4 How do scalers transform as they grow?

The chapter presents new evidence on the transformation process that distinguishes small- and medium-sized enterprises (SMEs) that scale up from comparable firms that do not scale. The analysis builds on detailed information on individual firms in up to four OECD countries. The chapter presents different transformation models that underpin scaling up and describes the transformation of scalers based on dynamic characteristics such as their innovative activity, integration into global markets, digitalisation or workforce characteristics.

In Brief

SMEs that scale up change more than "just" their size

Different transformation models underpin scaling up, depending on the main factors that trigger scaling. Scaling up is much more than "just" a period of rapid growth: it is the expression of a transformative process that a firm undergoes. Transformation can potentially include aspects such as changes in the managerial structure or ownership, or a firm's engagement in new activities, e.g. research or export. For some firms, scaling is the result of a forward-looking growth strategy grounded on innovation and productivity improvements that involves a deep transformation of the inner structure of the firm. For other firms, the scaling transformation may be driven by a surge in demand or by the replication of existing business processes that leaves the core structure of the firm unaltered. Therefore, the timing and nature of the transformation provide some indications on which scaling models prevail.

The transformation of scalers can be captured in four stylised models. They are stylised as, in reality, firms will rarely follow a single model but a combination of them, which may evolve as they grow. The first model is "disruptive innovators" that invest in technological innovations, typically research and development (R&D)-based, which result in disruptive changes to their product range or the ways they produce. The second model is "gradual innovators" that prepare to scale by investing in human capital and upgrading their production processes with gains in new market shares arising from gradual improvements in the productivity of existing processes rather than from disruptive innovation. The third model is scalers that do "more of the same", i.e. expansion without changes in the composition of the workforce. For example, a manufacturing firm might add a second production facility or a local retailer might add another store. The fourth model is "demand-driven scalers" that face an external and temporary increase in demand that translates into a sales windfall.

The analysis of rich firm-level data provides new evidence on the transformation models of scalers by following firms before, during and after scaling. Understanding the extent of SMEs transformation requires a rich set of data, typically linked to different administrative and survey data sources. For this chapter, detailed information on firms' financial accounts is available for Finland, Italy, Portugal and Spain with additional information on firm workforces only available for Finland and Portugal. The analysis compares scalers with peers over a period of seven years: two years before scaling, three years during the scaling phase and two years after. The dynamic factors that are analysed include innovation and digitalisation, workforce skills and education, access to global markets, productivity and debt. Peers are firms in the same sector, founded around the same time and of similar size, before the scaler enters its high-growth phase.

Several factors are permanently different in scalers – during, before and after scaling – and define the "DNA" of firms with potential and ambition for fast growth. Attempts to predict future scaling, in general, perform poorly, which confirms that every type of SME can grow fast. However, the analysis of the transformation process of Finnish and Portuguese scalers identifies some factors that could potentially change over time but are instead stable over the seven-year period. For instance, scalers in Finland employ about 30% to 50% more information technology (IT) specialists than peers – before, during and after scaling. This points to the role that differences in the uptake of digital technologies among SMEs may play in distinguishing scalers from their peers and the maturity of their digitalisation approach as they focus on in-house digitalisation rather than relying on outside services.

Another permanent difference is the age of the employees. Scalers' workforce is on average around 1-2 years younger than their peers. The managing director in scalers is also younger.

Scalers widen the differences with non-scaling peers as they grow. During and after scaling, Finnish and Portuguese scaler workforces become more diverse as they employ 10-30% more foreign-born employees than their peers. In Italy, Portugal and Spain, scalers' profitability grows in correspondence with scaling up to become 15-30% higher among employment scalers and 40% to 100% higher in turnover scalers than in peers; turnover scalers are 10-35% more productive than their peers after scaling. Some of the extra profit is used to accumulate cash and other current assets that can be sold quickly, possibly to create a buffer to deal with bad times or to accumulate funds for future investments. Part of the profits is also shared with the employees, as wages are 1-2% higher in scalers than their peers for comparable workers during and after scaling.

Overall, scaling appears to be a strategic choice, as scalers' transformation begins before scaling materialises. The transformation is not confined to the years in which scaling takes place. For many dynamic factors, such as labour productivity, integration in foreign markets or access to credit, the differences compared to non-scaling peers are most evident in the two years that precede scaling and are thus classified as "anticipatory differences". For instance, employment scalers in Finland, Italy, Portugal and Spain are 5-15% more productive than their peers before scaling up. Scalers also appear to prepare their expansion by hiring 15% to 40% more workers specialised in R&D than peers. In addition, scalers are more indebted than peers to support their investments, in the attempt to develop a disruptive innovation or to increase their productivity. In some dimensions such as integration into global markets, before growing scalers are already similar to firms in the larger size class that they achieve after scaling. This points to scaling being predominantly the outcome of a strategic gradual innovation path rather than a random event that makes the scaler a "one-hit wonder".

