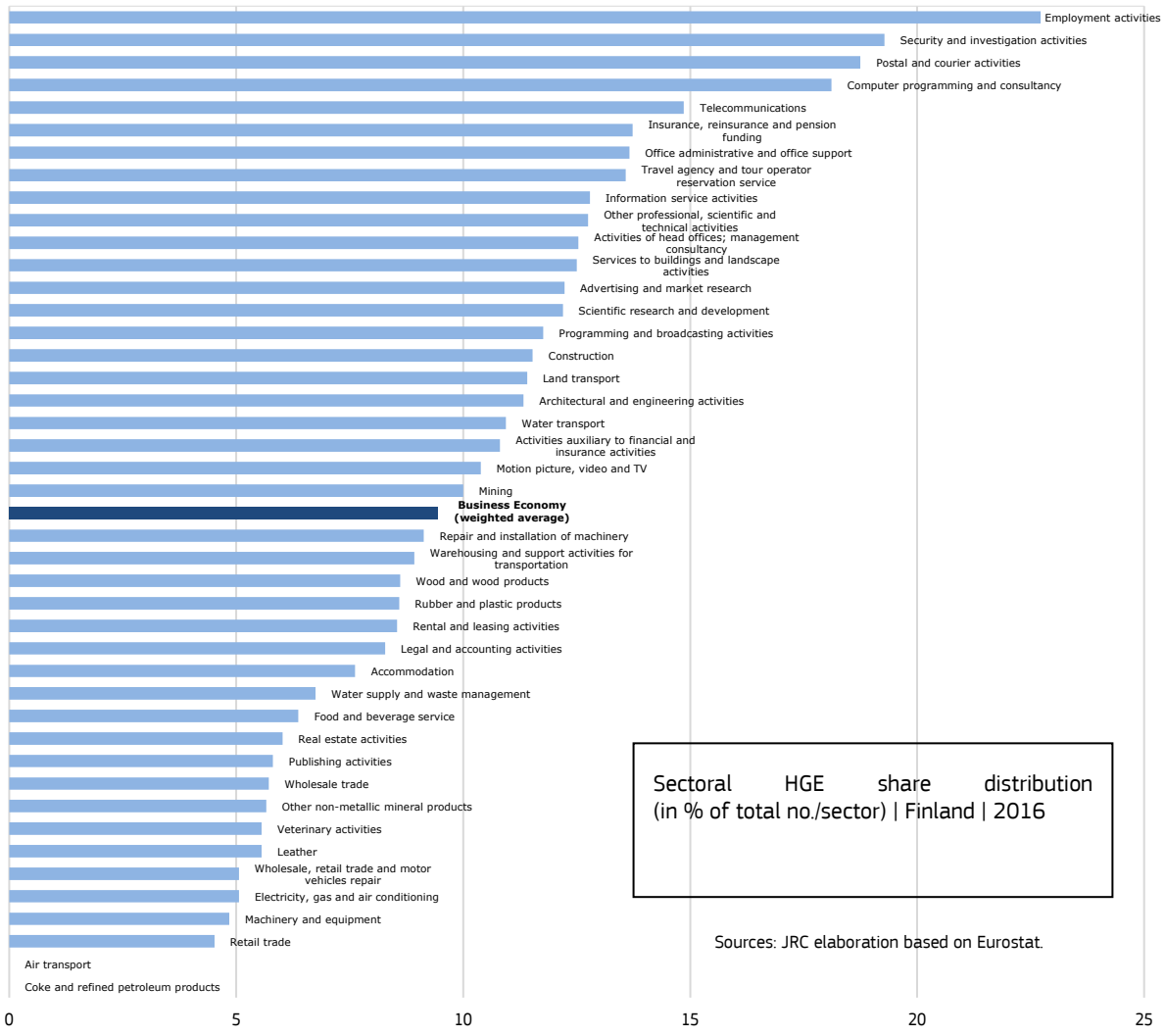
2. HGEs indicator framework



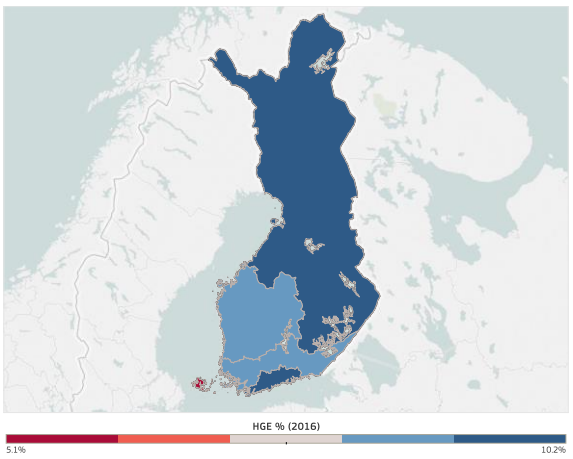
[73] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

- FI performs above the EU average in many indicators, especially in terms of innovative entrepreneurship, SME access to equity, its most innovative region and SME innovators.
- The emergence of HGEs in FI is favoured particularly by the easy access to human capital and financing, the high incidence of innovative entrepreneurship, the privileged position of the capital city region of the country as an innovative one and the existence and well-functioning of linkages among SME innovators.
- FI could further improve the conditions for the emergence of HGEs by improving the SME access to loans, changing the HGE-relevant labour market regulation and also with the promotion entrepreneurial skills.

3. Firm demographics and sectoral decomposition



- The average share of HGEs in FI is around 9.5% across the business economy, ranging from 4.5% in retail trade to 22.7% in employment activities.
- The highest share of HGEs is found in knowledge-intensive services and transportations, and particularly in knowledge-intensive market services (such us employment activities and security and investigation activities) and postal and courier activities.



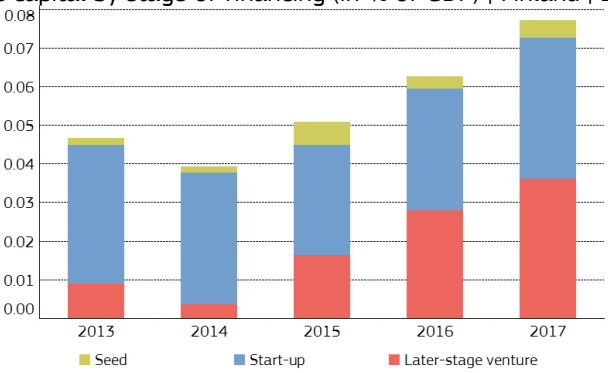
HGE share (% of active enterprises) across NUTS2 regions | Finland | 2016

Sources: JRC elaboration based on Eurostat

- From a geographical point of view, the highest shares of HGEs among active enterprises are found in the Helsinki-Uusimaa region and in North and East Finland. The presence of this type of companies is lower in West Finland, South Finland and specially the non-continental part of the country.
- The regional share of HGEs does not correlate well with the GDP per capita level of the region (except in the case of the capital city region).

4. Financing HGEs and start-ups: the role of venture capital

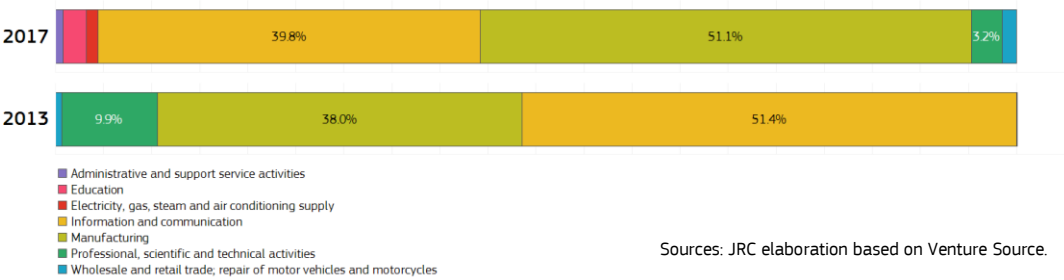
Venture capital by stage of financing (in % of GDP) | Finland | 2013-2017



Sources: JRC elaboration based on Venture Source.

- FI has increased venture capital investments as a share of GDP since 2014. The share of later-stage ventures has substantially increased in FI during that period.
- The size of investments in seed companies is increasing in line with the EU average but remains relatively modest.

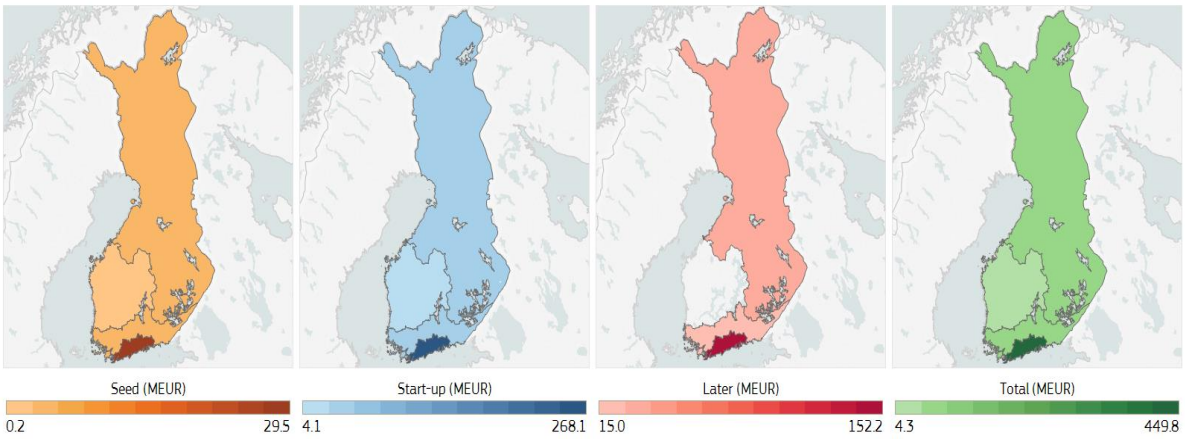
Sectoral distribution of VC investment (in %) | Finland | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- The sectoral distribution of venture capital investments is concentrated in two major sectors: information and communication, and especially manufacturing.
- In 2017, manufacturing received more investments than four years ago (the same is happening with the education and also electricity, gas, steam and air conditioning supply sectors), while the share of investments in other sectors (information and communication and also professional, scientific and technical activities) has declined.

Regional distribution of VC investment by stage of financing (in MEUR) | Finland | 2013-2017

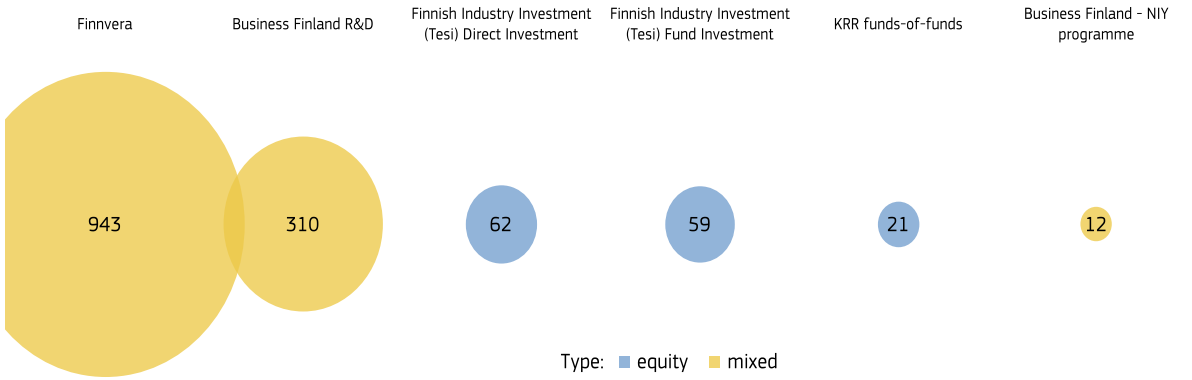


Sources: JRC elaboration based on Venture Source.

- Over the period 2013-2017, there is a strong concentration of venture capital in one major hub (Helsinki region) across all stages of financing.
- A similar pattern is observed for all stages of financing, with the capital city region attracting most of the investments and West Finland showing the lowest VC investments.
- Later-stage investments are the ones that are more concentrated.

5. Finance-related policy measures

Financial instruments Finland (MEUR)



- Finnish Industry Investment (Tesi) – direct VC investments. Finnish Industry Investment makes investments in companies in their growth and internationalisation phases and M&A situations. In 2018, Tesi's direct investments to Finnish startups and growth companies were €62 million (of which €52 million were first investments).
- Finnish Industry Investment (Tesi) – fund investments. In addition to direct investments into Finnish companies, Tesi also makes investments in venture capital and buyout funds, with the objective of developing the venture capital and private equity market in Finland. In 2018 Tesi made investments into 8 funds, €59 million in total.
- KRR funds-of-funds, managed by Tesi, invest in venture capital and growth funds operating in Finland that invest in Finnish growth companies. Besides Tesi, other investors include Finnish insurance and pension companies. So far there have been three different KRRs. The total capital of the currently active KRR III is 150 million euros. In 2018 it invested €21 million into two Finnish VC funds.
- Business Finland - NIY programme (grant+loan). The objective of the NIY programme is to accelerate the global growth of the most ambitious, rapidly growing startups in Finland. The maximum amount of Business Finland funding per company amounts to €1.25 million, of which a maximum of €500,000 may be funded as a grant, and €750,000 as a loan. Since 2008, a total of 386 startups have been selected for the funding. The total volume of the programme between 2008-2017 has been approximately €116 million (€11,6 million annually on average).
- Business Finland Venture Capital (BFVC) Ltd invests in venture capital funds which invest in companies in their early stages of development. The purpose of the company is to develop Finland's venture capital market. So far Business Finland Venture Capital Ltd has invested €37,4 million into 11 funds. There were no investments in 2018.
- Other financing instruments: * Business Finland R&D grants and loans – Finland's main instrument for supporting companies' R&D activities. The total funding for SMEs in 2018 was €310 million, of which 51% were loans and 48% were grants. The funding is predominantly, but not exclusively, aimed at companies aiming for international growth. * Finnvera - provides loans and guarantees for SMEs. Total amount of funding for SMEs in 2018 was €943 million. * VIGO Accelerator programme (2009-2015) – aimed to stimulate the Finnish private VC industry by giving support to new VC investor teams. Some of teams have managed to raise a VC fund, in which BFVC (see above) has invested. * Vake Oy - a Finnish state company, which was established in 2016 and became operational in 2018. Its balance sheet is €1.8 billion. It can operate as an active owner and utilize different investment tools and instruments. By the time of writing Vake is only starting its investments activities.

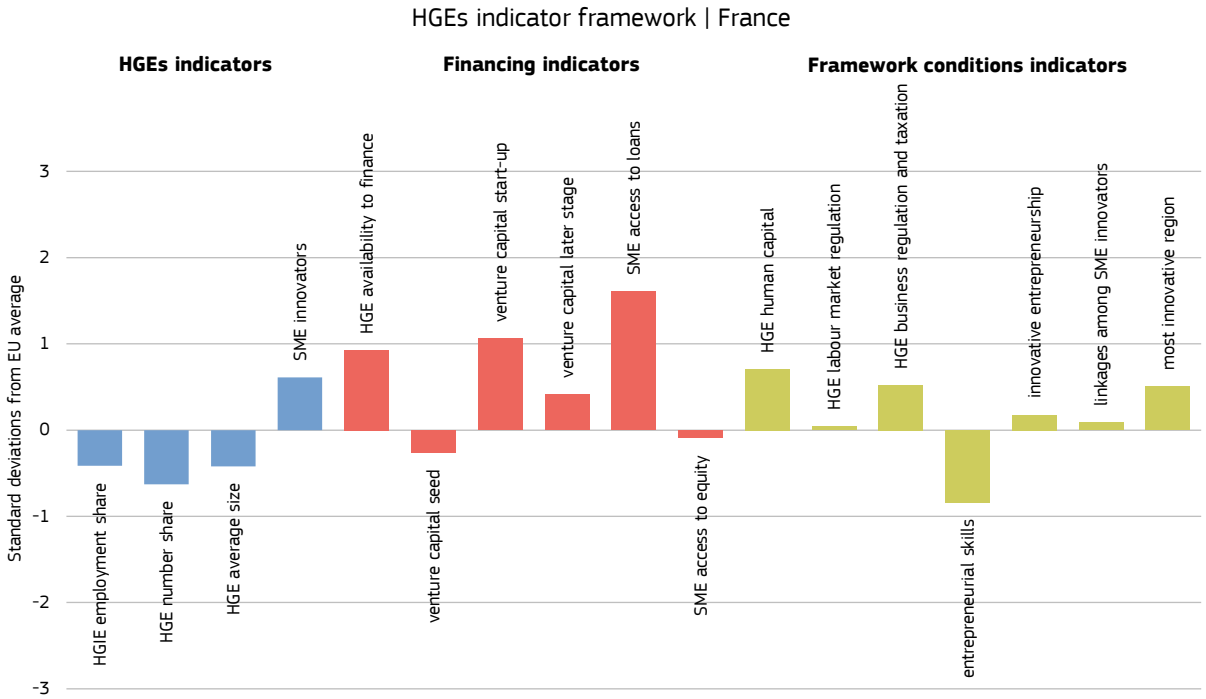
A4.10 High Growth Enterprises Factsheet – France (FR)

1. Executive summary

FR performs overall well as regards to the framework conditions supporting the development of high growth enterprises (HGEs[74]). There is a strong performing innovation ecosystem with a fairly good access to finance and human capital. Venture capital (VC) investments have significantly increased in recent years and are quite diversified in terms of sectoral coverage. A number of measures have recently been taken to promote the scaling-up of companies, including through the PACTE law (*Plan d'action pour la croissance et la transformation des entreprises*) and the Deep Tech Plan at national level, or the SRDEIIs (*Schémas régionaux de développement économique d'innovation*) at regional level.

However, FR lags behind in terms of the relative number and employment share of HGEs as well as the average size of HGEs. According to Business France, ten year after their creation, FR start-ups have on average half as many employees as US start-ups. When looking at the supportive framework conditions for HGEs, entrepreneurial skills and investments in VC seed, which are key elements to launch any new business, are not performing well in FR compared to the EU average. More importantly, regional disparities are very pronounced in FR, which could partly explain the lower performance at national level. In 2016, the region *Ile-de-France* concentrates around one quarter of FR enterprises in the business economy with ten or more employees and relatively even more HGEs (around 30% of the total). As a result, the share of HGEs in the region *Ile-de-France* is the highest in FR and similar to the EU average (11%), while this share is below the EU average in all other FR regions. When looking at the financing sources for HGEs, regional disparities appear to be even more acute. For instance, VC is mostly concentrated in the region *Ile-de-France* (around 70% of total VC).

2. HGEs indicator framework

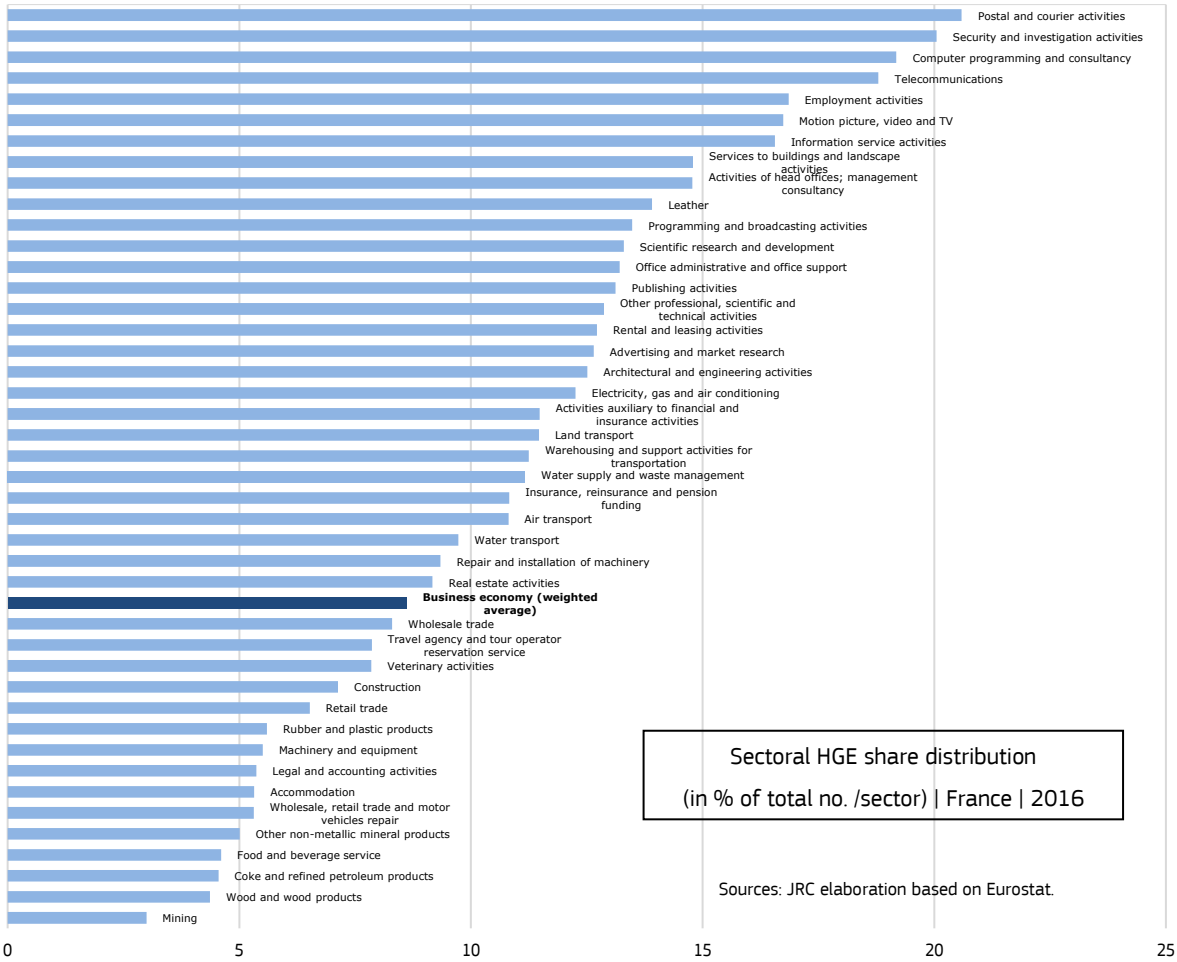


- FR performs above the EU average for SME innovators and its most innovative region (among other indicators), but lags behind for HGEs in terms of relative number and employment share, and average size.

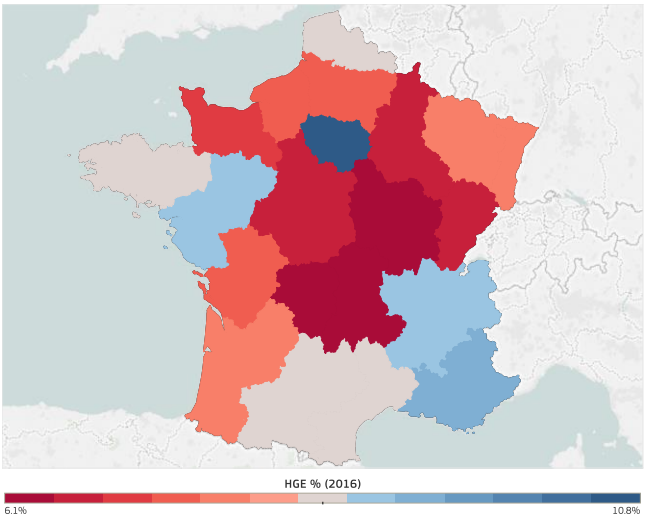
[74] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

- The framework conditions seem favourable for HGEs in FR, with an overall well performing system for access to finance and human capital as well as a supportive business environment.
- However, FR could improve its support for entrepreneurial skills and investments in VC seed, which are key elements to launch and grow any new business.

3. Firm demographics and sectoral decomposition



- The average share of HGEs in the business economy (with at least 10 employees) is around 9% in FR, versus 11% in the EU: the HGE share ranges from 3% in mining to around 21% in postal and courier activities.
- Overall, highest shares of HGEs are mostly found in knowledge-intensive industries, particularly in ICT, employment activities, and motion picture, video and TV. However, the highest share is found in postal and courier activities.



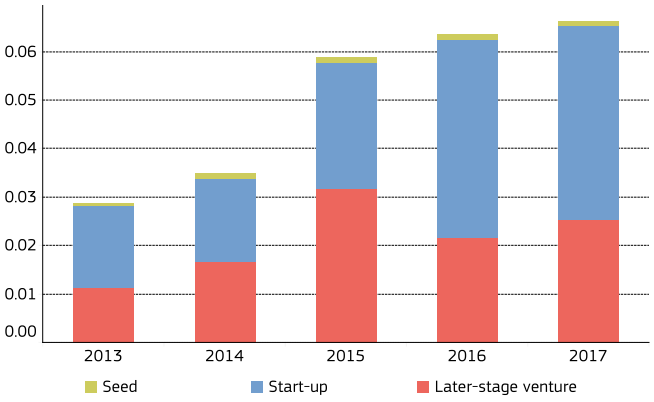
HGE share (% of active enterprises) across NUTS2 regions | 2016 | France

Sources: JRC elaboration based on Eurostat

- Overall, the density of HGEs is quite low in FR regions. The highest concentration is found in the region *Ile-de-France*, where the HGE share just reaches the level of the EU average (11%). In all other FR regions, this share is below the EU average.
- Regional disparities are important in FR: one fourth of enterprises in the business economy with ten or more employees and 3 HGEs out of 10 are located in a single region, the region *Ile-de-France*.

4. Financing HGEs and start-ups: the role of venture capital

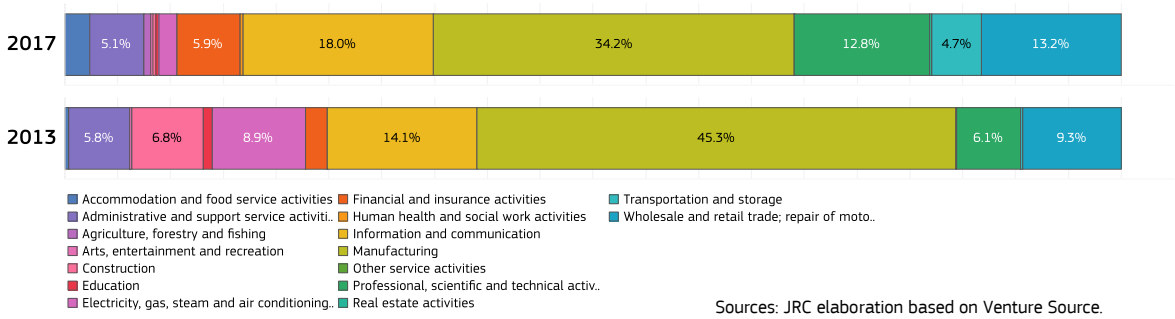
Venture capital by stage of financing (in % of GDP) | France | 2013-2017



Sources: JRC elaboration based on Venture Source.

- Overall, VC investments as a share of GDP steadily increased in FR in recent years going from less than 0.03% in 2013 to above 0.065% in 2017 but they remain below the weighted EU average (0.07% in 2017).
- FR Investments in start-ups and later-stage ventures have significantly increased since 2013. In comparison, the size of investments in seed companies remains very modest and is below the EU average.

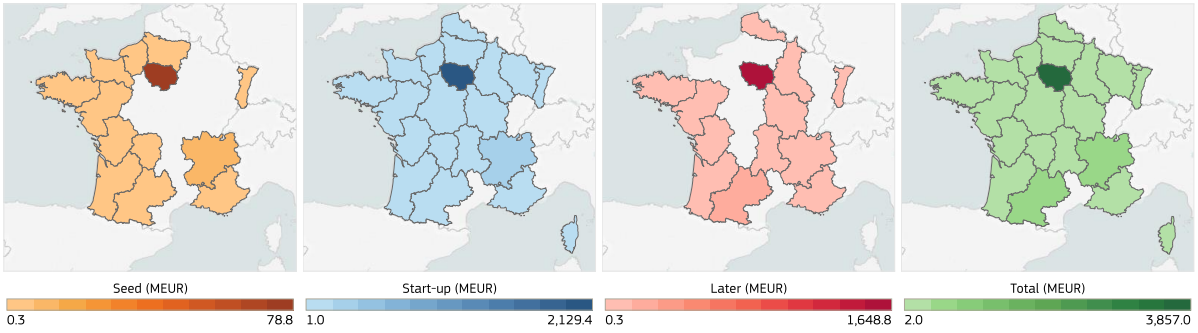
Sectoral distribution of VC investment (in %) | France | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- The sectoral distribution of VC investments in FR is quite diversified, though some sectors generally tend to receive most investments, such as manufacturing, ICT, wholesale and retail trade, and professional, scientific and technical activities.
- The investments per sector have shown some limited evolution over time. In terms of shares, VC investments in manufacturing decreased between 2013 and 2017 but still represented the highest share (around 1/3 of total VC investments in 2017), while those in ICT, wholesale and retail trade, and professional, scientific and technical activities increased.

Regional distribution of VC investment by stage of financing (in MEUR) | France | 2013-2017



Sources: JRC elaboration based on Venture Source.

- Over the period 2013-2017, there was an extreme concentration of VC in Paris area (*Ile-de-France*) across all stages of financing. The capital region attracted around 70% of VC investments for each stage of firm development (seed, start-up and later).

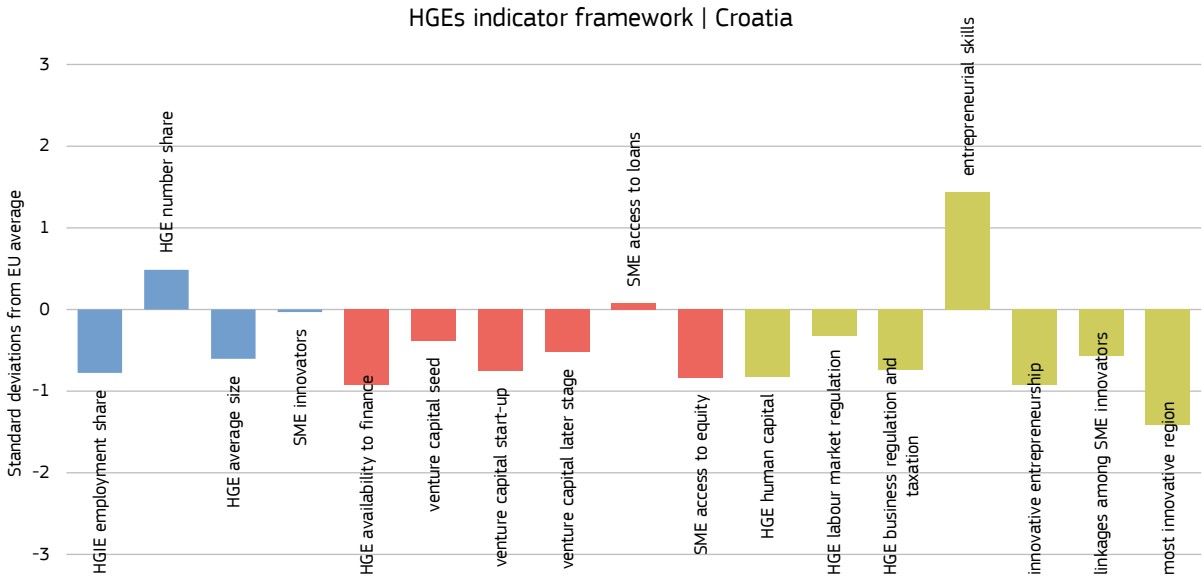
A4.11 High Growth Enterprises Factsheet – Croatia (HR)

1. Executive summary

HR overall performs well below the EU average in most factors determining the development of HGEs[75] (it is among the five Member States with the lowest relative performance across the EU28). In spite the number share of HGEs is slightly below the EU average, the employment share is still far from being compared to other Member States. Along with grants schemes fostering SMEs growth and for which HGEs were eligible, the most part of available financial instruments in HR are measures supporting favourable loans and guarantees obtained through ESIF. In 2018 and 2019 two main initiatives, both supported by the EIF (The Croatian Venture Capital Initiative and the Croatian Growth Investment Programme) have been launched with the aim of establishing a venture capital market in the Country. Overall, given the lack of monitoring and evaluation data and studies, it is difficult to analyse the exact impact of relevant national / regional strategies and policies to encourage and support entrepreneurial activity. The weak performance of the innovation ecosystem in HR does not support the development of HGEs. Also the poor performance in terms of most innovative regions heavily affects the rise of HGEs. However the emergence of HGEs is mainly hindered by the lack of venture capital financing and access to skilled workforce. The sectoral distribution of venture capital investments is diversified, but certain sectors stand out, such as air transport and employment services. Despite positive expectations due to the contribution obtained through support by ESIF, the venture capital markets in HR remain underdeveloped in comparison to the EU average.

The conditions for HGEs could improve by supporting the development of a venture capital market and an increased human capital. The availability of staff with the right skills is considered an obstacle for investments by HGEs. HR performs well below the EU average for this indicator. The lack of adequate skills is also reflected by the low proportion of HGE employment share. The equity financing gap is another aspect HR could address to improve the overall performance of the country. With regard to the skilled workforce shortage this can be addressed via closer collaboration with the educational institutions. For what concerns instead the financing gap, this can be initially addressed through ESIF-backed funds.

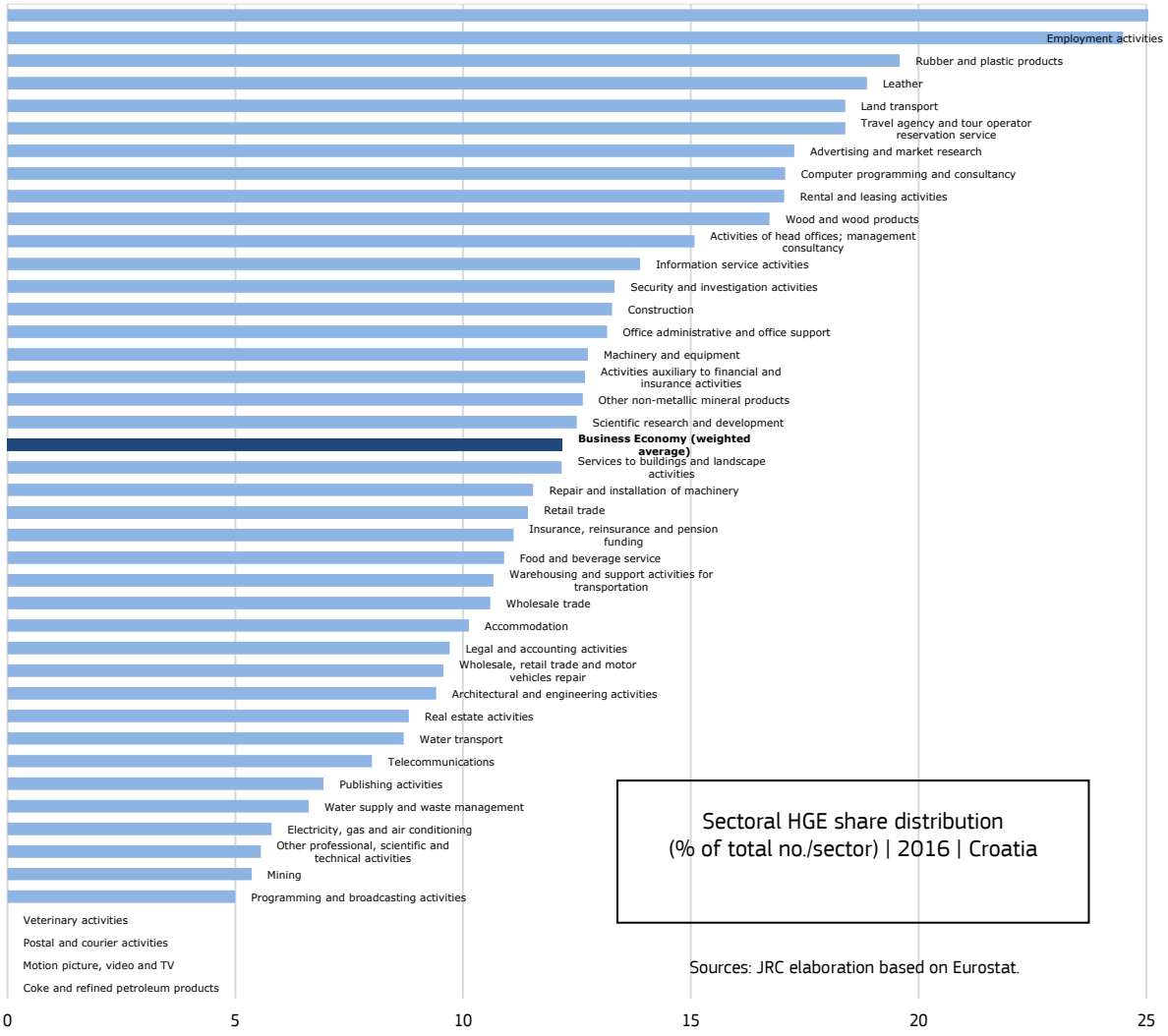
2. HGEs indicator framework



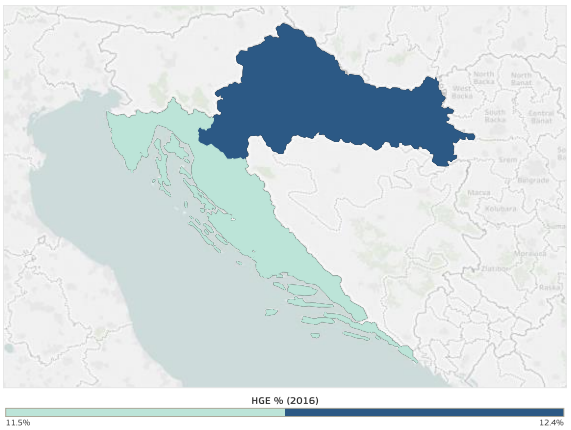
[75] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

- HR performs slightly above the EU average in three indicators, especially in terms of HGE number share, SME access to loans, and entrepreneurial skills. However, all the other indicators show a negative performance of HR, especially in terms of most innovative region, SME access to equity and HGE availability to finance.
- HR could improve the conditions for HGEs by supporting SME access to equity finance and targeted investments in human capital via a closer collaboration with educational institutions.

3. Firm demographics and sectoral decomposition



- The average share of HGEs in HR is around 11% across the business economy, ranging from 5% in programming and broadcasting activities to 40% in air transport.
- The highest shares of HGEs are found in knowledge-intensive and medium-high tech manufacturing industries, particularly in air transport, employment activities as well as rubber and plastic products.



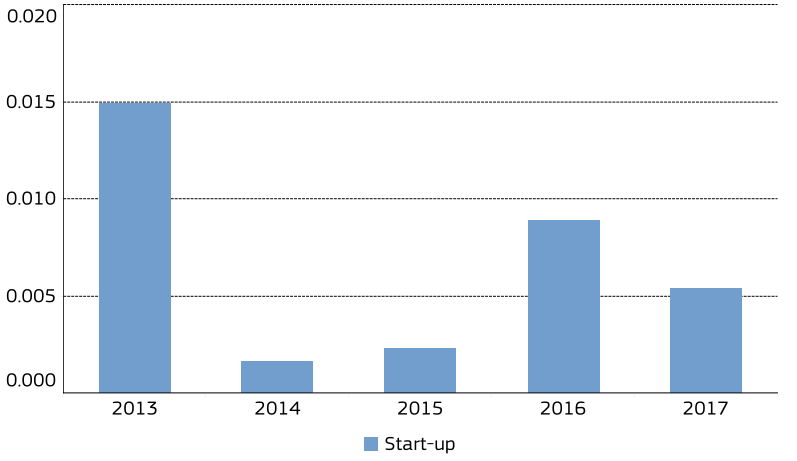
HGE share (% of active enterprises) across NUTS2 regions | 2016 | Croatia

Sources: JRC elaboration based on Eurostat.

- In terms of geographical concentration, HGEs are homogeneously distributed in all the HR regions, with a slightly higher percentage in the Zagreb region (12.4% vs. 11.5%).

4. Financing HGE and start-ups: the role of venture capital

Venture capital by stage of financing (in % of GDP) | Croatia | 2013-2017

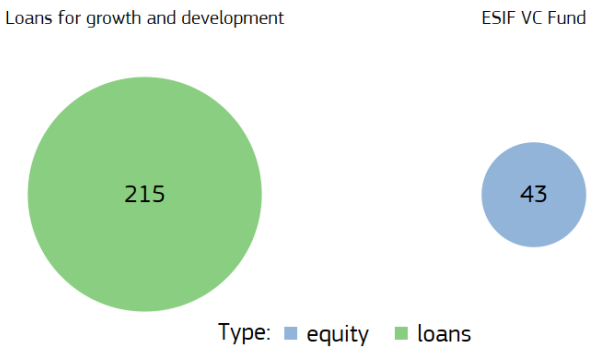


Sources: JRC elaboration based on Venture Source.

- In the period 2013-2017 HR saw the pick of venture capital investments as a percentage of GDP in 2013. The volume felt in 2014 and then increased in 2015 (slightly) and in 2016. It felt again in 2017.
- Importantly, the entire volume of venture capital investments over the period 2013-2017 targeted start-up enterprises, leaving uncovered seed companies and later-stage ventures.

5. Finance-related policy measures

Financial Instruments (MEUR) | Croatia



- Support to entrepreneurship is a widely shared policy objective at national, regional and local levels. These include the Smart specialisation strategy (S3), Strategy for the development of entrepreneurship in Republic of Croatia 2013 – 2020, Strategy for fostering Innovation, as well as local and regional development strategies, all of which have defined goals of fostering entrepreneurial environment and competitiveness.
- Measures for fostering economic activities on national level primarily refer to incentives awarded by the Ministry of Economy, Entrepreneurship and Crafts (MEEC) in line with the national strategy for development of entrepreneurship, and specific acts, such as the State Aid Act, Investment Promotion Act, Act on fostering development of, and the Croatian Agency for SMEs, Innovations and Investments (HAMAG-BICRO), which is focused on fostering innovative entrepreneurship.
- As of 2019, there are three main policy measures which are expected to boost scaling up of HGEs, all co-financed through ESIF (Operational programme Competitiveness and Cohesion 2014-2020). These include: financial instruments, grants for innovative SMEs and measures for establishing VC market.
- *Financial instruments*: favourable loans and guarantees promoted by HAMAG-BICRO, obtained through ESIF amounted to €500m (already contracted in full). The largest sum (€ 215m) has been allocated to ESIF Loans for growth and development, which target SMEs operating for at least 2 years. Total allocation per project amounts to €50,000 with the repayment deadline of 10 years and an interest rate of 1.5%.
- *Grant schemes*: in 2019, the main grant scheme was Innovations in newly established SMEs, for which €20m was allocated. Towards the end of July 2019, the total allocation was increased to €26m and submissions are expected to continue. Furthermore, in July another grant scheme targeting innovative SMEs ("Innovations in S3 areas") was launched (€85m). Both grant schemes are managed by Ministry of Regional Development and EU Funds of Croatia (MRDEUF), Ministry of Economy, Entrepreneurship and Crafts (MEEC), and HAMAG-BICRO.
- *Venture Capital*: in June 2018, The Croatian Venture Capital Initiative (CVCi FoF) was established by the European Investment Fund (EIF) and the Ministry of Regional Development and EU Funds (MRDEUF) with the purpose of creating one or more venture capital funds for investing in Croatian start-ups and HGEs. Fil Rouge Capital was selected to manage the new VC fund, whose activities started in 2019. EIF allocated €35m into the fund, while private investors contribute at least €7m.
- In January 2019, the EIF and the Croatian Bank for Reconstruction and Development (HBOR) launched the Croatian Growth Investment Programme (CROGIP), a €70m investment programme to support fast-growing SMEs which are established and are operating in Croatia. EIF and HBOR will each commit EUR 35m in order to facilitate additional private-sector investments into equity funds.
- However, the effectiveness and impact of the adopted strategies, implemented measures and allocated resources often varies. The policy measures implemented include also reduction of administrative burden (including digitisation of administrative procedures), provision of services at favourable terms (incubation, acceleration, education, mentorship, and internationalisation) as well as different tax incentives for investments and RDI projects.
- Given the lack of monitoring and evaluation data and studies, it is difficult to analyse the exact impact of relevant national/regional strategies and policies to encourage and support entrepreneurial activity. This will change over time, since many (if not most) measures implemented today include co-financing through ESIF, and their implementation is subject to monitoring and evaluation.
- However, on the basis of indicative evidence and overall positive trends in enterprise development, it can be concluded that additional resources made available in the recent years (primarily through ESIF), coupled with some reduction of administrative and tax burdens are generating positive results.

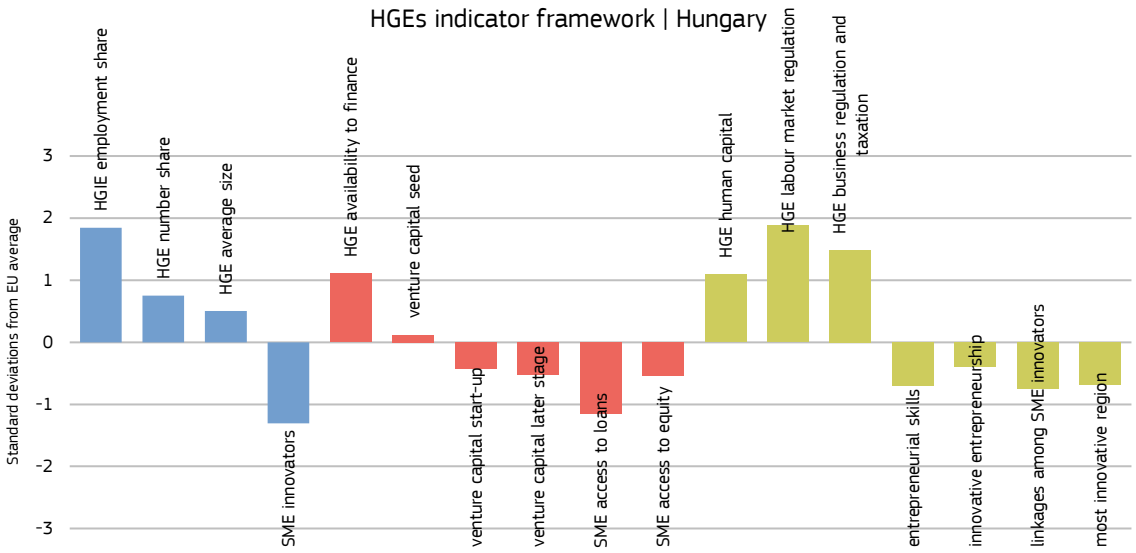
A4.12 High Growth Enterprises Factsheet – Hungary (HU)

1. Executive summary

The share of HGEs[76] in HU is significantly above the EU average, in a context of generally favourable regulatory, finance and human capital framework conditions, but still underdeveloped loan, equity and venture capital markets. A characteristic feature of Hungarian HGEs is their relatively large size and, related, their large employment share. This may be caused by multiple external factors. On the positive side, in the strongly internationalised Hungarian economy, high growth may be strongly related to integration into global value chains. Such integration may primarily be an option for relatively large firms. On a more negative side, most of the smaller firms may not be growth-oriented or lack the capabilities to innovate and enter new markets. In policy terms, the large employment share of HGEs shows that policies aimed at such firms may have a relatively large aggregate effect.

A clear challenge for the HU policy framework is the undersupply of innovative projects with a clear high-growth potential, especially compared to the amount of funds allocated to this aim from EU sources. While the state has made a larger effort to help venture capital markets develop often via hybrid funds including banks or other private investors, this undersupply of projects is an important challenge. For example, in the first round of the Gazella programme, the amount of applications was around a third of the available funding. Therefore, all these policies face a trade-off between supporting relatively few firms and widening the net with the risk of supporting not very innovative firms with lower growth prospects. The subsidised provision of venture capital either by state-owned or hybrid funds have created a venture capital "market" with similar volumes to Western European economies. While it is unlikely that these would crowd out private investment, it is not clear how the market would operate without continued government intervention. While there are few assessments of the new tools, there are some signs of over-provision of these funds and a competition between different funds subsidised by the state for a limited number of innovative projects.

2. HGEs indicator framework

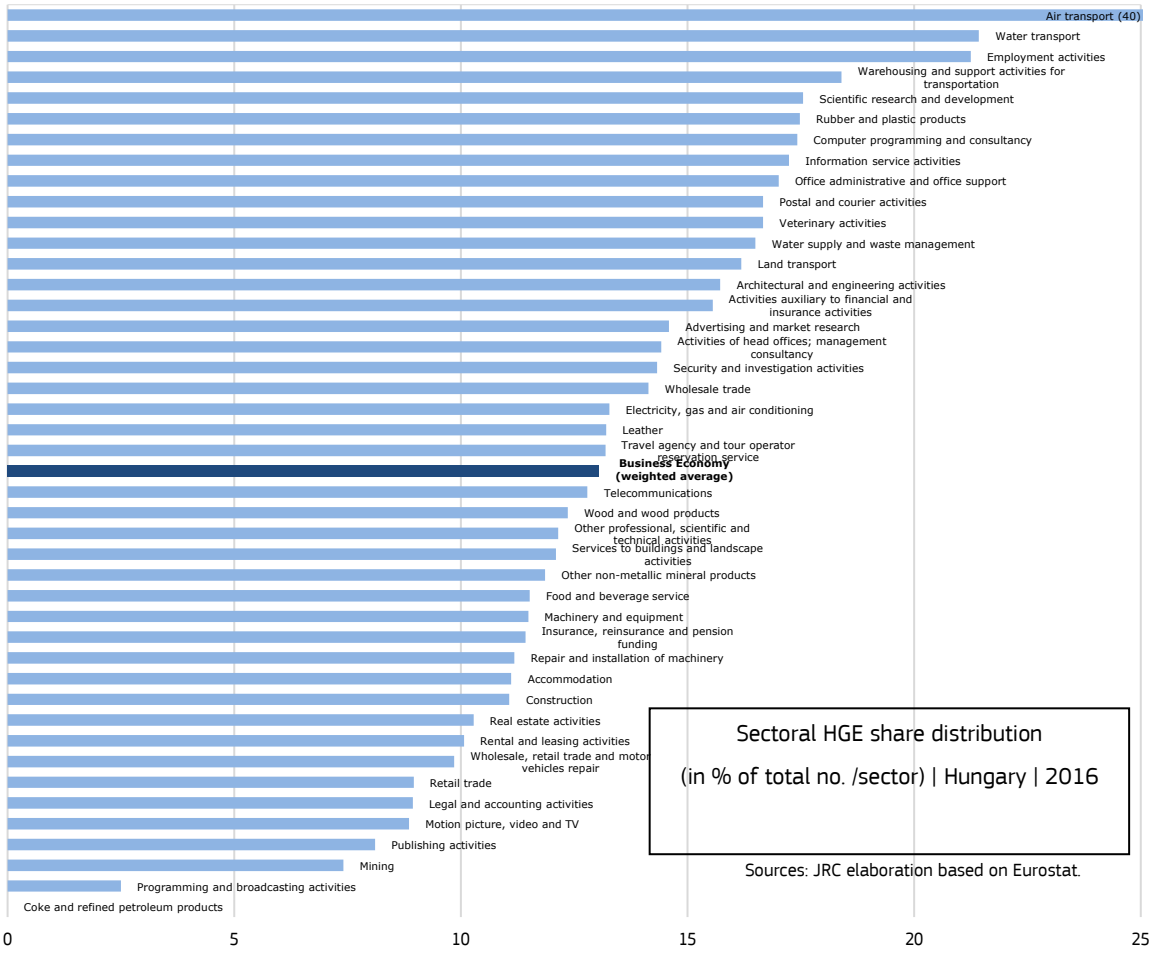


- HU performs above the EU average in several indicators, especially in terms of the HGE share and average size, employment share.