Introduction

Scaling up is much more than "just" a period of rapid growth. Scaling up is the expression of a transformative process that a firm undertakes. Transformation can include aspects such as changes in the managerial structure or ownership, or a firm's engagement in new activities, e.g. research or export. Importantly, transformation might already start before a firm scales up while some transformative changes are only taking place during the scaling-up phase or afterwards, as a firm consolidates its new scale.

The type of transformative process that scalers undertake depends on the factors that trigger scaling. For some firms, scaling is the result of a forward-looking growth strategy grounded on innovation and productivity improvements that involve a deep transformation of the inner structure of the firm. For other firms, the scaling transformation may be driven by a surge in demand or by the replication of existing business processes that leaves the core structure of the firm unaltered. Conceptually, this can be broken down into four models of scaling up elaborated in the next section: i) scaling through R&D investment and disruptive innovation that change what or how firms produce or operate; ii) scaling through gradual innovation that yields productivity improvements that compress costs and lead to better products or services; iii) scaling by replicating current production processes, i.e. traditional "economies of scale"; and iv) scaling thanks to an increase in demand due to external factors that result in a windfall for the company.

The analysis of the transformation process associated with scaling up compares an extensive set of dynamic factors in scalers and non-scalers. To understand scalers' transformation, detailed data on the inner workings of the firm is required. Leveraging on microdata for four countries, the analysis compares scalers with similar firms, i.e. "peers" that have a similar size, age, operate in the same economic

sector and are located in the same region. This comparison allows identifying the distinctive elements of scalers' transformation patterns.

Scalers are assessed over a seven-year period. In addition to the three years of the high-growth phase, scalers characteristics are considered in the two years before and the two years after scaling. For each country, the timespan analysed is the central seven-year interval within the available dataset, i.e. 2010-16 for Finland, 2006-12 for Italy, 2011-17 for Portugal and 2007-13 for Spain. For each year, the values of a broad group of dynamic factors among scalers – such as the share of R&D employees among all employees, the number of exported products or productivity – are compared against the values in similar non-scaler "peers" (i.e. firms of similar size and age in the same country, sector and location that do not scale over the same period). The analysis uses econometric methods to account for potential confounding factors and time trends, as well as to test whether differences between scalers and their peers are statistically significant.

Different transformation models underpin scaling up

Scaling up can be triggered by different factors that lead to four different (stylised) models that capture the transformation of scalers before, during and after scaling up. The four models try to address that in some cases the scaling transformation entails a change in a long-term strategy that results in deep changes in the firm production processes, while in other cases the demand-driven transformation arises from the replication of existing business processes that leaves the core production structure unaltered. The models also explain why the transformation can be incremental, going from strength to strength and eventually building a persistent advantage with respect to peers, or rather result in a more abrupt change that may be temporary (Table 4.1).

Table 4.1. The key elements of the four transformation models

Transformation model	Disruptive or incremental innovation	Corporate strategy	Temporary or persistent change	Demand or supply-driven
Disruptive innovator	Disruptive	Anticipatory	Temporary/Persistent	Supply
Gradual innovator	Incremental	Anticipatory	Persistent	Supply
More-of-the-same scaler	Incremental	Anticipatory	Persistent	Both
Demand-driven scaler	Disruptive	Reactive	Temporary	Demand

The "disruptive innovator" develops new products or processes to gain a competitive advantage. The firm invests in R&D or makes other innovation investments, e.g. in digitalisation, to innovate its products or the way it operates in anticipation of scaling.[1] If successful, the firm can enjoy (temporary) competitive advantages and gain market shares, either because the new products are unique or of better quality compared to the competition, or because the firm can produce at a lower cost. The firm, therefore, is characterised by higher productivity and profitability than peers during scaling. Higher profit may also translate into a wage premium for employees, depending on the functioning of the local labour market. This group of scalers is characterised by permanent differences that are linked to innovation, such as greater workforce diversity and younger workforce and management than in peers.

The "gradual innovator" invests in human and physical capital and in intangible assets to become more productive than its peers. In anticipation of scaling, this strategy requires accessing external capital (e.g. equity or bank credit) for training the workforce, hiring specialised staff, developing intangible assets, adopting new management practices, etc. If the investments are successful, productivity improves, output quality increases or prices decrease, and the firm scales up by gaining additional market shares. The higher productivity in comparison to peers can also lead to a wage premium for the employees. This type

of scaler is characterised by persistent differences compared to its peers in human capital (which can be captured by the share of educated workers and IT specialists for example), which is a key driver of productivity advantages. While there are some similarities between this model and the "disruptive innovator", the transformation is a sudden and discrete change that revolutionises the way the firm operates in the case of the "disruptive innovator" and a more incremental process that adds strength to strength in the case of the "gradual scaler".