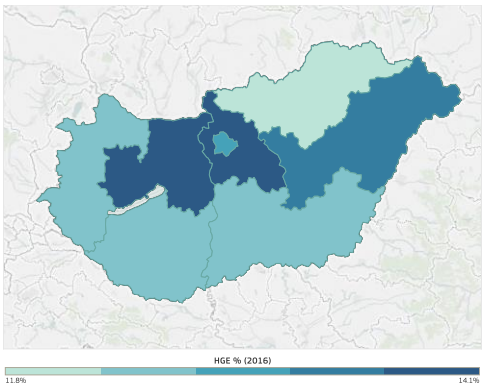
[76] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

- The emergence of HGEs is favoured particularly by the availability of finance and human capital, as well as the overall regulatory framework.
- HU could further improve the conditions for HGEs by improving the loan, equity and venture capital markets, fostering the overall development of innovative SMEs and their linkages and by supporting the entrepreneurial skills available across the working-age population.

3. Firm demographics and sectoral decomposition



- The average share of HGEs in HU is 13% across the business economy, ranging from 2.5% in programming and broadcasting activities to 40% in air transport.
- In HU, among innovative industries, HGEs' employment share is the largest in such services as air transport, employment activities, computer programming and information service activities.
- HU has a larger HGEs share than the average European country most industries. The relatively high aggregate share of Hungarian HGFs is not a result of industry composition but it prevails within industries.



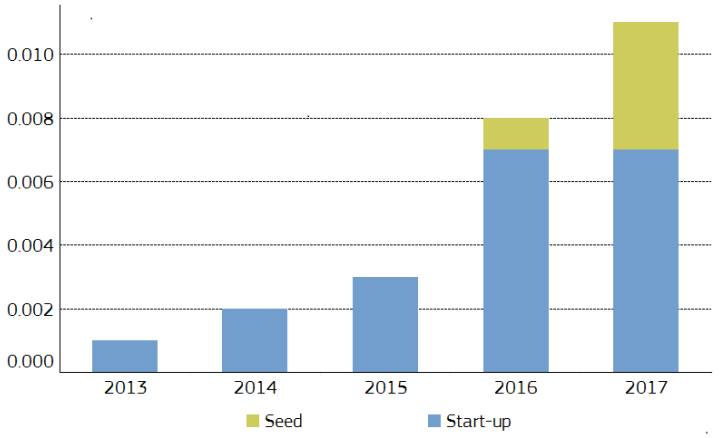
HGE share (% of active enterprises) across NUTS2 regions | 2016 | Hungary

Sources: JRC elaboration based on Eurostat

- In 2016, the share of HGE (as % of active enterprises) was highest in the regions of Central Hungary, showing a strong concentration of HGEs in Budapest and particularly the surrounding regions.
- The presence of HGEs was also significant in other Hungarian regions, with the important exception of Northern Hungary.

4. Financing HGEs and start-ups: the role of venture capital

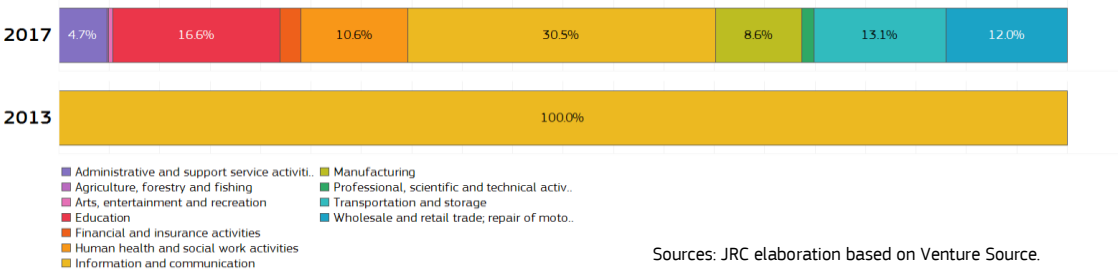
Venture capital by stage of financing (in % of GDP) | Hungary | 2013-2017



Sources: JRC elaboration based on Venture Source.

- Venture capital investments as a share of GDP remain low compared to the EU average, despite having increased significantly since 2013. A distinct feature of HU (and the CEE region in general) is that it relies much more heavily on the public funding than venture capital markets in E15 countries.
- The share of start-up ventures has increased sharply, despite a slight decline in 2017. The state has made a larger effort to help venture capital markets develop often via hybrid funds including banks or other private investors.

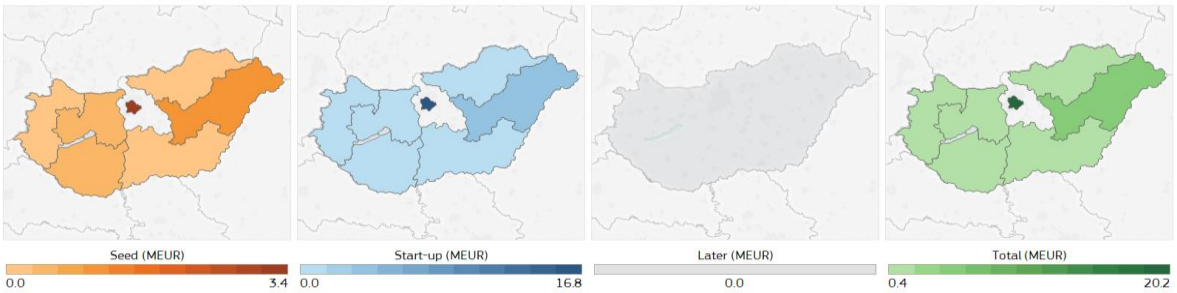
Sectoral distribution of VC investment (in %) | Hungary | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- The sectoral distribution of venture capital investments is diversified, but certain sectors receive most investments, such as ICT, education, transportation and storage, and wholesale and retail trade.
- The sectoral distribution of venture capital investments can change substantially across time.

Regional distribution of VC investment by stage of financing (in MEUR) | Hungary | 2013-2017



- Over the period 2013-2017, there is a strong concentration of venture capital in the Budapest region across all stages of financing.
- The seed stage funding is mostly distributed across regions in HU. Start-up funding is also evely distributed across regions.

5. Finance-related policy measures

Name	Scope	Eligibility	Year	Assessment
Hungarian multi (GINOP 1.2.7)	Financial and non-financial support to help firms with high growth potential to introduce new technologies and grow	– operate in industries prioritized in the Irinyi plan – HUF 500 mn revenue – at least 5% annualized growth for 2 consecutive years – 'pre-certification'	2017, 2019 (?)	– Few firms applied and won in the first round – Target group may be widened
Magvető Fund (GINOP 8.1.3/A)	Hybrid VC Fund	– prioritise industries in S3 – innovative, potentially HG – all VC stages	– Investment decisions 2017-2023 – Investments should be for 2-7 years	no assessment yet, for evaluation of previous programs see text
"New JEREMIE" funds (GINOP 8.1.3/B)	7 hybrid VC funds	– prioritise industries in S3 – innovative, potentially HG – all VC stages	– Investment decisions 2018-2023 – Investments should be for 2-7 years	no assessment yet, for evaluation of previous programs see text
ICT VC Fund (GINOP 8.2.3)	VC fund	– ICT start-ups – innovative, potentially HG	– Investment decisions 2017-2023	no assessment yet, for evaluation of previous programs see text

		– all VC stages	– Investments should be for 2-7 years	

- An important characteristic of Hungarian financing programmes is that the supply of funding is likely to exceed the demand of HGEs. This is reflected by the poor performance of firms funded by the previous round of subsidized funds but also from the under-subscription of the GAZELLA GRANT.
- Consequently, while these programs theoretically aim at innovative high growth firms, in practice they are likely to finance other firms or not very viable projects. For example, as mentioned, in the GAZELLA GRANT the definition of a HGE, diverging from the Eurostat definition of HGE, seems to require that employment, growth or exports growing by at least 3% in two subsequent years in a 3-year period.
- In contrast, there are a number of support measures which are not aimed specifically at HGIEs, but are easily accessible and probably more attractive for some firms. For example, the Central Bank provides investment subsidies while there are innovation grants available for all SMEs.
- The assessments of the previous rounds of subsidized venture capital have shown modest positive results for the subsidized firms. At the same time, these funds have been criticized for not being transparent and, in some cases, used inappropriately.
- There is also a more fundamental contradiction between the market logic of VC funds (flexibility, substantial risk taking, supporting firms with the best prospects) and the logic and rules of state intervention (more rigid rules, less risk taking, investing into projects which would be less likely to receive funding from private sources).

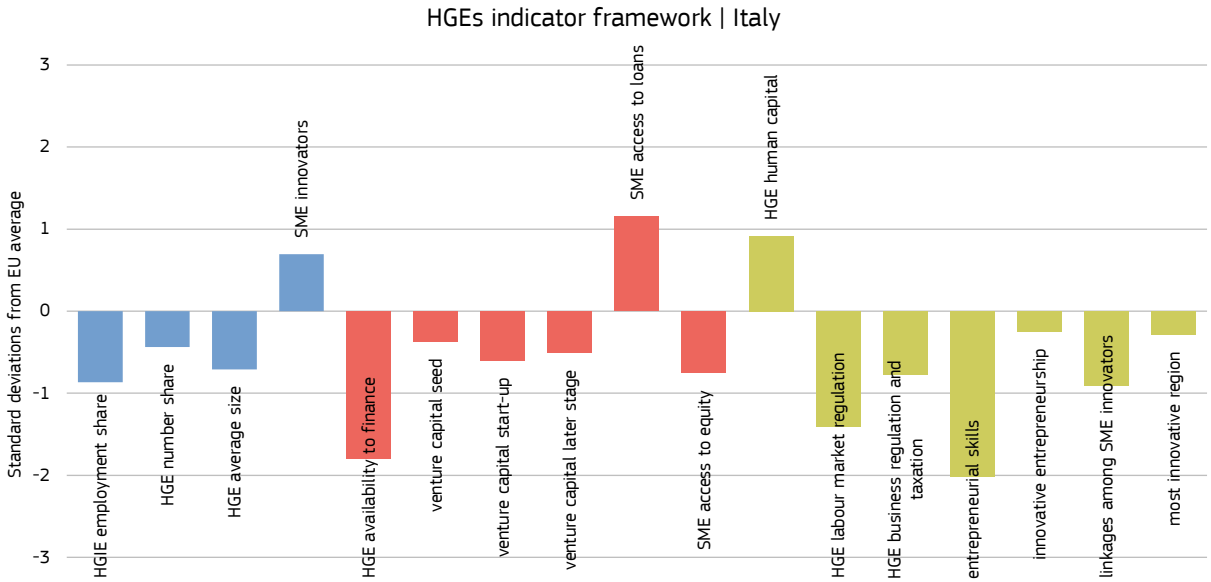
A4.13 High Growth Enterprises Factsheet – Italy (IT)

1. Executive summary

IT overall performance in factors determining the development of high growth enterprises (HGEs[77]) appears dissatisfactory. The share of innovative SMEs and access to human capital in IT is not far from the EU average whereas the generally weak performance of the innovation ecosystem in IT does not facilitate the development of HGEs. The emergence of HGEs is also impaired by the scarce accessibility to finance for this specific category of firms. This is also reflected in the overall stable and below EU-average trend in venture capital (VC) available in IT during recent years, thereby partly addressing previous shortcomings in equity finance. The sectoral distribution of VC investments is diversified, but certain sectors stand out, such as manufacturing, ICT, financial and insurance activities. There is a strong concentration of venture capital in Lombardy across all stages of financing, which may also be related to the relatively strong innovation performance vis-à-vis other IT regions. The venture capital markets in IT is small and underdeveloped, especially in comparison to the UK or DE.

The conditions for HGEs could further improve by supporting the development of relevant entrepreneurial skills. The availability of staff with the right skills is considered an obstacle for investments by HGEs. IT performs far below the EU average for this indicator. The lack of adequate skills is also reflected by the low proportion of the working-age population who believe they have the required skills and knowledge to start a business. In recent years Italy's R&I policies have not deployed the resources and energies needed for the challenges facing the country. The challenges for Italy's R&I system and the problems for HGEs are mainly of structural nature; in the short term, the budget constraints for public expenditure and the stagnation of GDP, demand and investment make it difficult to expect significant changes in the country's economic performance and policy outlook.

2. HGEs indicator framework

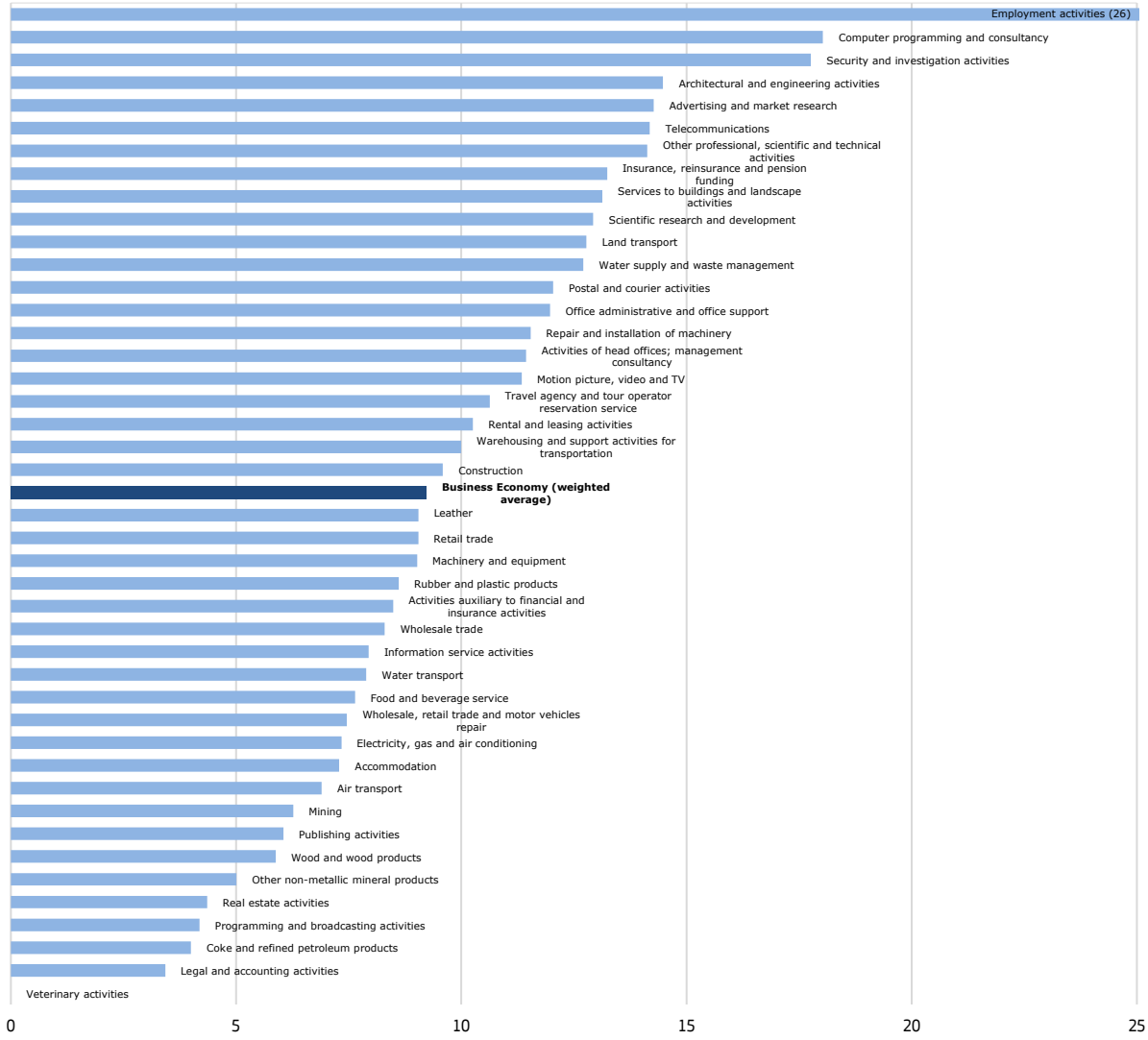


- IT performs below the EU average in several indicators, especially in terms of HGE employment share and availability to Finance, SME access to equity, entrepreneurial skills, HGE labour market regulation and linkages among SME innovators.

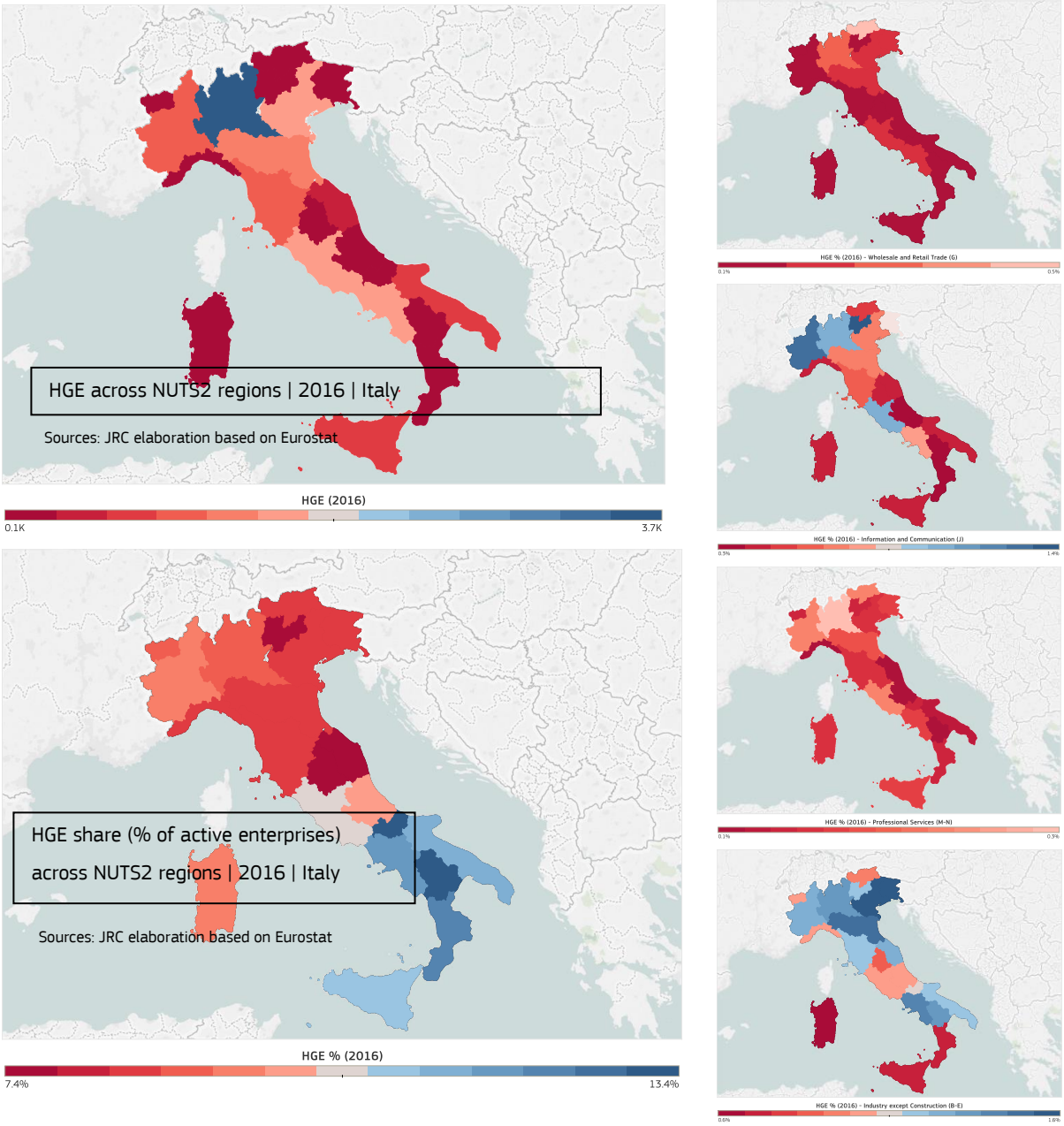
[77] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

- The share of innovative SMEs, their access to loans and human capital can support the emergence of HGEs in IT.
- IT could further improve the conditions for HGEs by supporting the access and availability of finance related to HGEs and enhance the overall entrepreneurial skills available across the working-age population.

3. Firm demographics and sectoral decomposition: HGEs fine-grained

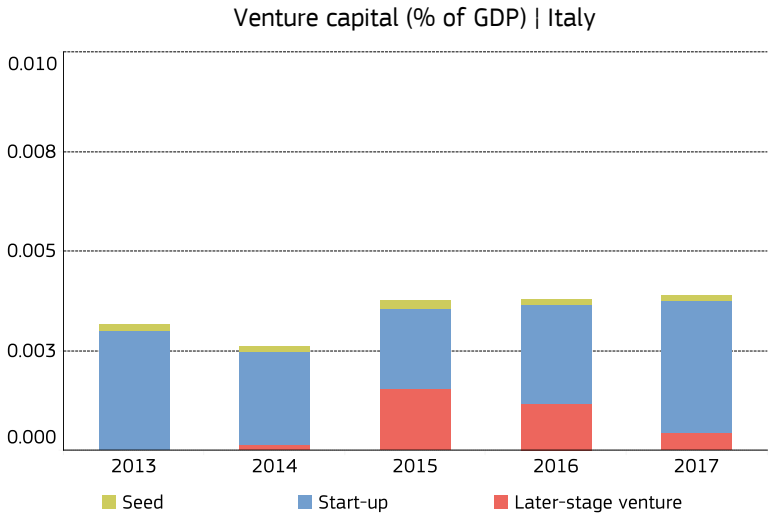


- The average share of HGEs in IT is 9.2% across the business economy, ranging from 3.4% in legal and accounting activities to a remarkable 25.8% in employment activities.
- The highest shares of HGEs are found not only in knowledge-intensive and medium-high tech manufacturing industries, such as computer programming, telecommunications and scientific research, but also in less knowledge intensive sectors such as services to buildings and landscape, postal and office support activities, rental and leasing.



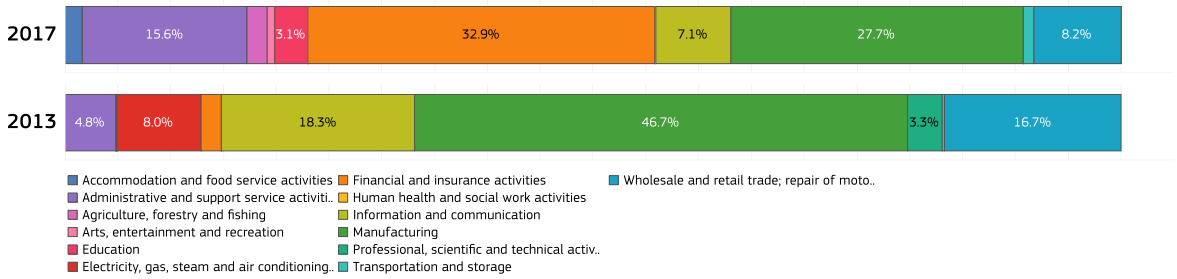
- HGEs are mostly clustered in the region of Lombardia with large disparities with respect to other areas, particularly in the South of Italy.
- Looking at the proportion of HGE with respect to other firms in the same region, the highest share of HGEs among all active enterprises is instead concentrated in the southern regions, particularly Basilicata and Molise.
- 'High-Growth' appears therefore as a signal of enterprise resilience in southern regions, which are characterised by an overall lower number of enterprises. The ability to growth fast is what distinguishes firms enduring in those regions.
- Investigating further the size of the HGE phenomenon by looking at regional breakdown of sectoral developments, Southern IT regions present far less favourable shares of HGEs with respect to Northern counterparts.
- In Southern IT regions, services and human capital-intensive industries perform worse in terms of the proportion of HGEs over all active companies, while manufacturing-related industries are those presenting a relatively higher share of HGEs.

4. Financing HGEs and start-ups: the role of venture capital



Sources: JRC elaboration based on Venture Source.

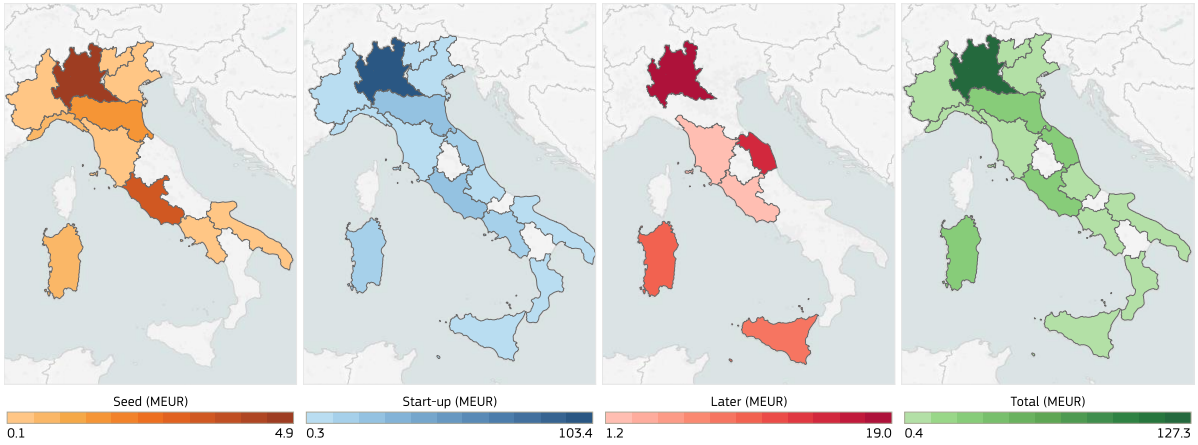
- IT has maintained a rather stable share of GDP in venture capital investments since 2013, with a slight increase since 2015.
- The share of later-stage ventures has substantially increased in IT despite a recent drop in 2017. The size of investments in seed companies is increasing in line with the EU average but remains relatively modest.



Sources: JRC elaboration based on Venture Source.

- The sectoral distribution of venture capital investments is diversified, but certain sectors receive most investments, such as manufacturing, ICT, financial and insurance activities, wholesale and retail trade, and administrative and support services.
- The sectoral distribution of venture capital investments appears to change substantially across time (2017 vis-á-vis 2013).

Regional distribution of VC investment by stage of financing



Sources: JRC elaboration based on Venture Source.

- Over the period 2013-2017, there is a strong concentration of venture capital in Lombardy across all stages of financing.
- The start-up stage funding is most distributed across regions in IT, whereas later stage venture capital is most concentrated within a few regions.

5. Finance-related policy measures

Policy Measure	Year	Target	Value (€)
2019 Budget law	2019	Firms, SMEs	TBC (simplification and indirect incentives for VC and business angels)
New Fondo Nazionale Innovazione	2019	Firms	€1b (public fund for VC)
Tax credit for the training activities	2019	Firms	€250m
Smart&Start Italia	2017	Firms, SMEs	€95m in 2017 budget law
Industria 4.0 / Impresa 4.0	2016	Firms	€2.3 billion in 2018 and around €4 billion in 2019-2020
DL 69/2013 'New Sabatini Law'	2013	Firms, SMEs	2014-2021: €385,8m. Refinancing of €48m in 2019, €96m for each year until 2023 and €48m in 2024
Fondo centrale di garanzia per le piccole e medie imprese	2013	Firms with some streamlined access for Start-ups, innovative SMEs, incubators	From 2013 €950m for start-ups; €93m for innovative SMEs; €12m for incubators
Investment compact law 2015 n.33	2015	Firms, SMEs (Innovative SMEs, incubators, patent box)	N/A
Start up Law 17 december 2012 n.221	2012	Firms, SMEs	N/A
Contratti di sviluppo	2011	Firms	2011-2019: €2.4b ; then €1.1m in 2019, €41m in 2020 and €70.4m in 2021

- In Italy the difficulty to access risk capital is a persistent limitation for the scaling-up of firms and venture capital plays a limited, but growing role.
- The main traditional policy tool to grant access to credit to SMEs is the '*Fondo centrale di garanzia per le piccole e medie imprese*' a public fund offering guarantees for loans by private banks to SMEs. The fund provides collateral and other instruments allowing SMEs and micro-firms to fund their investment through bank loans.
    - In the period 2008-2014 the fund made available €32b of collateral (of which €17.6b for manufacturing firms) triggering €56b of new investment (of which €31.2b in manufacturing) mainly by firms located in Northern

regions. In 2014 €8.3b of collateral has led to €12.9b of new investments.

- The fund relevant is also for the start-ups and innovative SMEs. The amendments to the start-up law in 2015 and in the 2017 stability law provided a guarantee scheme covering 80% of bank debts of SMEs up to €2.5m earmarked for innovative SMEs.

- The most important policy effort towards firm's productivity in recent years has focused on indirect tax incentives to firms for a wide range of activities, including R&D, patents, human capital, investment in machinery and in the digital technologies of the Industry 4.0 programme.
  - Measures of 'Industry 4.0' have mainly focused on allowances for accelerated depreciation of the cost of acquisition of advanced machinery. In addition, a range of measures for R&D tax credits and tax incentives on investment have been introduced, offered to all firms. The targets of such policy included €10 billion of expected additional private investments in 2017-2018; €11.3 billion of expected R&D and innovation expenditure by business in 2017-2020; €2.6 billion of expected early stage investments in new firms in 2017-2020.
  - For 'Industry 4.0' an ISTAT study found that in the first year of the programme mainly large, technologically advanced firms benefitted from such measures; the impact on additional investment is estimated at 0,1% only (ISTAT, 2018). Larger effects may be anticipated in later years.
- ISTAT has carried out an assessment of the R&D tax credit showing that in 2015 7,993 private businesses benefitted from the tax credit for around €590m; average per firm is modest (less than €75,000), three quarters of recipients are located in Northern regions and no additionality of the tax credit measure was found (ISTAT, 2018[78]). In a context of low demand and stagnating GDP, potential effects of tax incentives for R&D and innovation have been limited.

[78] ISTAT (2018f) Statistiche report. I profili dei nuovi imprenditori e delle imprese a elevata crescita, Anno 2016, Roma, 14/12/2018.

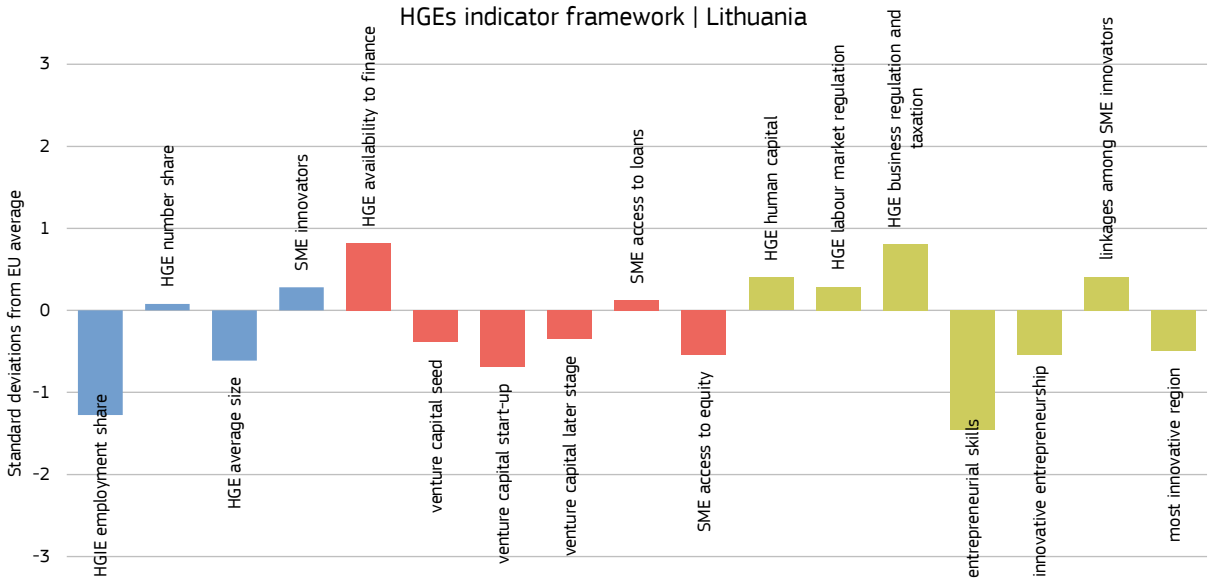
A4.14 High Growth Enterprises Factsheet – Lithuania (LT)

1. Executive summary

Since 2012, the number of high-growth enterprises (HGEs[79]) in LT has slightly declined, constituting approximately 11% of all active enterprises in 2017. Most HGEs are active in knowledge-intensive services, while the number of such enterprises in high-tech manufacturing sectors remains small. The policy mix relevant for HGEs in LT is targeted at young SMEs or start-up enterprises. Relevant policy measures aim to support entrepreneurial activity, business R&D and productivity growth. LT overall performs well in labour market regulation, business regulation and taxation. The business environment in LT is generally quite favourable, and the number of innovative start-up companies has been increasing. Simultaneously, the company death rate has been decreasing, and fell below the EU average in 2016 to 5.77%.

However, LT underperforms in HGIE employment share. SME access to finance also remains a major barrier to scaling-up enterprises. There is very little VC and business angel investment and few accelerator programmes. Many enterprises also face barriers in entering international markets and therefore encounter limits to their scaling-up. Other barriers include lack of human resources and entrepreneurial skills.

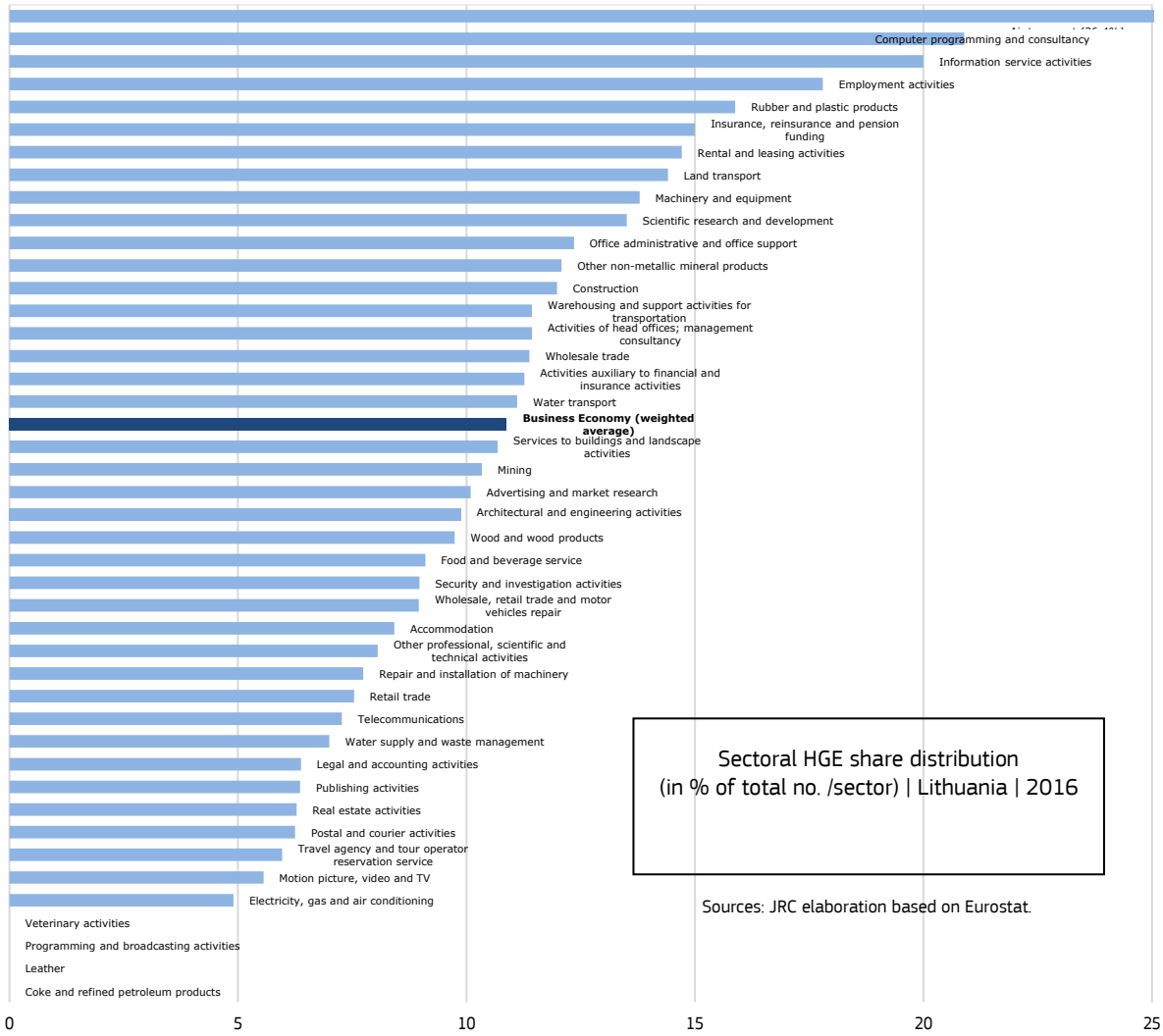
2. HGEs indicator framework



- LT performs substantially below the EU average in HGIE employment share, venture capital and entrepreneurial skills.
- LT performs substantially above the EU average in HGE availability to finance (other than VC), and business regulation and taxation.
- In general, the VC market could be improved as well as multiple aspects of the innovation ecosystem.

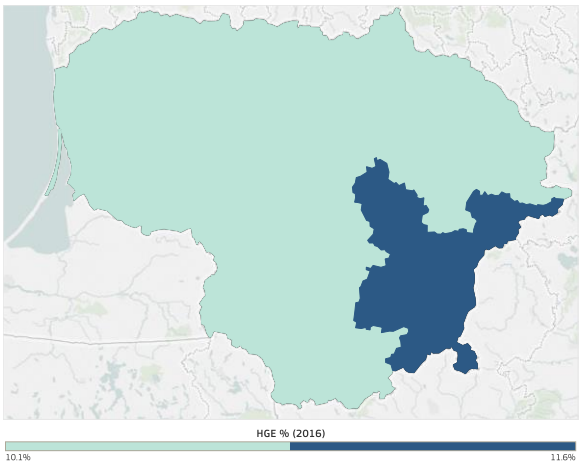
[79] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

3. Firm demographics and sectoral decomposition



Sectoral HGE share distribution (in % of total no. /sector) | Lithuania | 2016

Sources: JRC elaboration based on Eurostat.



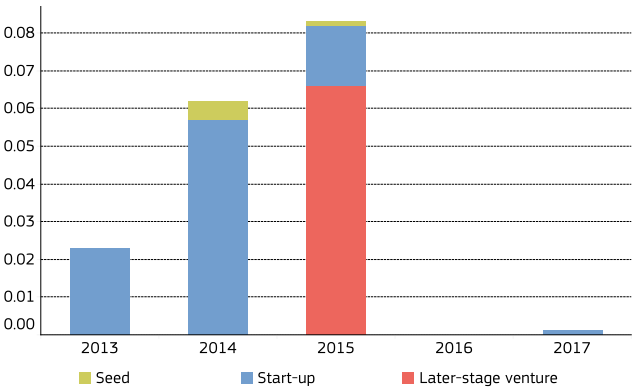
HGE share (% of active enterprises) across NUTS3 regions | 2016 | Lithuania

Sources: JRC elaboration based on Eurostat

- The average share of HGEs in LT is 11% of the business economy, ranging from 4.9% in electricity, gas and air conditioning (and none for a few sectors) to 36.4% in air transport.
- The highest shares of HGEs, apart from air transport, are found in IT and employment activities.
- HGEs are mostly concentrated in the county of Vilnius.

4. Financing HGEs and start-ups: the role of venture capital

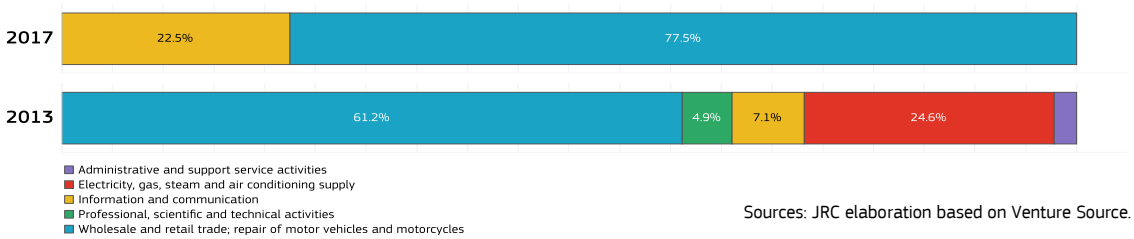
Venture capital by stage of financing (in % of GDP) | Lithuania | 2013-2017



Sources: JRC elaboration based on Venture Source.

- There was an increasing trend in venture capital funding until 2015.
- In 2013 and 2014 start-up stage venture capital investments dominated, while in 2015 the share of later-stage venture investments increased.
- The sharp decline in 2016 and 2017 could be due to data availability problems, which stem from missing information on the amount of VC investments in the database.

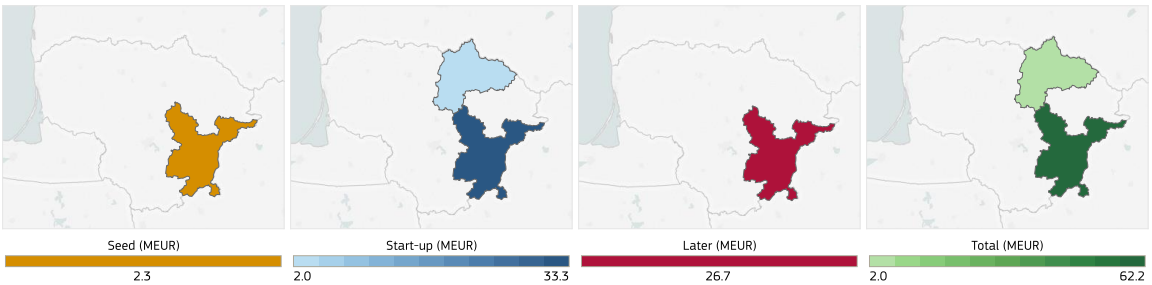
Sectoral distribution of VC investment (in %) | Lithuania | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- The sectoral distribution of VC investments is not diversified. Both in 2013 and 2017, most VC investments were made in wholesale and retail trade, repair of motor vehicles and motorcycles. Also information and communication sectors attracted some VC investments.
- In 2013, around one quarter of VC investments were made in electricity, gas, steam and air conditioning supply.

Regional distribution of VC investment by stage of financing (in MEUR) | Lithuania | 2013-2017



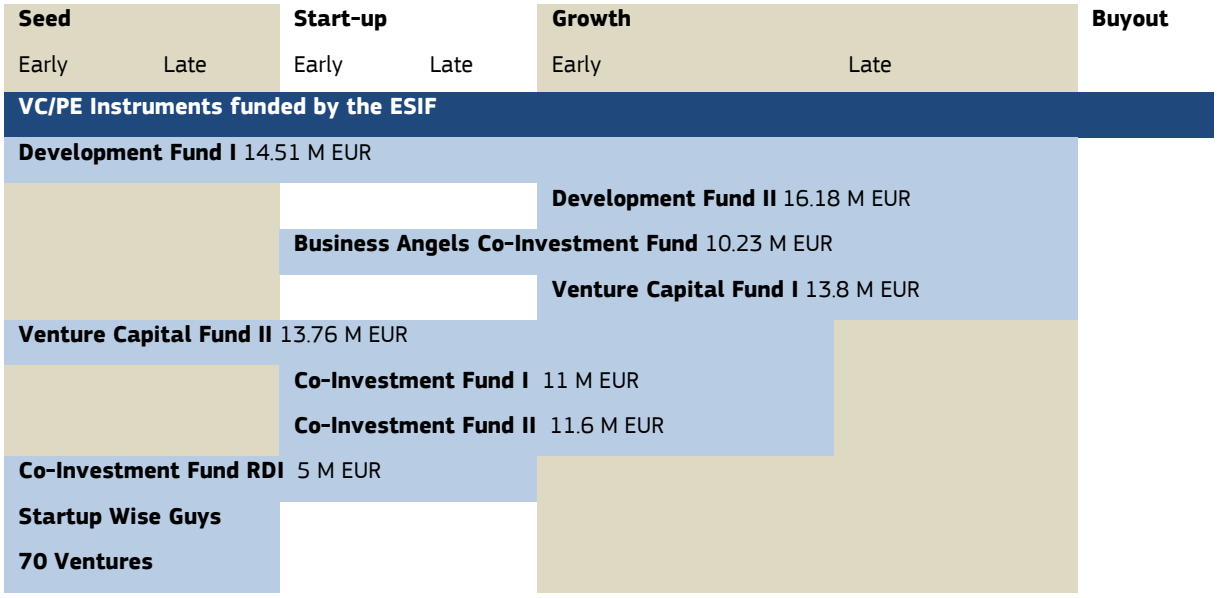
Sources: JRC elaboration based on Venture Source.

- VC investments are concentrated in the capital city of Vilnius and Vilnius County.

5. Finance-related policy measures

Policy	Total budget	Eligibility criteria	Years of imple-mentation	Assessment
"Verslo konsultantas LT" provides SMEs with professional business consultancy services	6 M EUR	SMEs active for less than a year, or between 1 and 3 years (no direct competition between these groups)	Implemented once in 2016 Ongoing implementation since 2018	The measure was said to be relevant, but its implementation is facing difficulties and no evidence of impact was found.
"Verslumas FP" is a measure which funds various financial instruments such as risk capital, risk-shared loans, guarantees, accelerators etc.	128 M EUR	SMEs at their various stages of development (cf. the section 1.2 on funding)	Since 2017	This measure helps SMEs overcome one of the key barriers to scaling up, namely access to finance. Initial evaluation results are positive, but given the short time frame since the launch of this measure, further assessment is needed.
"Invest FP" is a tool to fund risk-shared loans.	48 M EUR	SMEs or small enterprises that are active up to one year and need a loan of more than 25 000 EUR	Since 2017	This measure helps SMEs invest into new production lines and/or technology facilities and upgrade their business. However its implementation is slow, therefore no data for assessment is available.
"Technoinvestas FP" is a measure which funds financial instruments that target innovative enterprises with R&D activity.	22 M EUR	SMEs active for less than five years, or which have an HEI as a shareholder at the time of investment and are active in any area of Smart Specialisation	Since 2018	This measure is very recent, therefore no assessment is available.
"Inostartas" is a measure that provides young innovative start-ups with subsidies to develop their products	4.5 M EUR	SMEs active for less than 1 year or between 1 and 3 years (no direct competition between these groups)	Since 2018	This measure was initially targeted at new start-ups, but the funding requirements restricted participation to those SMEs that have already developed a product prototype and were in a later stage of development.

Venture Capital Instruments funded by the ERDF



- In addition, in 2017 a start-up visa was introduced. It is designed for innovative start-up founders from third countries, who may apply for a temporary residence. Furthermore, Startup Employee Visa was introduced. It facilitates migration procedures for skilled workers from third countries who are going to be recruited by companies with high technological potential.

A4.15 High Growth Enterprises Factsheet – Latvia (LV)

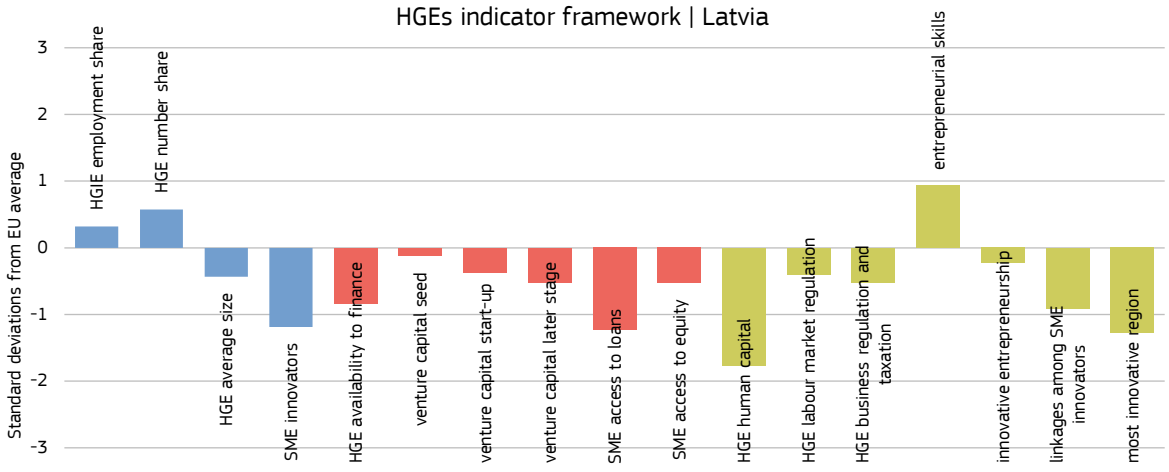
1. Executive summary

LV underperforms in most factors determining the development of high growth enterprises HGEs[80]. While the employment and number share of HGEs in LV is slightly above the EU average, the country performs below the EU average in terms of access to finance and in most framework conditions with the notable exception of **entrepreneurial skills**. This is reflected in the fact that the start-up community is steadily growing with roughly 50 new start-ups per year. While the community has not grown to a well-developed start-up ecosystem yet, there is an active work in collaboration with the public and non-profit sector to improve the framework conditions and organisational links for the rudimentary ecosystem to mature.

In terms of access to finance, there has been an overall increase in venture capital availability in LV in the recent years except in 2017. The sectoral distribution of venture capital investments is diversified, but certain sectors stand out, such as ICT and manufacturing. There is a strong concentration of venture capital in the region of Riga which is also where most HGEs are found. According to the start-up ecosystem mapping completed in 2019, over the period 2012-2018 the total amount of venture capital attracted by Latvian start-ups reached €122.2m distributed over a total of 178 cases. Venture capital constitutes the main form of financing for start-ups or 46%. Other investors like banks and financial institutions represent 23% of the total investment, business angels - 6%, enterprises – 5% and crowdfunding – 1%[81]. Despite the increasingly positive trend in VC availability, the venture capital market in Latvia is developing relatively slowly, it is focused in early stages of financing and is quite dependent on public co-funding.

The conditions for HGEs could improve by supporting the **development of human capital** and the **linkages** between different actors in the innovation ecosystem. Human capital shortage due to demographic and emigration trends has been one of the primary sources of concern for the development of the Latvian innovation and entrepreneurship system for a long time now. In addition, there are relatively few research-industry and intra-industry links, in no small part because the industrial side is technologically weak. While the development of a technology-oriented start-up ecosystem sends promising signals bringing together and supporting the entrepreneurial talent in Latvia, it is clear that the country's current human capital cannot support a long-term expansion of this trend.

2. HGEs indicator framework

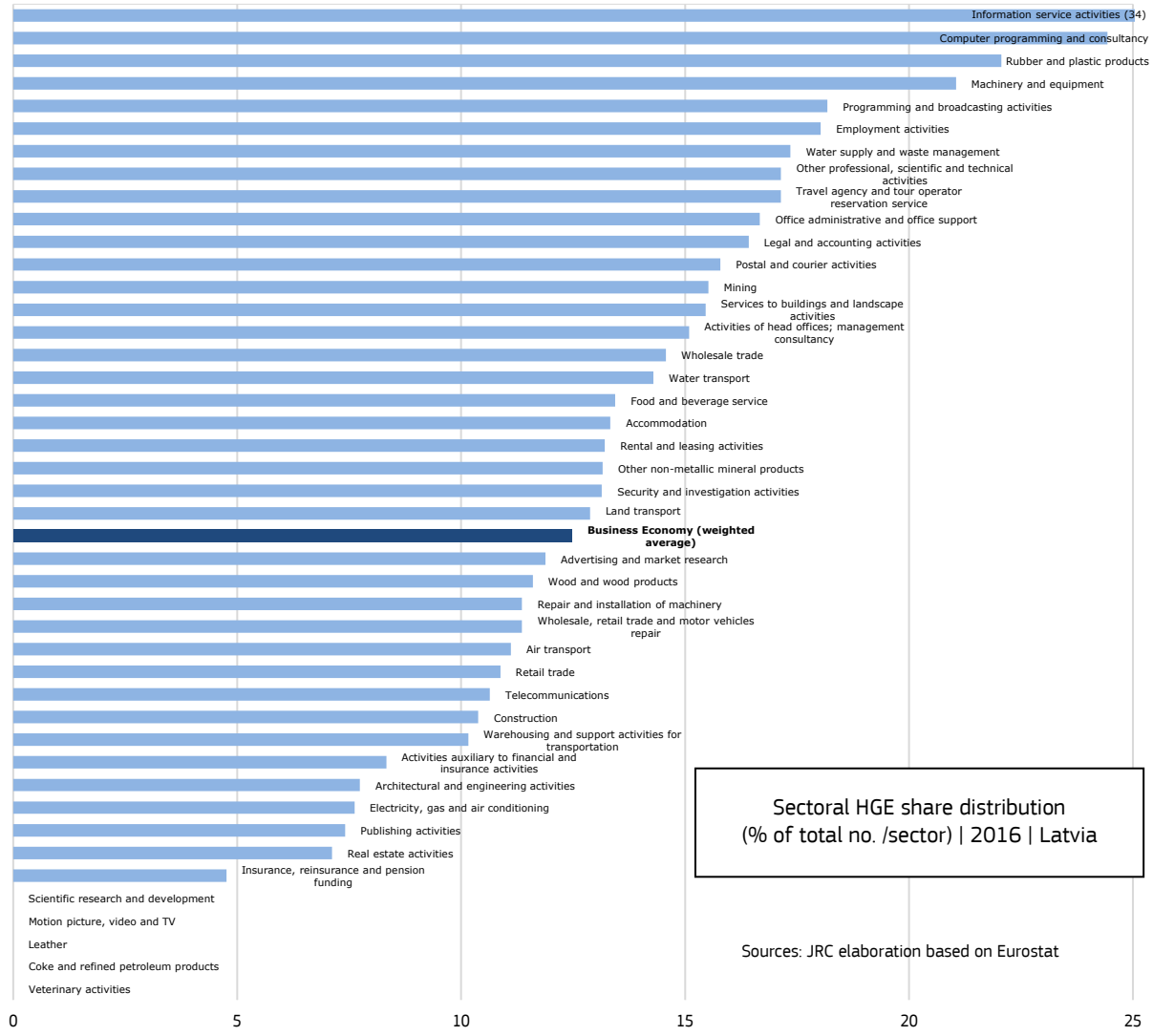


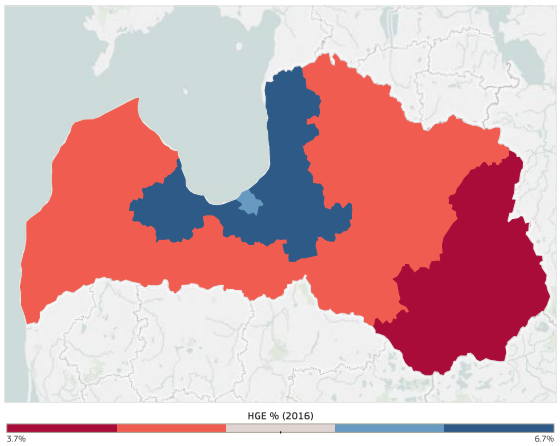
[80] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

[81] Gateway & Partners (2019) Assessment of Latvian Start-Up Ecosystem, Identification of its Current Status and Development of Policy Recommendations. Ministry of Economics

- LV performs below the EU average in most indicators, especially in terms of access to finance, human capital and linkages among SME innovators. This indicates an overall weekly performing (innovation) ecosystem in the country.
- The emergence of HGEs and their shares among total enterprises is favoured by strong entrepreneurial skills.
- LV could improve the conditions for HGEs by supporting the development of human capital (e.g. by attracting people with the right skills) and by continuing to promote access to financial resources.

3. Firm demographics and sectoral decomposition



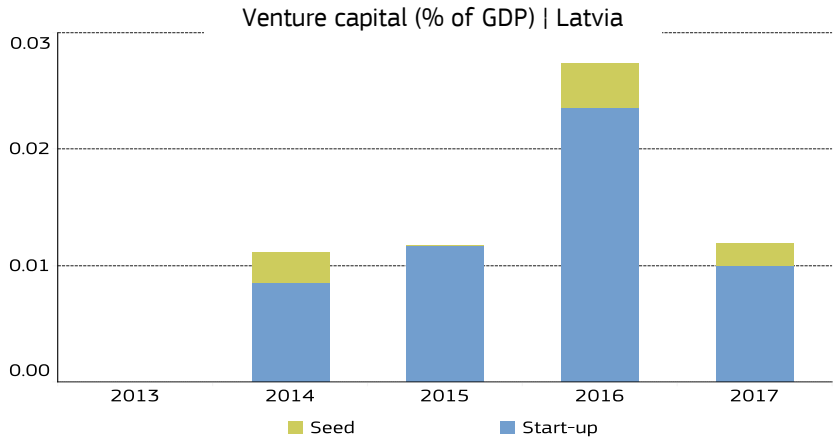


HGE share (% of active enterprises) across NUTS3 regions | 2016 | Latvia

Sources: JRC elaboration based on Eurostat

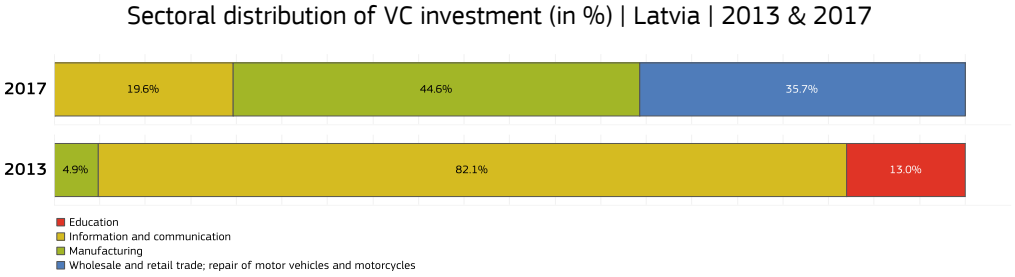
- The average share of HGEs in LV is 12.5% across the business economy, ranging from 4.8% in insurance activities to an impressive 34% in information service activities.
- The highest shares of HGEs are found not only in knowledge-intensive and medium-high tech manufacturing industries, particularly in ICT and machinery and equipment, but also in medium-low tech sectors such as rubber and plastic products.
- The highest share of HGEs among active enterprises is concentrated in the Riga region.

4. Financing HGEs and start-ups: the role of venture capital



Sources: JRC elaboration based on Venture Source.

- LV has increased venture capital investments as a share of GDP from 2014 to 2016, but has seen a reduction in 2017.
- LV has a problem with later stage VC which indicates the underdevelopment of the growth venture market.



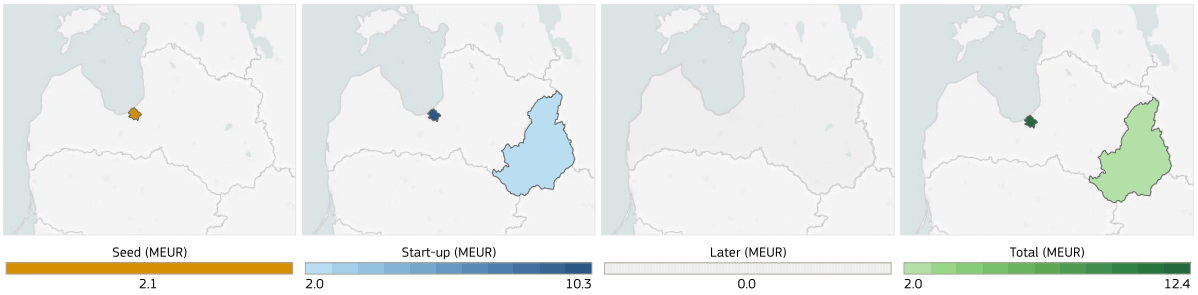
Sources: JRC elaboration based on Venture Source

- The sectoral distribution of venture capital investments is diversified, but certain sectors receive most investments, such

as ICT, manufacturing, and wholesale and retail trade.

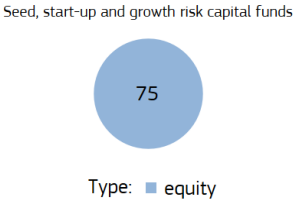
- The sectoral distribution of venture capital investments can change substantially over time.

Regional distribution of VC investment by stage of financing (in MEUR) | Latvia | 2013-2017



5. Finance-related policy measures

Financial instruments Latvia (MEUR)



- The Seed, start-up and growth risk capital funds may be viewed as the main publicly supported financial instrument for HGEs and it is mostly funded by the ERDF which indicates a strong reliance on EU Structural funds. It is planned that this public funding through risk capital funds leverages additional 40 MEUR from private investors.
- Latvia also uses loan guarantees and mezzanine loans to support young companies with growth ambition. The maximal amount of a mezzanine loan is 5 MEUR and it cannot exceed 45% of the overall project costs.
- The target group of the policy instruments is defined quite generally as technology and knowledge-intensive enterprises
- Latvia does not have a strong policy evaluation culture, hence more in-depth studies of the impact of the current support instruments are largely missing.
- The new *Start-up Law* came into force in 2017. It can be regarded as a novel step as Latvia was the only country in the world adopting such a legal framework. The aim of the support measures encompassed in the law is to help technology-based start-ups to face one of their greatest initial challenges – employee salaries and taxes.

A4.16 High Growth Enterprises Factsheet – The Netherlands (NL)

1. Executive summary

The Netherlands performs very well overall regarding high growth enterprises (HGEs[82]). Both the number of HGEs and HGE size are well above European average, but the HGE employment share is still around EU average. Both the number of HGEs and the number of people they employ have risen fast at +47% and +72% between 2012 and 2017. The large increase in HGE employment is partially due to the flexibilisation of the Dutch labour force as the largest growth in HGE employment occurred in the sector 'employment activities'. The emergence of HGEs is favoured by the improved accessibility to finance. This is reflected in the increase in venture capital (VC) available in the Netherlands in recent years. In 2017, the sectoral distribution of VC investments was diversified, with manufacturing, ICT and transportation receiving most investments. The sectoral distribution of VC investments can change substantially over time noting how in 2013 manufacturing received over 80% of total VC compared to 33% in 2017. VC investments concentrate in North Holland and Brabant - both leading innovation regions, but not the only ones in the Netherlands. Despite progress, the VC markets in the Netherlands still remain underdeveloped, especially in comparison to the US and UK.

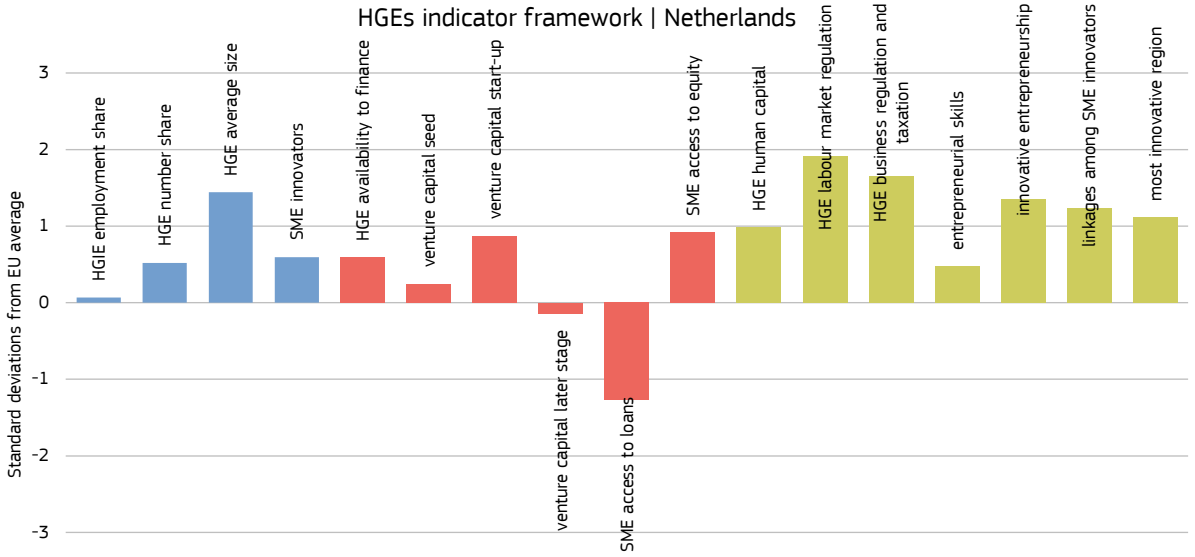
While overall the conditions for HGE in the Netherlands are excellent, there is room for improvement in facilitating SME access to loans. Considering the general shortages of STEM and ICT personnel in the Netherlands, the positive picture for HGEs is somewhat surprising. There may also be room for improvement in the provision of entrepreneurial skills. Among the knowledge-intensive HGEs, most (about 60%) can be found in knowledge intensive market service followed by high-tech knowledge services. There are relatively few HGEs in (medium-) high-tech manufacturing sectors. The Dutch approach to industrial policy which offers support to public-private partnerships in top sectors may lend itself to coordinating knowledge production and aligning it with industry's interest, but may be less suitable for generating new firms that push forward more disruptive kinds of innovations.[83] A 'meta-evaluation of the rationales and effects of 60 Dutch innovation and entrepreneurship policies'[84] found that a substantial share lacked a clear grounding in economic thinking on growth and innovation. Those that are actually tuned to innovation and growth are increasingly of a fiscal nature, covering about 80% of the entire budget for this segment. The Patent Box (Innovation Box) accounts for roughly half of this, but is not particularly friendly for younger HGEs not having already a patent portfolio that allows them to decrease their profit tax (profit they may not yet make in the first place). In that sense, the other fiscal incentive "WBSO" which offers partial tax exemption for labour costs of R&D employees, is observed to be more suitable for supporting innovation in HGEs.

[82] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

[83] Janssen, M. (2019). What bangs for your buck? Assessing the design and impact of Dutch transformative policy. Technological Forecasting and Social Change.

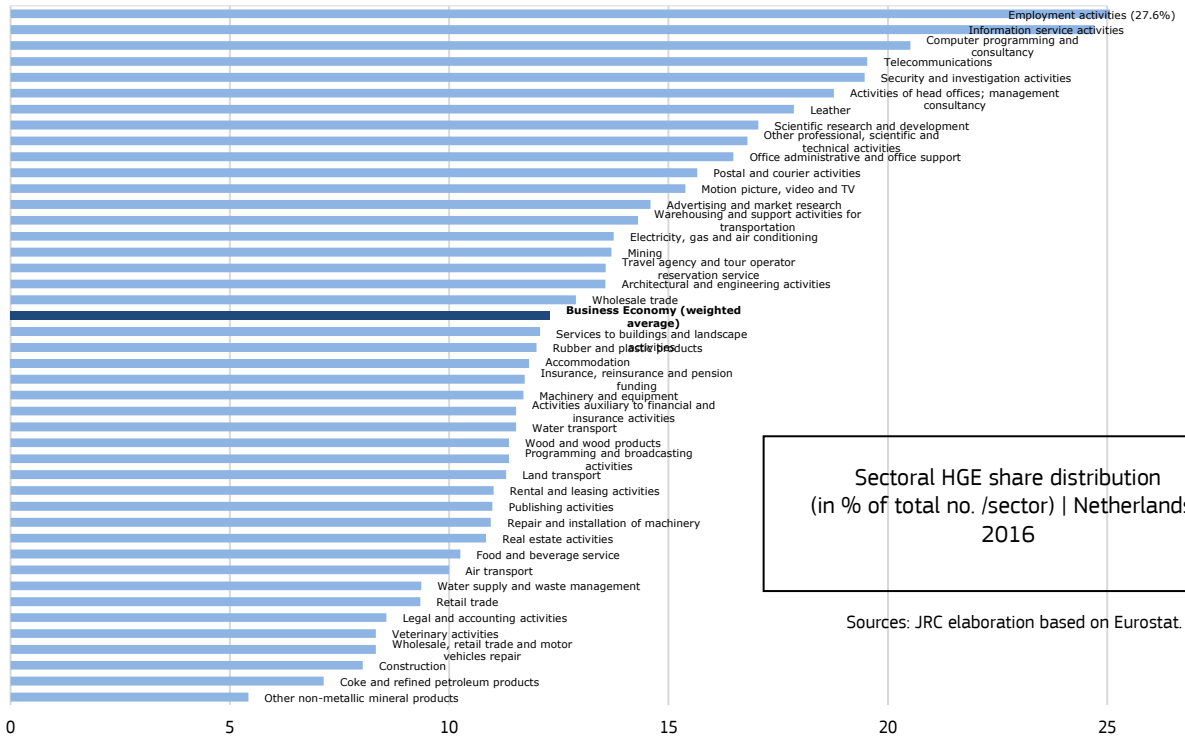
[84] Dialogic (2015). Meta-evaluation innovation and entrepreneurship policy mix. Commissioned by Min. of EAC.

2. HGE indicator framework



- NL performs above the EU average for almost all indicators, especially those related to business framework conditions favourable to high-growth, except for later-stage venture capital and SME access to loans.
- The overall positive regulatory environment stands out as particularly above average.
- As far as financing growth is concerned, the relatively higher use of equity finance by Dutch start-up SMEs contrasts with the below average score for access to loans.
- Other indicators on which the Netherlands performs well above the EU average are HGE average size, SME innovators, linkages among SME innovators and most innovative regions.
- Something worthy of further investigation is why, for such an overall positive indicator fingerprint, the HGE employment share is barely above average.

3. Firm demographics and sectoral decomposition



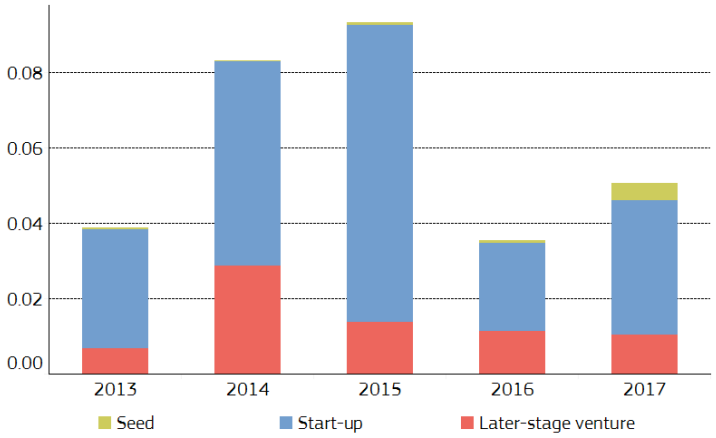
Sectoral HGE share distribution (in % of total no. /sector) | Netherlands | 2016

Sources: JRC elaboration based on Eurostat.

- The average share of HGEs in the Netherlands is around 12% across the business economy, ranging from 5.4% in other non-metallic mineral products to 27.6% in employment activities.
- The highest shares of HGEs are found in knowledge-intensive and high and medium-high tech manufacturing industries, particularly in ICT and research-related sectors in addition to employment activities.

4. Financing HGEs and start-ups: the role of venture capital

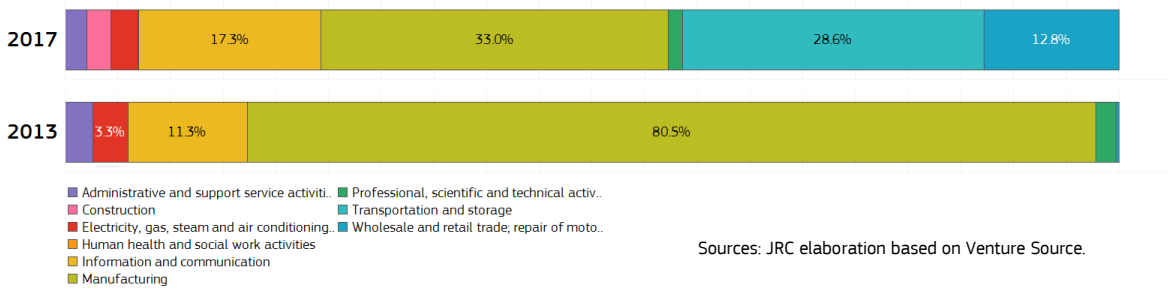
Venture capital by stage of financing (in % of GDP) | Netherlands | 2013-2017



Sources: JRC elaboration based on Venture Source.

- Between 2013 and 2015 the Netherlands experienced a large increase in Venture Capital investments. Following a sharp drop in 2016. VC volumes picked up again in 2017.
- By far the largest share of VC investments are made in startups. The availability of VC for later stage ventures and for seed capital remains limited.
- This is in contrast to e.g. the UK and to a lesser extent Germany where investments in later stage ventures take up a considerable larger share of VC funding.

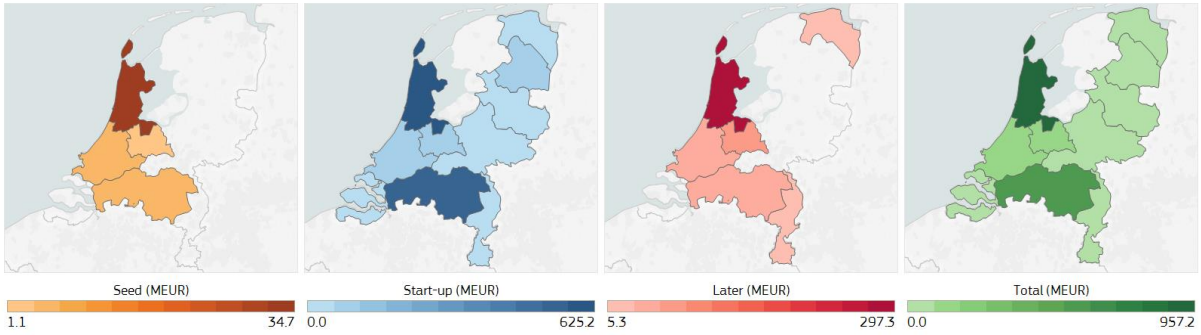
Sectoral distribution of VC investment (in %) | Netherlands | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- In period 2017, the sectoral distribution of venture capital investments is diversified, but certain sectors receive most investments, such as manufacturing, ICT, and transportation
- The sectoral distribution of venture capital investments can change substantially across time noting how in 2013 investments in manufacturing received over 80% of total VC investments comparted to 33% in 2017.

Regional distribution of VC investment by stage of financing (in MEUR) | Netherlands | 2013-2017



Sources: JRC elaboration based on Venture Source.

- Over the period 2013-2017, there is a concentration of venture capital in North Holland and Brabant across most stages of financing.
- The start-up stage funding is most distributed across regions in the Netherlands and as shown in the first figure of section 4 comprises the main share of VC funding.

5. Finance-related policy measures

Instrument	**Type**	**Target population**
Dutch Venture Initiative (DVI)	Funds-of-funds, executed by EIF	Fund managers, active *at least* in the Netherlands
Seed Capital Funds	Funds	Dutch fund managers
Growth facility	Guarantee	Banks + investors
Innovation Credit	Credit	HGIEs
Qredits	Credit	Small SMEs

- The DVI–I is a 'later stage venture capital' funds-of-funds launched in 2013 which focuses explicitly on HGIEs. DVI-I committed €193m (95.5% of its €202.3m funds-of-funds budget) to 14 funds; the total volume of these funds amounts to €1.6 billion. The percentage of 'private' investment (also including equity provided by other governments) is 88%. In 2014, the Dutch government decided on an additional injection of €100mln euro (DVI-II), for the purpose of stimulating early phase investments by business angels and private equity parties.
- The Seed Capital Fund focuses on high-tech or creative entrepreneurs. It provides public venture capital investment funds. The scheme improves the return-to-risk ratio for investors. Seed Capital funds can finance a maximum of 50% of their investments via loans from the Seed Capital instrument. In practice, these funds have obtained 51.5% from private investors.
- The Growth Facility: this *guarantee* covers maximum 50% of risk funding provided by banks or private equity investors
- The Innovation Credit supports development projects with high risks. Companies using the Innovation Credit pay back the loan if their project is successful, otherwise the loan can be converted to a grant.
- Since 2009 the Ministry of EA has been supporting the availability of microfinancing, as executed by the non-profit Qredits Microfinance Institution. Qredits offers credit of up to €250,000, and also provides services like coaching, mentoring and helping with credit requests previously denied by banks.

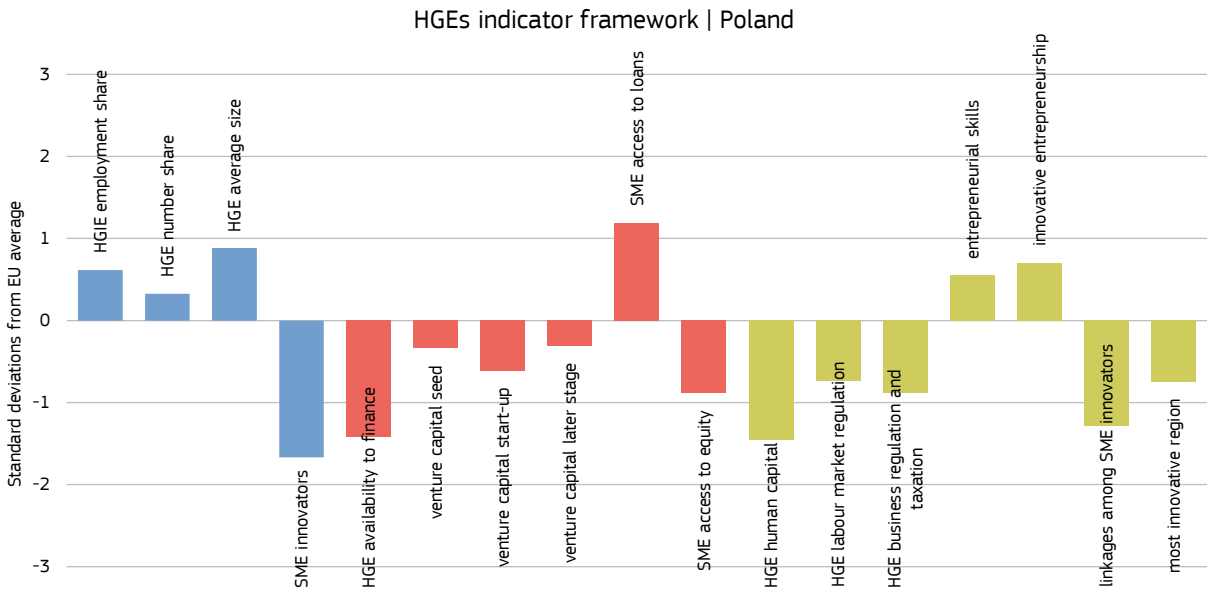
A4.17 High Growth Enterprises Factsheet – Poland (PL)

1. Executive summary

PL performs above-average in the number and employment share of high-growth enterprises (HGEs[85]). As the financial and framework conditions are generally weak, one possible explanation for the large share of HGEs might be the high average growth of the economy (2018 GDP growth: 5.1% in PL vs 2.0% in EU), which allowed HGEs to emerge disproportionally to the overall growth in the number of enterprises, thereby resulting in a relatively high share of HGEs vis-à-vis the EU average. Despite the unfavourable overall level of framework conditions, entrepreneurial skills and innovative entrepreneurship are considered to be above the EU average.

Conditions for the emergence and development of HGEs could be improved in several factors. Framework conditions are seen as one of the critical barriers, in particular, regulation for starting, running and growing a firm, along with, company taxation, labour market regulations and higher education system. However, regulations related to access to capital and product market regulations seem to be rather supportive. Venture capital financing and SME access to equity in general are well below the EU average which may constitute a barrier for HGE development. Also, venture capital is concentrated in a few, already developed regions. Over half of venture capital available in PL comes from public sources. However, these financial instruments are not targeted directly towards HGEs, which can benefit from wide array of initiatives for innovative companies that could be grouped in the following categories: training for entrepreneurs, funding initiatives, acceleration programmes and matching initiatives.

2. HGEs indicator framework



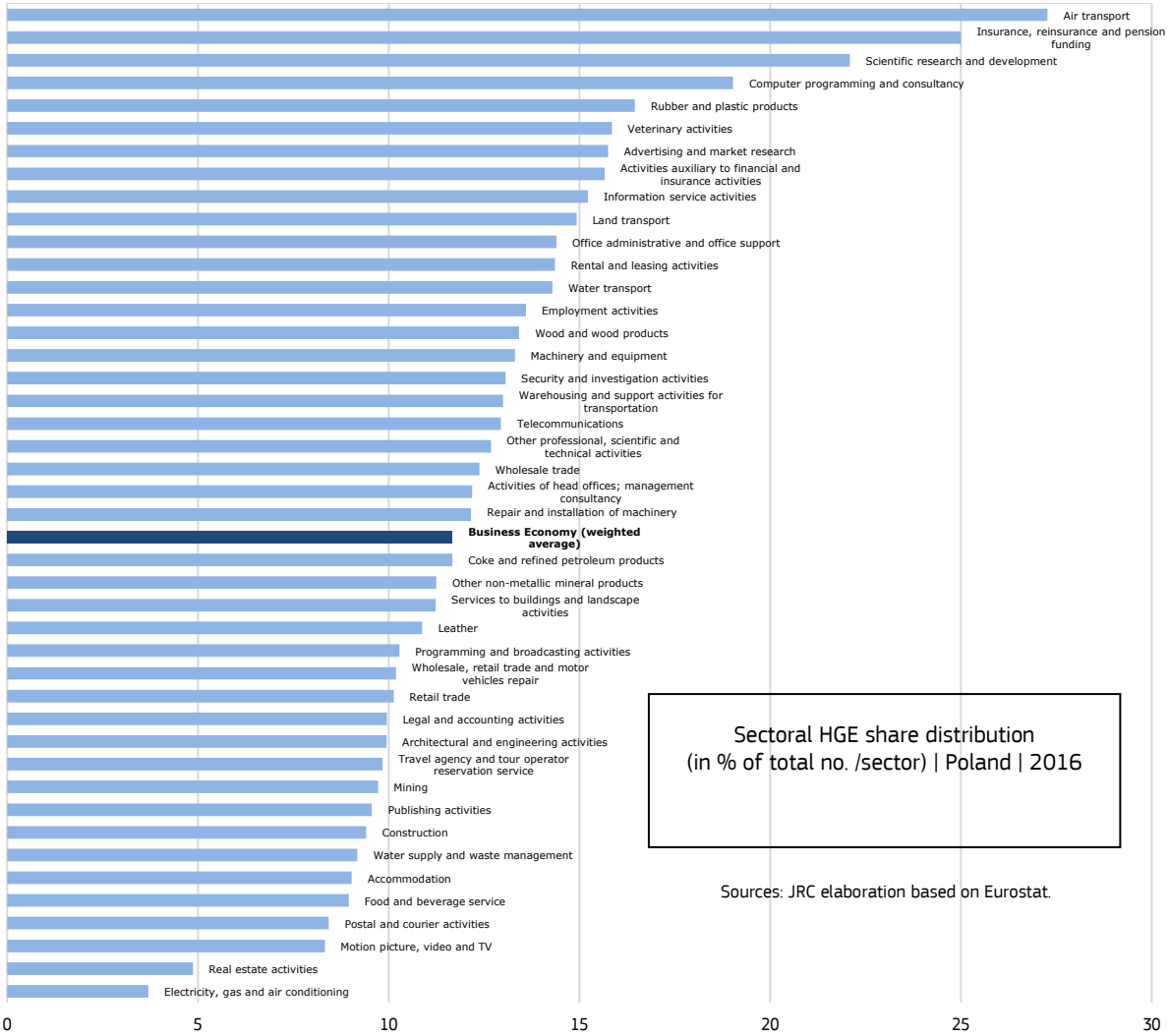
- PL performs above the EU average in the share of HGE in terms of both employment and number. The average size of HGEs is significantly higher than the EU average. In contrast to HGEs, the share of SME innovators is lagging behind.
- Financing conditions for HGE in PL are weak compared to the EU average. Although SMEs' access to loans is favourable, availability of finance is still considered a serious investment barrier for HGEs. This finding can be explained by the lower-than-average share of venture capital in GDP (seed, start-up and later stage) and weak

[85] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

access to equity for SMEs.

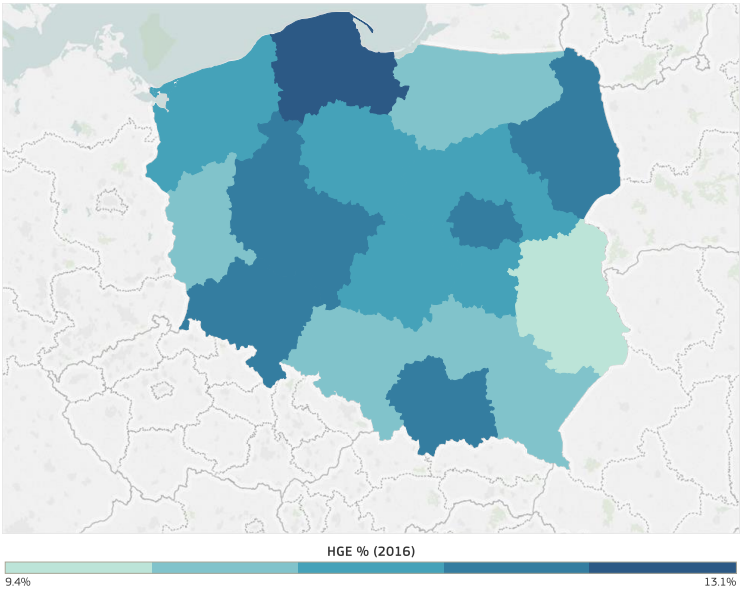
- Framework conditions are generally lagging behind the EU average. Although entrepreneurial skills and innovative entrepreneurship outperform the EU average, regulations and a lack of human capital for HGEs are serious investment barriers. The lack of linkages among SME innovators and the below-average innovation performance of the most innovative region in PL highlight the weaknesses of the innovation ecosystem.
- The contrast between high share of HGEs and low level of financing and framework conditions calls for further analysis. High average growth (2018 GDP growth: 5.1% in PL vs 2.0% in EU) might have been a potential driver of the high share of HGEs in the Polish economy.

3. Firm demographics and sectoral decomposition



Sources: JRC elaboration based on Eurostat.

- The average share of HGEs is 12% in PL across the business economy, ranging from 3.7% in electricity, gas and air conditioning to 27.3% in air transport.
- The highest shares of HGEs are found in knowledge intensive services.



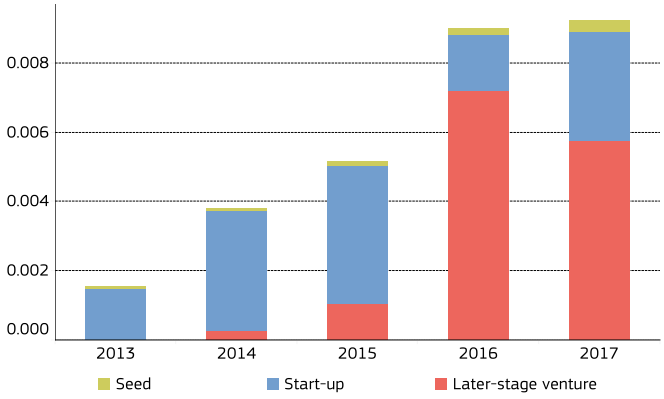
HGE share (% of active enterprises) across NUTS2 regions | 2016 | Poland

Sources: JRC elaboration based on Eurostat

- The highest share of HGEs can be found in the Pomorskie region, which showed the second-highest growth rate of gross value added in PL in 2016
- The regional share of HGEs is correlated with the GDP per capita level of the region.

4. Financing HGEs and start-ups: the role of venture capital

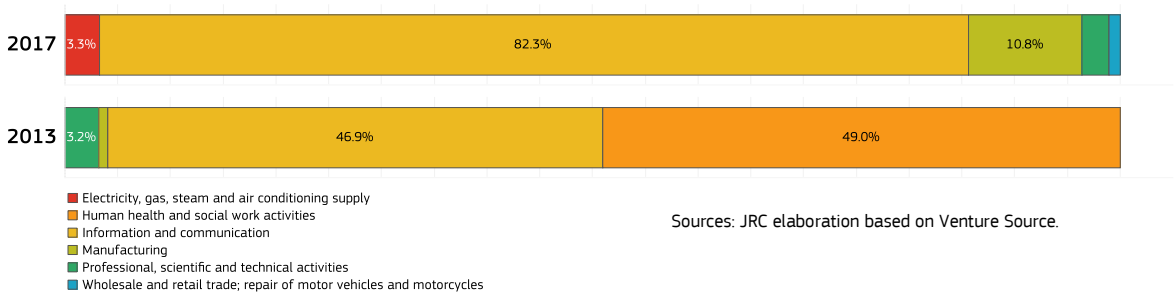
Venture capital by stage of financing (in % of GDP) | Poland | 2013-2017



Sources: JRC elaboration based on Venture Source.

- Venture capital as a share of GDP has been increasing quickly since 2013, however, the overall level is still far below the EU average.
- Within venture capital, later-stage ventures raised their share substantially. In 2017, later-stage investments were responsible for about 2/3 of all venture capital.

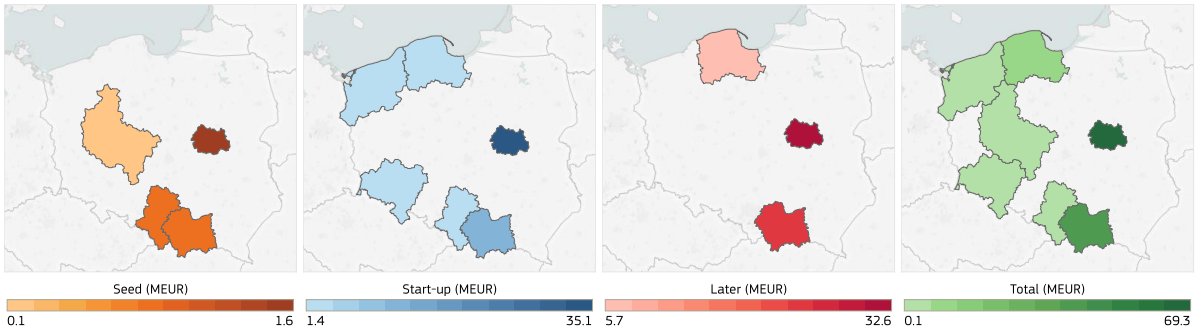
Sectoral distribution of VC investment (in %) | Poland | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- The sectoral distribution of VC investments changed substantially between 2013 and 2017, which is also related to the relatively low shares of VC investments per year, thus large changes can occur already due to only a few investments.
- ICT increased its share from 46.9% to 82.3%, while the health industry shrunk from almost half to practically zero. Manufacturing increased its share from below 1% to above 10%.

Regional distribution of VC investment by stage of financing (in MEUR) | Poland | 2013-2017



Sources: JRC elaboration based on Venture Source.

- Venture capital in general is concentrated in the few most developed regions (based on GDP per capita).
- Most of the venture capital is invested in three regions: the capital region, Malopolskie and Slaskie.

5. Finance-related policy measures

- There are no financial instruments tailored to HGEs in PL. However, HGEs can benefit from the following general governmental programmes and financial instruments.
- Training:
  - Academy of SME Manager: co-finance training for management of SMEs
- Funding:
  - PFR Ventures: fund of funds: financing for innovative SME
  - De minimis guarantees by BGK: guarantee programme to facilitate access to finance for SMEs
  - The Biznesmax guarantee with subsidy by BGK: guarantee programme to facilitate access to finance for SMEs
  - Electro ScaleUp: to support the dynamic development of start-ups in electromobility
  - Design for entrepreneurs: finance a professional design process with the aim of implementing a new, improved product or service

    - Legal support for start-ups: finance legal support for start-ups cooperating with investors
- Acceleration programmes:
    - Scale Up: accelerate development of start-ups
- Matching services:
    - Connect & Scale UP: improve quality of innovations by networking/adopting large companies' practices

A4.18 High Growth Enterprises Factsheet – Portugal (PT)

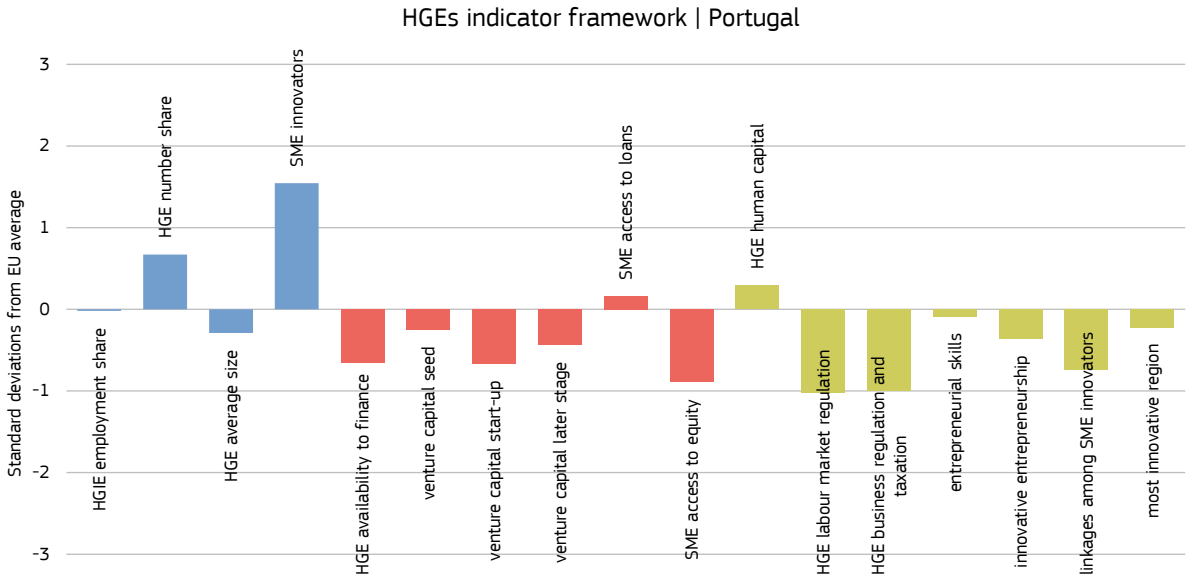
1. Executive summary

On average, the shares of HGEs[86] in the most knowledge intensive sectors in PT are higher than for the whole business economy: around 20% in the information and communication sector; 18% in administrative and support service activities; and 13% in professional, scientific and technical activities. This compares with an equivalent share of 12.8% for the overall business economy.

The evolution of venture capital (VC) investments in PT in the period 2013-2017 shows an irregular pattern: after an initial increase from 2013 to 2015, it declined in 2016 and 2017, without recovering to earlier levels. VC investments are mainly concentrated in the ICT industry, and professional and technical activities. Lisbon and Porto take the lead in terms of the amount of VC invested.

The performance of HGEs is strongly influenced in terms of their innovation strategies and growth opportunities by the relatively poor framework conditions in PT. Among other measures, the national government could develop a strong innovation system and adopt policies that allow specific firms to effectively assimilate foreign technology. Improving SMEs access to equity as well as promoting linkages among SME innovators also represent important challenges for policy.

2. HGEs indicator framework

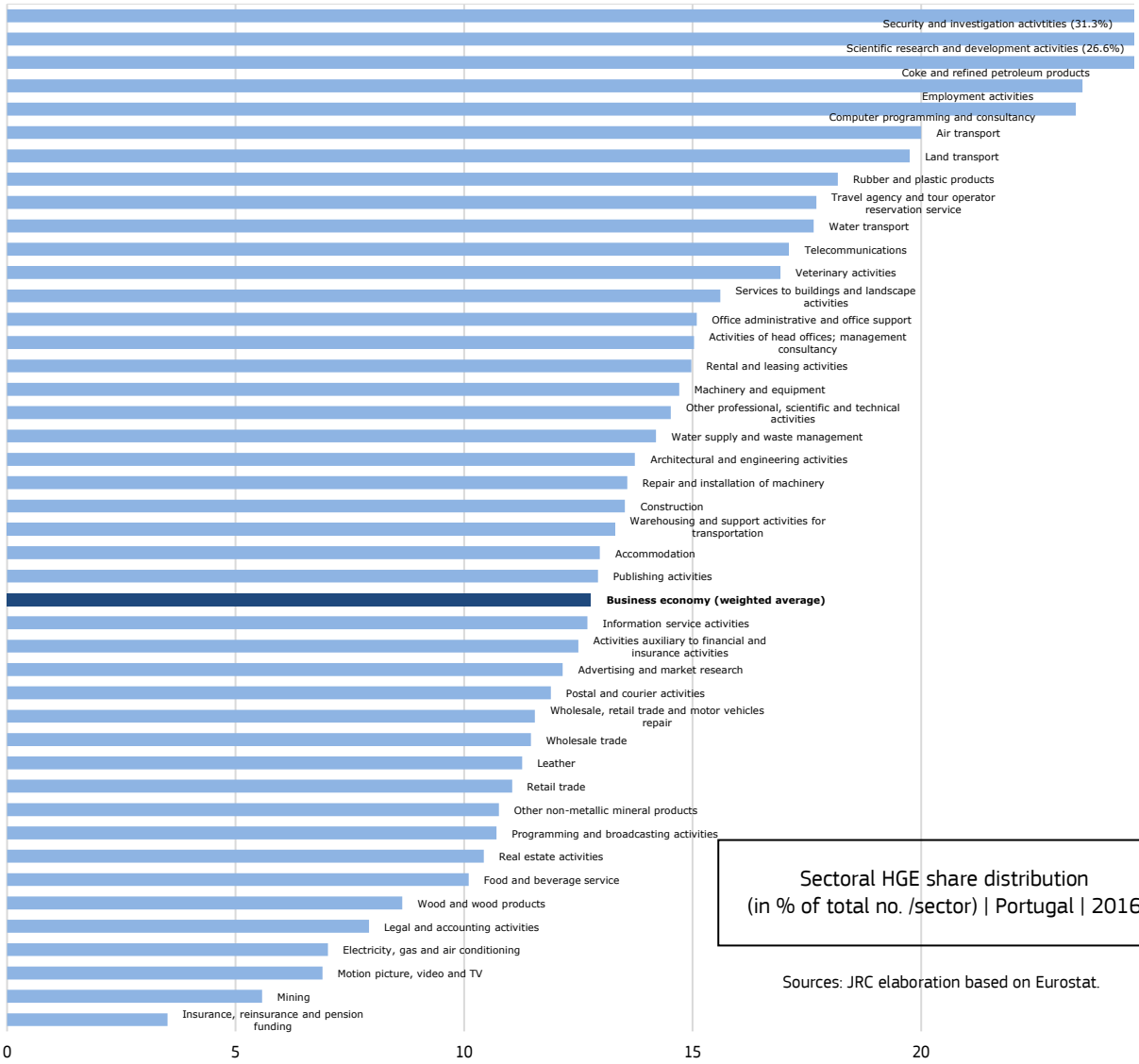


- PT performs above the EU average in terms of the share of total HGEs and SME innovators.[87]
- PT SMEs benefit more from loans than other sources of external financing compared to the EU average. Overall, access to finance remains a large barrier to the emergence of HGEs.
- In PT, the environment is not conducive to the emergence of HGEs. There is a need of more supportive framework conditions, concerning both institutions and policies, for both SMEs and HGEs.

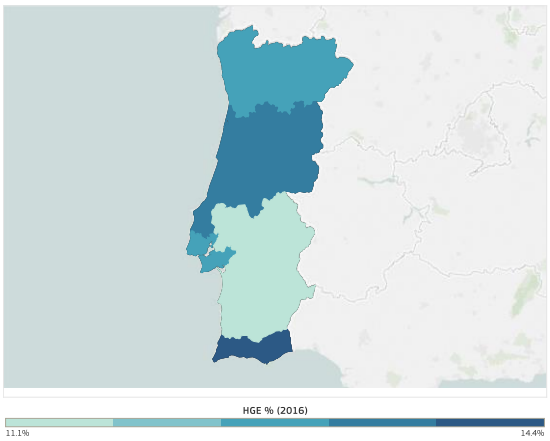
[86] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

[87] Units are normalized using the standard deviation of the distribution of "differences" across countries with respect to the EU for each indicator. These differences should thus be interpreted as "number of standard deviations away from the EU average".

3. Firm demographics and sectoral decomposition



- The average share of HGEs in PT is 12.8 % across the business economy, ranging from 3.5% in insurance and pension funding activities to a remarkable 31% in security and investigation activities.
- The highest shares of HGEs are found not only in knowledge-intensive and medium-high tech manufacturing industries, such as computer programming, telecommunications and scientific research, but also in less knowledge-intensive sectors such as services to buildings and landscape, postal and office support activities, and rental and leasing.



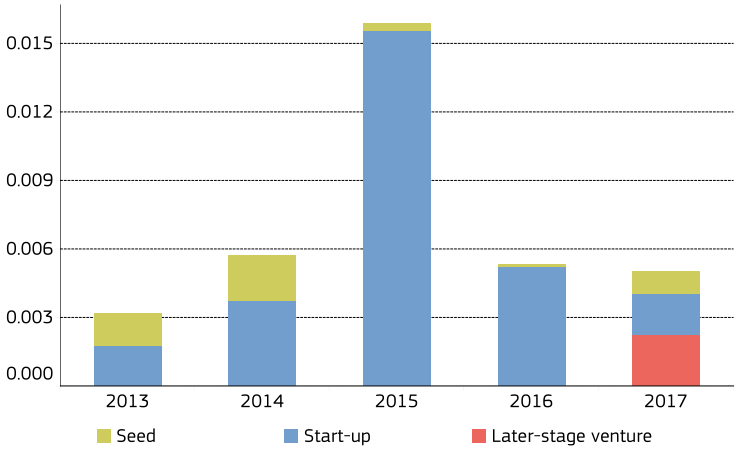
HGE share (% of active enterprises) across NUTS2 regions | 2016 | Portugal

Sources: JRC elaboration based on Eurostat

- From a geographical point of view, the highest share of HGEs among all active enterprises are found in the Algarve and Centro regions.

4. Financing HGEs and start-ups: the role of venture capital

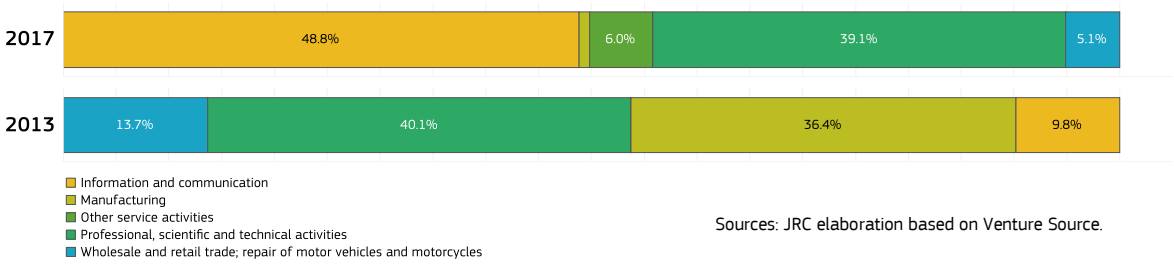
Venture capital by stage of financing (in % of GDP) | Portugal | 2013-2017



Sources: JRC elaboration based on Venture Source.

- Start-up VC investments as a share of GDP increased considerably from 2013 to 2015, then they declined in 2016 and 2017. The overall amount invested is in any case one of the lowest in the EU.
- The share of seed VC investments increased from 2013 to 2014, declined in 2015-2016 and recovered to the earlier share.
- Regarding later-stage VC investments, the picture is very much affected by missing information.

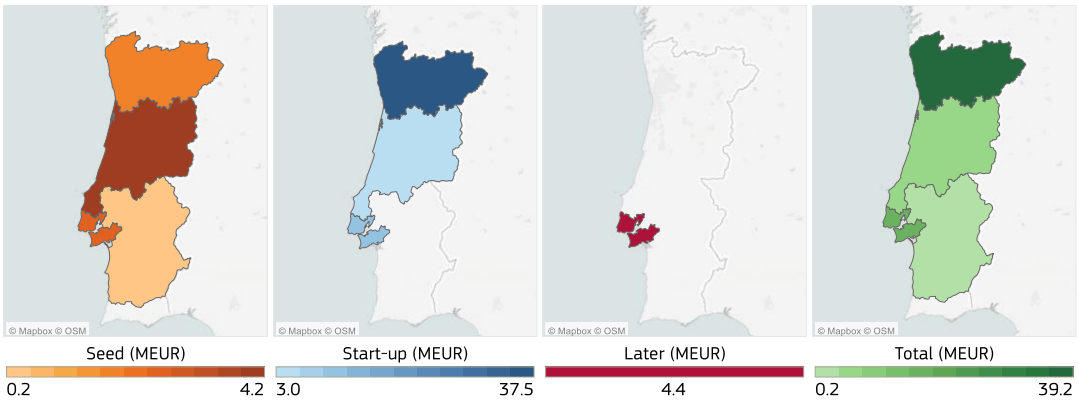
Sectoral distribution of VC investment (in %) | Portugal | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- Compared to 2013, in 2017 the largest amount of VC investments were made in the ICT industry and in scientific and technical activities, whilst the reverse is the case of manufacturing and wholesale and retail trade.

Regional distribution of VC investment by stage of financing (in million euros) | Portugal | 2013-2017



Sources: JRC elaboration based on Venture Source.

- Most of seed VC-backed companies are located in the Centro and Lisbon regions.
- Start-up companies are mostly located in Norte region, whereas later stage companies are located in the Lisbon region.

5. Finance-related policy measures

- The innovation policy mix in PT has no specific measures targeted at HGIEs. However, HGEs may apply to the wide set of instruments available to support their growth and innovative performance.
- Some of most important programmes in place are:
  - SIFIDE (Tax Incentive System) for R&D support.
  - Financial Incentives in the form of grants and loans, including the new System of Incentives for Productive Innovation in SMEs (Notice N.º 31/SI/2018) as well as support to R&D projects, including those in cooperation with S&T organisations and firms;
  - Financial guarantees, provided through the Mutual Guarantee system
  - Start-up Voucher programme, ADN-Start-up Credit line;
  - Equity, through *Venture Capital* funds managed by both public (Portugal Ventures) and private organisations Support to the participation of Portuguese firms in EU R&D instruments/programmes and EUREKA.

A4.19 High Growth Enterprises Factsheet – Romania (RO)

1. Executive summary

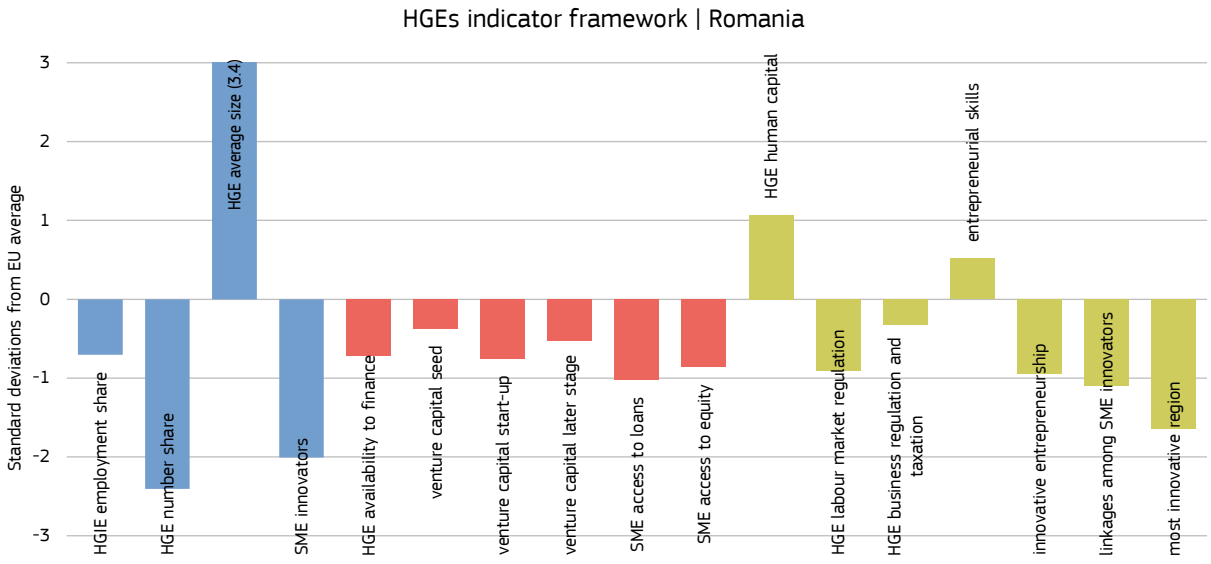
Romania performs well in terms of human capital available for HGEs[88] and entrepreneurial skills. The start-up scene is booming and this is reflected in the fact that in the 2016 Start-up Nation Scoreboard RO ranks on the 9th position among EU28.

RO has a small share of HGEs but they are hiring a large number of employees. This type of companies are found almost exclusively in the services sector, with a slightly higher concentration in knowledge-intensive services. There is a very limited number of HGEs in manufacturing and especially in its high-tech segment. The innovation ecosystem performs weakly due to relatively unfavourable financial, regulatory and market conditions. As a result SMEs show very low innovation activity.

Financial constraints that this type of companies face in RO tend to be relatively stronger than in the EU as a whole. The venture capital market is underdeveloped, and it is restrained to a small number of deals and sectors, concentrating in only two development regions. There are no policies or financial instruments specifically targeting HGEs, but there are instruments and policies focusing on SMEs that that also cover implicitly HGEs as beneficiaries, targeting all stages of enterprise development. Funding schemes are available from national and European sources, the latter having a substantial share.

Improvements are needed in making the business environment friendlier for SMEs with growth ambition and in strengthening their innovation ecosystem. Measures to consider can include modifications in regulation (labour market, business regulation and taxation), enhancement of collaboration among SME innovators, development of strong innovative capacities in regional hubs, as well as measures to improve access to finance.

2. HGEs indicator framework

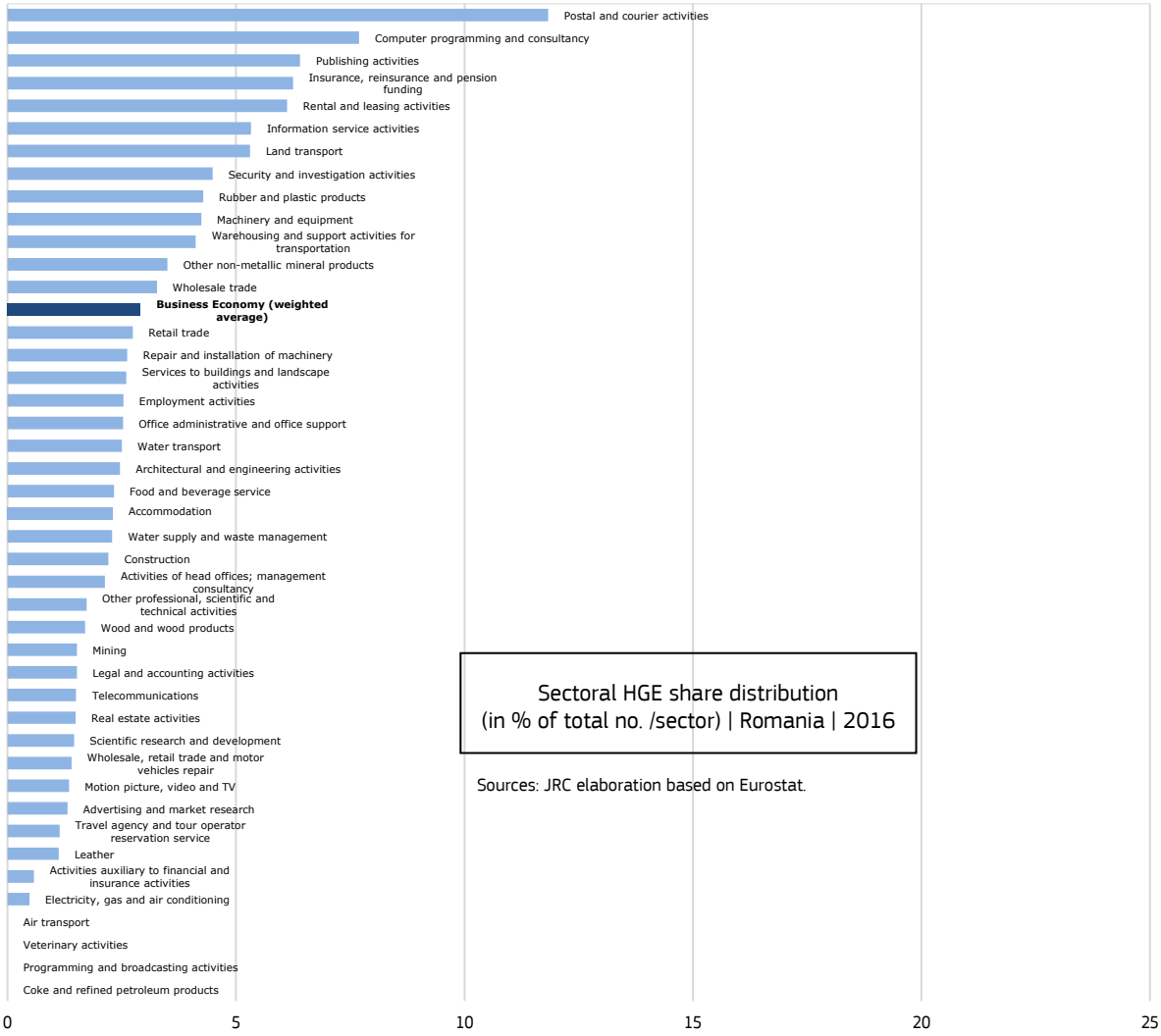


- RO performs below the EU average in all respects (firm demographics, access to finance and framework conditions), except for the average size, human capital available for HGEs and entrepreneurial skills.

[88] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

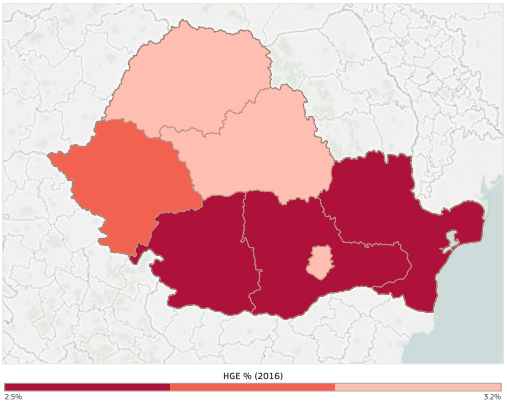
- The lower performance in HGE number share coupled with the high average size is an indication of few, but large companies in this segment. Contribution to employment creation is weaker compared to the EU average.
- HGEs face relatively strong financing constraints, both in terms of equity and debt financing.
- Despite general labour shortages in the country, it seems that potential employees with the right skills are available for HGEs. However, the innovation ecosystem performs weakly due to regulatory, innovative entrepreneurship, collaboration and regional innovation aspects.

3. Firm demographics and sectoral decomposition



Sectoral HGE share distribution
(in % of total no. /sector) | Romania | 2016

Sources: JRC elaboration based on Eurostat.



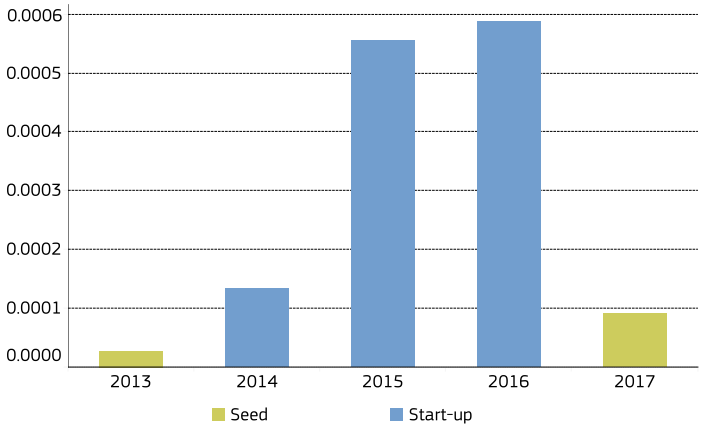
HGE share (% of active enterprises) across
NUTS3 regions | 2016 | Romania

Sources: JRC elaboration based on Eurostat

- The average share of HGEs in RO is relatively low, at around 3-4% (weighted average of the business economy) ranging from 0% in certain service sectors to 12% in postal and courier activities (the EU average across the business economy is 11%).
- HGEs are found almost exclusively in the services sector. There are almost no HGEs active in manufacturing, especially in high-tech manufacturing.
- HGEs are mostly concentrated in Northern and Central Transilvania as well as in Bucharest.

4. Financing HGEs and start-ups: the role of venture capital

Venture capital by stage of financing (in % of GDP) | Romania | 2013-2017



Sources: JRC elaboration based on Venture Source.

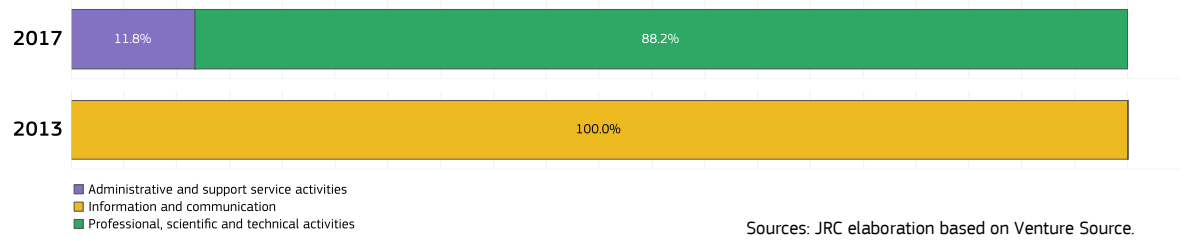
- The venture capital market is very much underdeveloped characterized by a practically negligible share of this type of financing, and it is restrained to a very limited number of deals.
- The key players are as follows:

Name		**Total Portfolio**	**Stage**	**Total support in RO**	**Areas**	**Comment**
Catalyst		EUR26mln	early	EUR0.2-2mln	Technology, media, telecom.	JEREMIE initiative
GapMinder		n.a.	Pre-seed, seed	n.a.	IT Software (fintech, cyber sec., MedTech, digital transformation (AI, ML, etc)	National VC fund
Gecad		EUR100mln	early	n.a.	Software and high-tech	
Early Game		EUR22mln	early	Up to EUR3.5mln per company	Innovative comps (blockchain, cloud, electric vehicles, NPL, big data, AI, ML, advertising, agritech, fintech, etc.)	National VC fund, co-funded by the ERDF. It has EIF backing.
Fribourg Capital		EUR20mln	Early, seed	n.a.	Early stage tech startup investments	
La French Tech		EUR1mln	seed	EUR20,000-100,000	Support for French start-ups to enter the RO market	It starts in 2020
3TS		3TS Capital	n.a.	n.a.	technology	It owns 10 companies in RO

Source: JRC elaboration

- Later-stage venture capital is completely missing, indicating a growth stage funding gap.

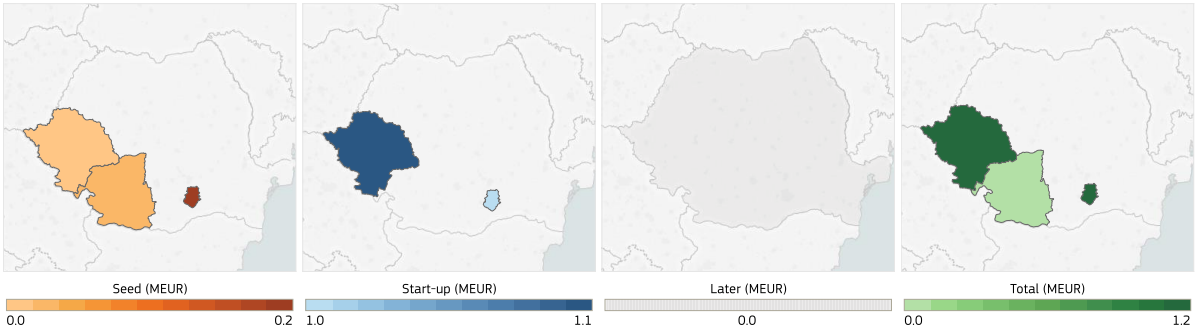
Sectoral distribution of VC investment (in %) | Romania | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- There is practically no sectoral diversification in the venture capital investments, which may be due to the very limited number of deals. Only the following three sectors received venture capital during 2013-2017: ICT, professional / scientific / technical activities as well as administrative and support services.

Regional distribution of VC investment by stage of financing (in MEUR) | Romania | 2013-2017



Sources: JRC elaboration based on Venture Source.

- Venture capital investments concentrate mainly in two regions: Bucharest and Banat. While the former concentrated both seed and start-up capital, the Banat region's companies received VC mostly in their start-up stage.

5. Finance-related policy measures

Instrument	Budget	Objective / Comment
Operational Programme for Competitiveness (OPC) and PA1	EUR 59mln	Accelerator and seed stage for innovative ideas and portfolio Risk Sharing Loan for innovative SMEs and research organizations
	EUR 104mln, over 2014-2020	Innovative technological projects; Innovative spin-offs and start-ups; Innovative newly created enterprises.
Scale Up Program	EUR0.1mln/business, 10% co-financing	Financial support to young technology enterprises. To be launched in 2019.
Start-up Nation	EUR 430mln	financial support for the establishment of start-ups ('start-up' in the definition of the programme does not draw on all three criteria commonly used in EC definition of start-up, but rather offer support to new, seed, small companies)
Diaspora Start-up Programme	EUR 40,000/ citizen	increasing employment by supporting non-agricultural enterprises in the urban area. It targets Romanian citizens living abroad wishing to set up a new

		company in Romania. Closed, has not been reopened.
Start-up City	EUR 10mln	compensate the lower chances for people of Bucharest to compete in Start-up Nation
SME Invest Romania	EUR 150mln	encourages and stimulates the development of SMEs via state guarantee facilities for their credits
National Multiannual Program for Microindustrialisation	EUR 65 mln over 2017-2020	encourage and stimulate the development of SMEs in priority sectors. Target: 660 beneficiaries
State aid scheme for stimulating investments with a major impact on the economy	EUR 300mln	companies investing at least EUR 1 million net

Source: JRC elaboration

- Under the policy cycle 2014-2020, there are no policies, nor financial instruments, specifically targeting HGEs. However, there are instruments and policies that include implicitly the HGEs as beneficiaries, targeting all the stages of enterprise development.
- Strategies with an impact on the long-term development of SMEs are the National Strategy of Research, Development and Innovation (NSRDI) 2014 –2020 and the National Strategy for Competitiveness (NSC) 2015-2020. The NSC defines five strategic priorities, related to improving the regulatory environment of the business environment, supporting public private partnerships, improving the ICT skills of the population, promoting the economic sectors potentially competitive and increasing the standard of living.
- Several schemes funded from national state budget or European funds are available. The start-up and enterprises' growth and expansion through innovation are mainly funded through specific programmes of the National Strategy for RDI. European funds for SMEs, including growth through innovation, are managed through a number of operational programmes. The Regional Operational Program (ROP) targets SMEs competitiveness with a total budget of EUR 877 million. SMEs in focus are those in the fields identified as competitive by the National Competitiveness Strategy and of the RDP. It aims at promoting the entrepreneurial spirit and supporting the creation and extension of the capabilities advanced by production and development of services.
- RO lags behind in business angel funding. There is a number of private investors who contribute equity to finance businesses with high potential for growth. Business Angels, allocate, on average, between EUR 10,000 and EUR 200,000.

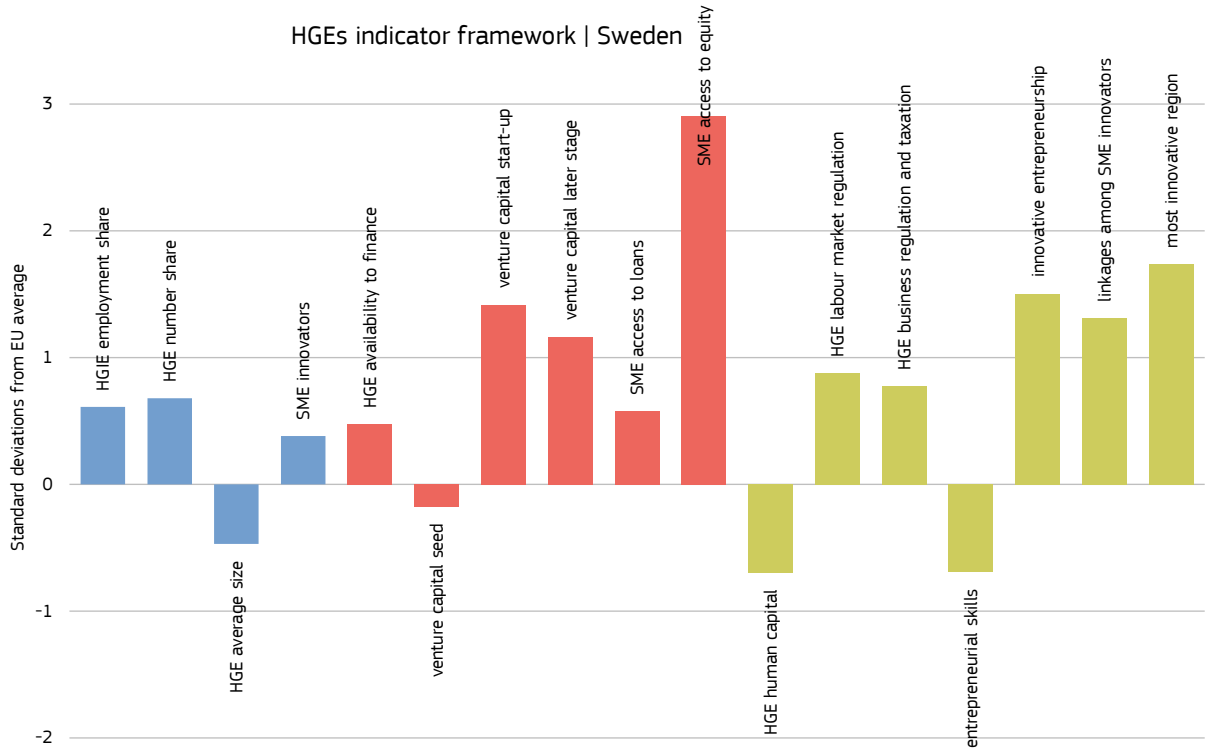
A4.20 High Growth Enterprises Factsheet – Sweden (SE)

1. Executive summary

SE overall performs well in factors determining the development of high growth enterprises (HGEs[89]). The employment and number share of HGEs in SE are both above the EU average. The generally strong performance of the innovation ecosystem in SE supports the development of HGEs. The emergence of HGEs is also favoured by the high accessibility to finance. This is also reflected in the overall increase in venture capital (VC) available in SE in recent years, thereby partly addressing previous shortcomings in access to finance since 2008. The sectoral distribution of VC investments is diversified, but certain sectors stand out, such as ICT and manufacturing. There is a strong concentration of VC in Stockholm across all stages of financing, which may also be related to the relatively strong innovation performance by the region vis-à-vis the EU average[90]. Despite progress, the VC market in SE remain relatively underdeveloped in comparison to the US and UK. Nevertheless, SE remains above the EU average in that regard.

The conditions for HGEs could further improve by supporting the development of relevant HGE skills. The availability of staff with the right skills is considered an obstacle for investments by HGEs. SE performs below the EU average for this indicator. The lack of adequate skills is also reflected by the low proportion of the working-age population who believe they have the required skills and knowledge to start a business. This might also help in addressing a lower than EU average HGE size and to increase SE capacity to attract VC seed investments.

2. HGEs indicator framework



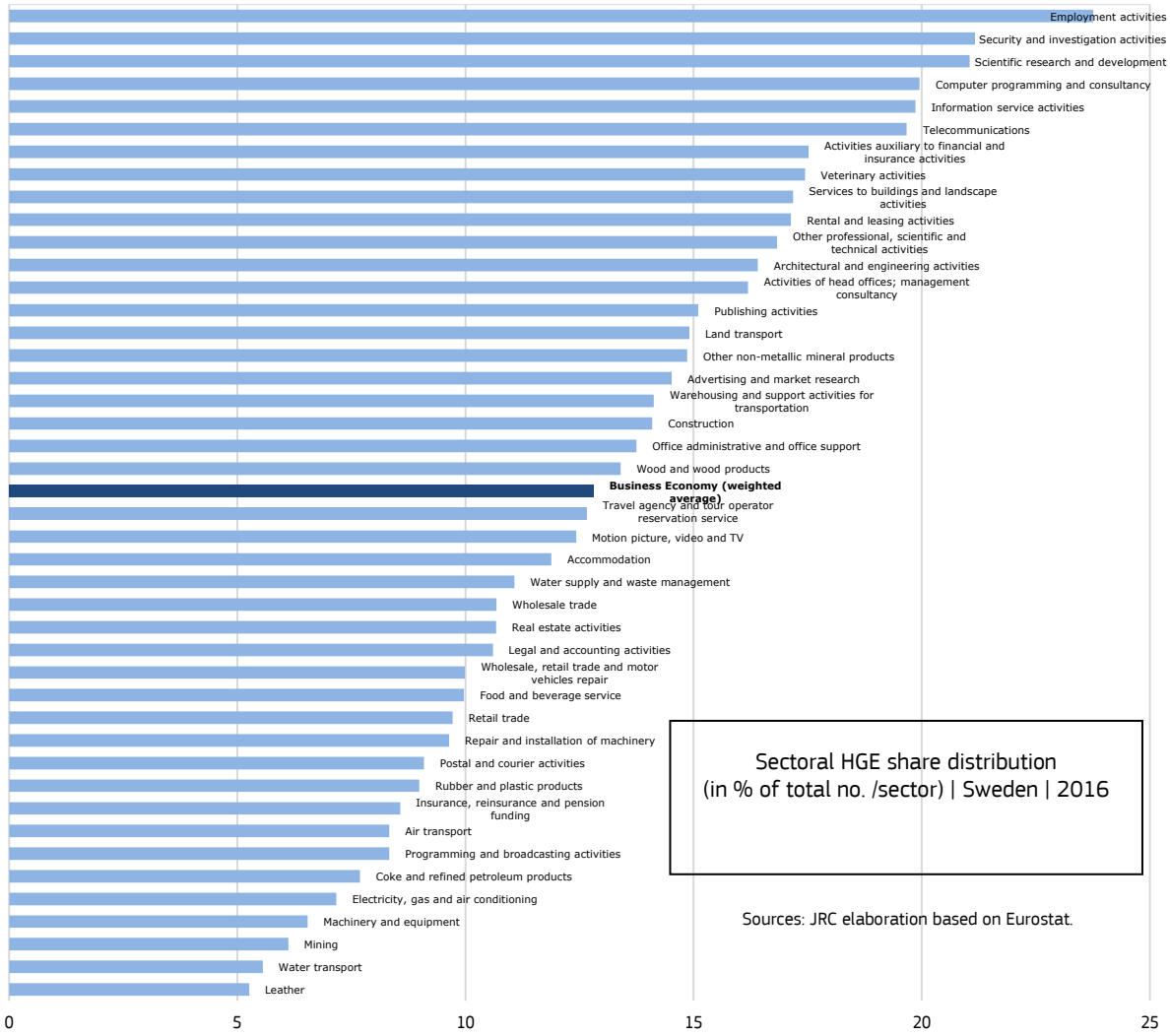
- SE performs above the EU average in several indicators, especially in terms of SME access to equity, most innovative region, innovative entrepreneurs, linkages among SME innovators and VC start-up and later stage investments.

[89] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

[90] According to the Regional Innovation Index (RII) available from the Regional Innovation Scoreboard (RIS), the region of Stockholm improved its innovation performance by 61% in 2019 with respect to 2011. For benchmarking purposes, Berlin did so by 52% during the same period.

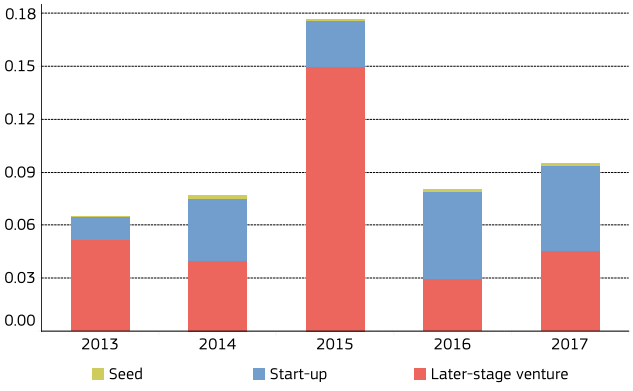
- The emergence of HGEs is favoured particularly by the availability of finance and the overall strong performing innovation ecosystem in SE.
- SE could further improve the conditions for HGEs by supporting the development of the right skills related to HGEs and enhance the overall entrepreneurial skills available across the working-age population. This might also help in addressing a lower than EU average HGE size and attraction of VC seed investments.

3. Firm demographics and sectoral decomposition



4. Financing HGEs and start-ups: the role of venture capital

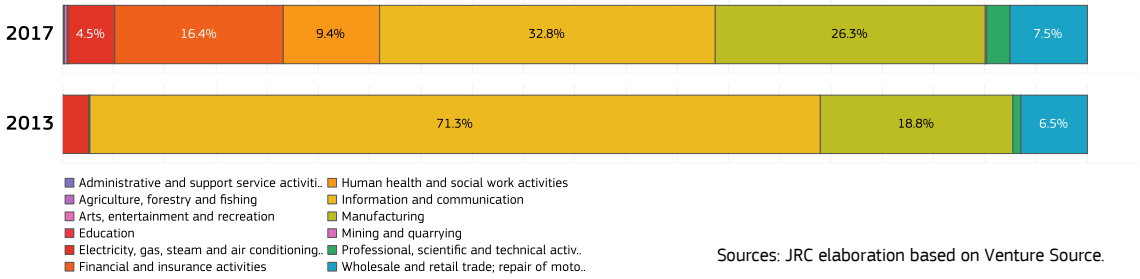
Venture capital by stage of financing (in % of GDP) | Sweden | 2013-2017



Sources: JRC elaboration based on Venture Source.

- SE has overall increased VC investments as a share of GDP since 2013, but with a peak during 2015.
- The share of start-up ventures has substantially increased in SE despite an overall drop in VC investments during 2016 with respect to 2015. The size of investments in later stage ventures has steeply increased in 2015 for then progressively dropping in 2017 to a similar level to 2013.

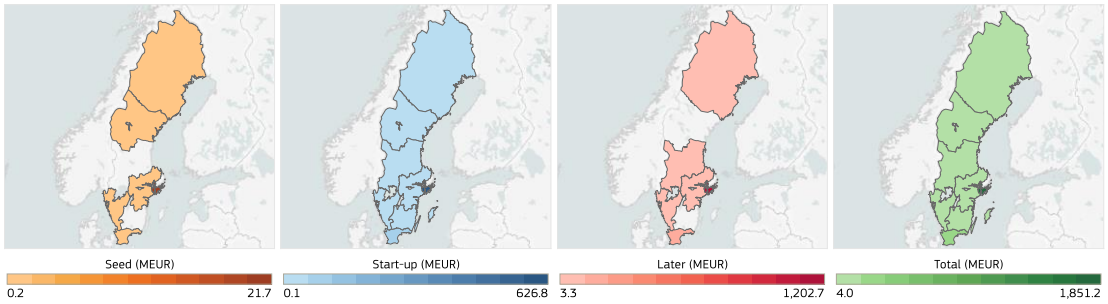
Sectoral distribution of VC investment (in %) | Sweden | 2013 & 2017



Sources: JRC elaboration based on Venture Source.

- The sectoral distribution of VC investments is diversified, but certain sectors receive most investments, such as ICT, manufacturing, financial and insurance activities, wholesale and retail trade, human health and social work activities, and education.

Regional distribution of VC investment by stage of financing (in MEUR) | Sweden | 2013-2017

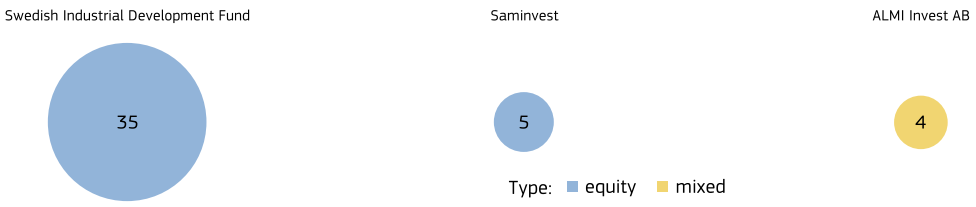


Sources: JRC elaboration based on Venture Source.

- Over the period 2013-2017, there is a strong concentration of VC in Stockholm across all stages of financing (seed: 79%; start-up: 80%; later: 85%; total: 83%).
- The start-up stage funding is most distributed across regions in SE, whereas seed and later stage venture capital are less evenly distributed across regions.

5. Finance-related policy measures

Financial instruments Sweden (MEUR 2018)



Policy Measure	Year	Target	Value (€)
Swedish Industrial Development Fund	2018	Large companies and SMEs during growth and expansion phases	€35m
Saminvest (public venture capital firm)	2018	six venture capital funds, which have made 56 investments in growth companies	€5.4m
ALMI Invest AB (public agency)	2018	Loans, equity and advisory services to companies with high growth potentials	€4.4m

- The Swedish Industrial Development Fund invests primarily through equity capital but also offers options and convertibles. Investments are made primarily in the growth and expansion phase in which the Fund will be an active and long-term minority shareholder. In 2018, the fund invested €35m, out of which €0.45m in three new companies, and €30m as follow-on investments.
- Saminvest was established in 2017 incorporating the two existing public VC companies Inlandsinnovation AB and Fouriertransform Aktiebolag. Saminvest has since then invested in six VC funds, which have made 56 investments in growth companies. In 2018, €0.6m of totally promised €5.4m was used by the six VC funds. Also in 2018, Saminvest made 17 exits to a value of over €100m, also to be invested in VC funds in the future.
- Almi Invest AB has a broad mandate and activities include brokering of loans, equity and advisory services to companies. Operations are supposed to complement the private market and be accessible across the country. Almi has no formal limit as concerns the industry or development focus of businesses. Even so, today, the operational focus is on companies with high growth potential. In 2018, Almi granted Growth loans of €1.7m. In addition, in 2018, Almi granted €2.6m in “micro loans” and €0.1m in “export loans.

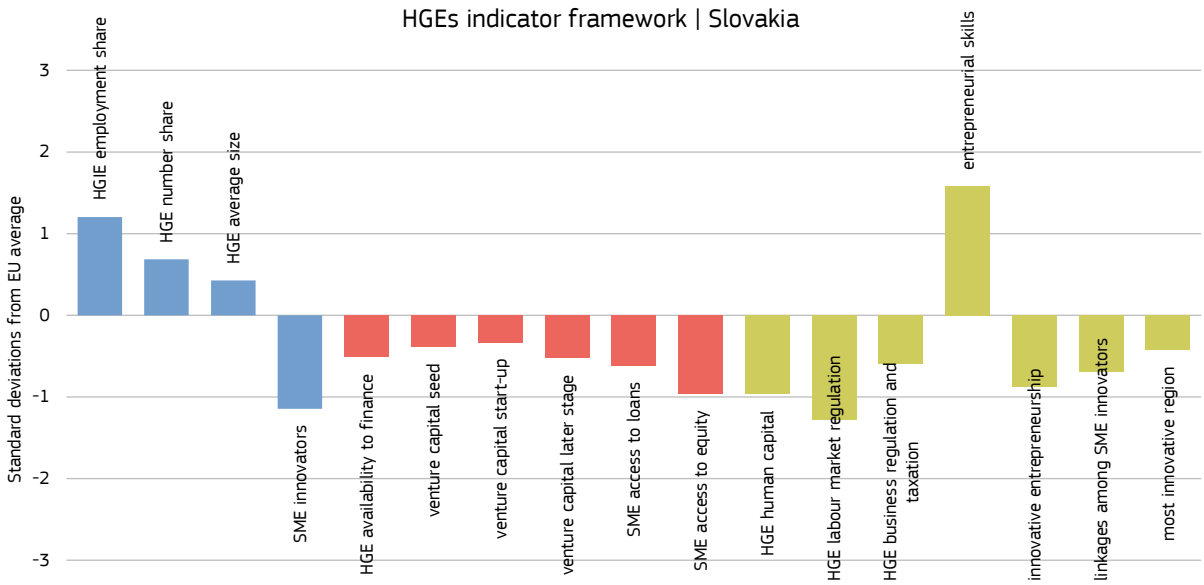
A4.21 High Growth Enterprises Factsheet – Slovakia (SK)

1. Executive summary

Overall, SK performs relatively well considering the presence of high growth enterprises (HGEs[91]). In SK, there is a higher employment and number share of HGEs, which are also on average larger, compared to the EU average. This relatively strong performance in terms of HGEs could be linked to the deep integration of SK in global value chains, in particular in the manufacturing sector. The highest shares of HGEs are found mostly in knowledge-intensive services and medium-low and low tech manufacturing industries. Furthermore, SK scores among the highest in self-reported entrepreneurial skills among all Member States.

The conditions for HGEs could further be improved by facilitating the availability and access to finance, improving the relevant regulatory environment and supporting the overall innovation ecosystem. While venture capital investments have increased substantially during the years 2014-2016, they are relatively low across all stages (seed, start-up and later stage) of ventures, are mostly concentrated around the region of Bratislava and recently dropped substantially. Thus, access to finance, improving the regulatory environment and advancing the innovation ecosystem (in particular the low levels of innovativeness of SMEs) can be considered key priorities for advancing the SK research and innovation ecosystem and enabling the framework conditions for the emergence and development of HGEs.

2. HGEs indicator framework

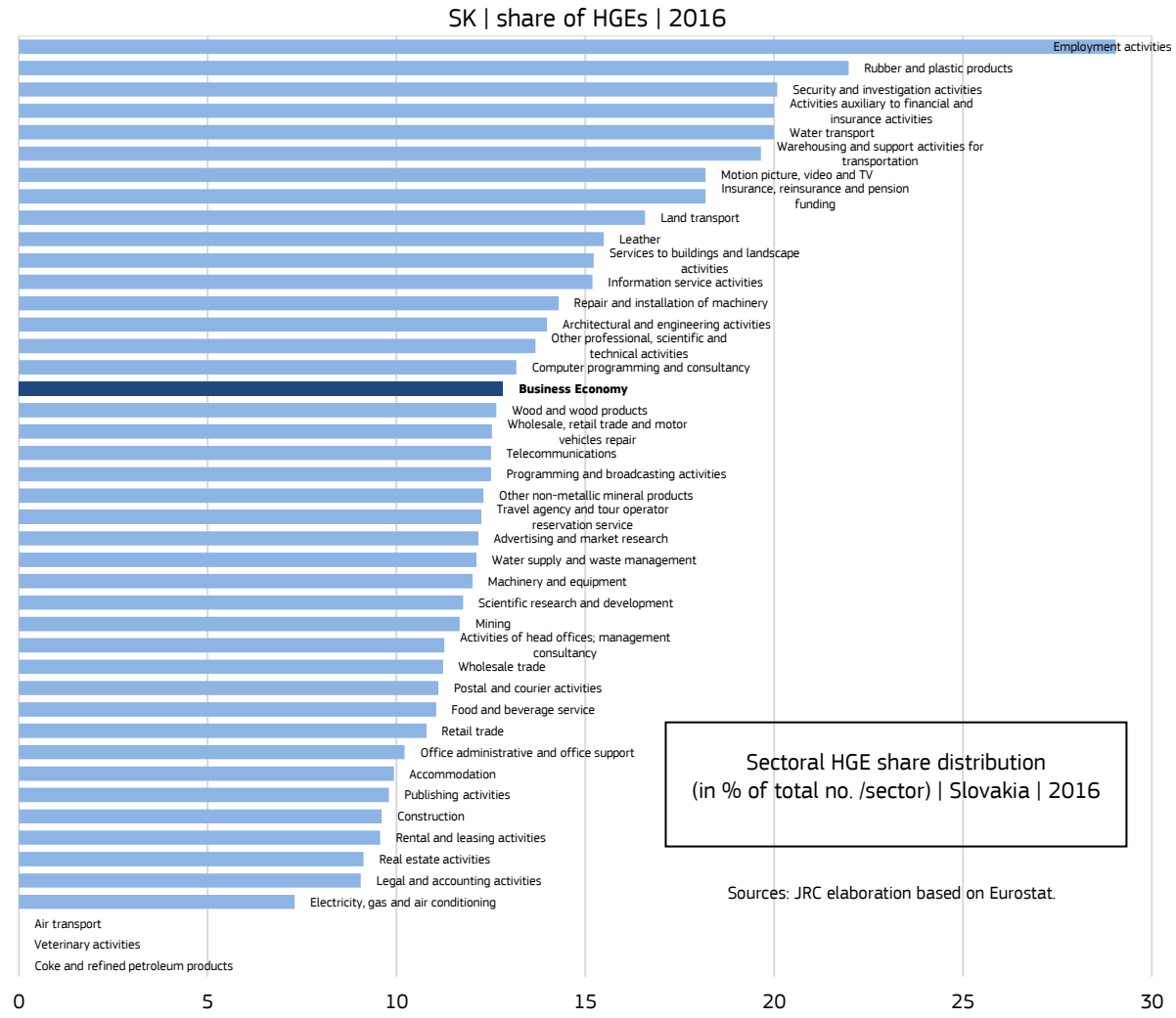


- SK performs well above the EU average in terms of the employment share of innovative HGEs across all active firms (19% of employees in enterprises with more than 10 employees work in HGEs, representing 189,789 employees in 2016), the number share of HGEs (13% of enterprises with more than 10 employees are HGEs, representing 2,130 HGEs in 2017) as well as the average employment size of HGEs (the average HGE has about 90 employees).
- Entrepreneurial skills, which measures the percentage of the working-age population reporting to have the required skills and knowledge to start a business, is one of the highest among all Member States (53% of positive responses).
- SK generally performs below the EU average across all other indicators, in particular regarding labour market regulation for HGEs, the share of innovative SMEs, SME access to equity and the percentage of HGEs considering the

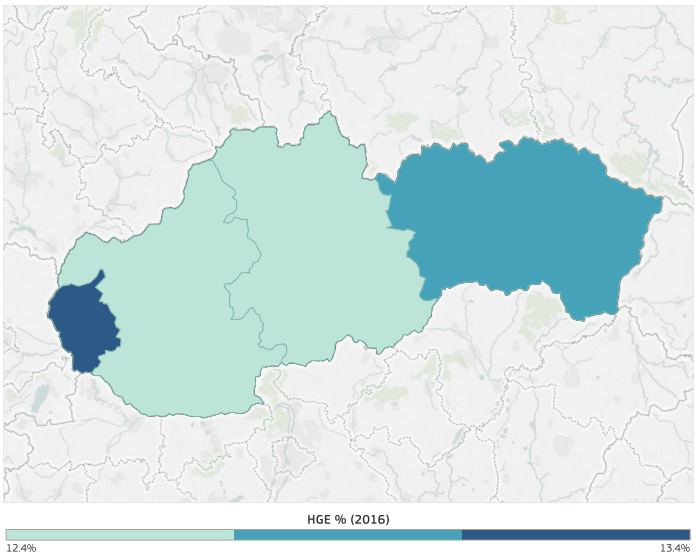
[91] In line with Eurostat, HGEs are defined in this factsheet as enterprises having (i) experienced an annualised average employment growth rate of 10% per year over a three-year period and (ii) at least 10 employees at the beginning of the growth period. The importance of HGEs is directly linked to their substantial contribution to employment growth, productivity improvements, economic renewal and innovativeness.

availability of staff with the right skills is not an investment barrier.

3. Firm demographics and sectoral decomposition



- The overall share of HGEs in SK is around 13% across the business economy, ranging from 7.3% in electricity, gas and air conditioning (or 0% for air transport, veterinary activities, and coke and refined petroleum products) to 29.1% in employment activities.
- The highest shares of HGEs are found mostly in knowledge-intensive services, medium-low manufacturing, and transportation and storage industries.



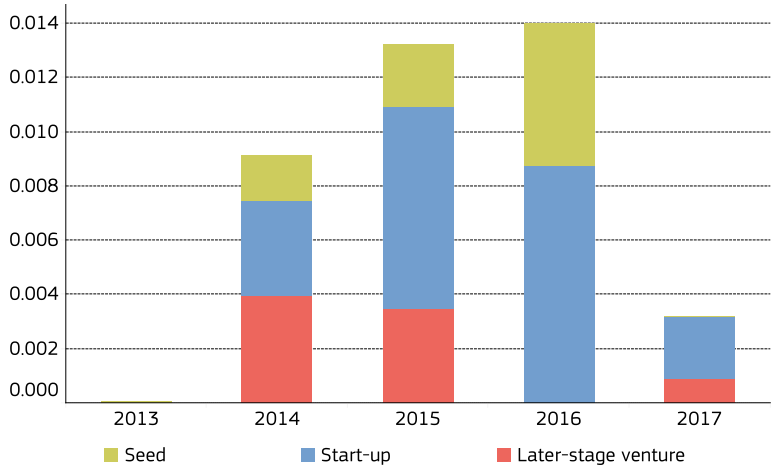
HGE share (% of active enterprises) across NUTS2 regions | 2016 | Slovakia

Sources: JRC elaboration based on Eurostat

- The proportion of HGEs relative to other firms is rather homogenous across regions.
- Nevertheless, the highest share of HGEs among active enterprises is found in the region of Bratislava and to a slightly lesser extent in Eastern Slovakia.

4. Financing HGEs and start-ups: the role of venture capital

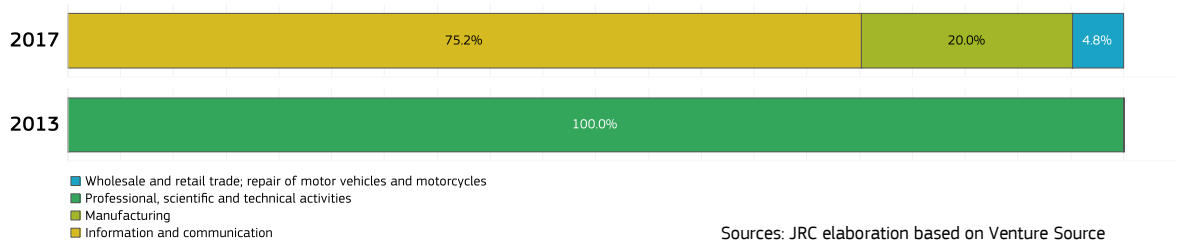
Venture capital by stage of financing (in % of GDP) | Slovakia | 2013-2017



Sources: JRC elaboration based on Invest Europe.

- While venture capital investments have increased substantially during the years 2014, 2015 and 2016, they are relatively low across all stages of ventures.
- During the peak in 2016, venture capital investments in SK reached 0.014% of GDP compared to roughly 0.1% in Sweden and 0.22% in the UK.
- The venture capital investments in SK are highly concentrated in Bratislava across all stages of financing.
- The relatively low levels of later stage ventures are noteworthy since they are considered crucial to keep the value added and employment created by scale-ups within an economy.

Sectoral distribution of VC investment (in %) | Slovakia | 2013 & 2017



Sources: JRC elaboration based on Venture Source

- The sectoral distribution of venture capital investments is concentrated in four sectors: professional, scientific and technical activities (receiving 100% of VC investments in 2013), information and communication, manufacturing, and wholesale and retail trade.
- The sectoral distribution of venture capital investments appears to be volatile over time, which is also reflected by the relatively low levels of overall venture capital investments.

5. Finance-related policy measures

Policy Measure	Investment Horizon	Target	Value (€)
Slovak Growth and Capital Fund (SGCF)	3 – 4 years	Firms, SMEs	€0.5 million to €2.5 million
National Holding Fund (NHF)	3 – 5 years	Firms, SMEs	€0.5 million to €2.3 million
Innovation and Technology Fund (ITF)	4 – 6 years	Firms, SMEs	€20,000 to €1.5 million

- In SK in 2014, private venture funds account for about 2% of VC investment (59% in the long-term EU average), public VC funds for approximately 57% (EU long-term average: 25%) and mixed (private-public) VC funds for about 41% (EU long-term average: 16%). In the EU, both the share of private and public VC investments have increased between 2007 and 2018, while the mixed VC funds have decreased (JRC, forthcoming).
- The objective of the Slovak Growth and Capital Fund (SGCF) is to identify relevant projects or companies with growth potential, covering potentially fast-growing companies across all sectors. The investment horizon is 3-4 years and the volume of investments ranges from €0.5 million to €2.5 million.
- The National Holding Fund (NHF) is providing VC financing for SMEs through the Slovak Development Fund (SDF), the SGCF and the Innovation and Technology Fund (ITF). The SDF invests in established or emerging companies that need additional growth capital. The SDF invests in the capital of companies and becomes a co-owner of the company for a pre-determined period. The investment horizon is 3-5 years and the volume of investments range from €0.5 million to €2.3 million.
- The aim of the ITF is to support the entrepreneurship by providing VC. The investment horizon is 4-6 years and the volume of investments range from €20,000 to €1.5 million.

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