The "more-of-the-same" scaler achieves a larger size without changing production processes. This is the economist's case of "economies of scale". A manufacturing firm, for example, might build a second production line within the same establishment to double its capacity. There are productivity gains as some assets can serve both facilities. An important feature is a need for significant upfront investment. Scaling can occur along the turnover margin only, for example in the case of a software company for which the initial investment in product development is high and variable production costs are low. In the manufacturing example, scaling in employment or both employment and turnover is the most likely, as the capacity of the new facility would not be fully utilised from the outset and workers will increase as production expands. New firms that enter the market at a lower size than competitors and that need to quickly reach a viable scale to survive also fall into this group. This type of scaler is characterised by a higher investment rate and higher debt than peers in anticipation of scaling, while productivity and profitability tend to align to peers as the firm grows and reaches its efficient scale.

The "demand-driven scaler" enjoys a sudden demand windfall. This scaler is a firm that benefits from an increase in demand for its products or services due to factors that are external to the firm. This can be the case, for example, of a construction company that is operating in an area where the public authorities procure new transport infrastructures or of a company producing face masks in the outbreak of pandemics. To expand production and satisfy increased demand, the firm needs to hire many new workers in a short period of time. The firm may therefore offer higher salaries than peers to attract workers or hire workers that have fewer opportunities in the labour market, such as older or low-educated individuals. For this type of scaler, there are no anticipatory or permanent differences in which it differentiates itself from its peers, as scaling is not anticipated. Factors driving increased demand are often temporary, which also means that scaling is not sustainable and the firm may go back to the initial size. In the analysis, this transformation model can be captured by the following transformational factors: higher debt to finance operations; higher wage premium to attract new workers in a short period of time; an expanded workforce with low-educated and low-skilled workers to support operations; and larger workforce diversity.

Differences between scalers and their peers take the form of anticipatory, transformational and permanent differences depending on whether scalers differ before, during (and after) or always from their peers (Table 4.2):

- **Anticipatory differences**: Scalers differ from their peers in the years just before the high-growth phase and converge toward similar values by the end of the high-growth phase. These factors help define the scale-up strategy of firms. A firm can prepare for achieving a new scale in the future by employing a different workforce, getting indebted or engaging in innovative activity. Other forms of strategy could involve an ambition to enlarge the market by exporting, which can then lead to scaling up.

- **Permanent differences**: These are factors that are permanently different between scalers and their peers, without significant variations during, before or after the scaling-up phase, even if they potentially vary over time. These factors, therefore, point to some *ex ante* characteristics that may be important to explain the ability of a firm to scale.

- **Transformational factors**: These are firm characteristics that vary significantly during scaling and that may continue to be different also at the new scale.

Table 4.2. Scaling up as a transformative process

A stylised taxonomy of different transformation patterns

Transformation model	Measurable dynamic differences from peers		
	Permanent differences	Anticipatory differences	Transformational factors
Disruptive innovator The firm develops technological innovation that translates into a competitive advantage.	• More workforce diversity • Younger workers and management	• Higher share of R&D and IT workforce • Higher debt	• Higher wage premium, productivity and profitability
Gradual innovator The firm invests in human capital and new production processes to become more productive than its peers and gain market shares.	• Higher share of educated workers • Higher share of IT specialists	• Higher debt	• Higher wage premium, productivity and profitability
More-of-the-same scaler The firm scales by producing additional output using the same business model.		• Lower productivity and profitability • Higher debt	• Profitability and productivity start from a lower level and align with peers after scaling
Demand-driven scaler The firm faces an exogenous and temporary increase in demand.			• Higher debt • Higher wage premium • More workforce diversity • More low-educated and low-skilled workers • Higher share of current assets

While the four models are presented separately, in reality, scalers may resemble a combination of different models, which may overlap and coexist in firms. For instance, an initial demand-driven expansion may allow the firm the accumulate the financial resources that are then used to fund a supply-driven growth strategy and the two phases may partially overlap. A gradual innovator that focuses on incremental productivity improvements may also develop some process innovations that are more disruptive in nature. Therefore, the aim is not to assign scalers to a specific "model" group but to link the empirical analysis to the different ways in which scaling can happen in firms. The four models take stock of a large body of literature on firm growth dynamics.[2]

The empirical analysis identifies the anticipatory differences, transformational factors and permanent differences that link to the four scaling models. The analysis considers a broad range of firm time-variant characteristics, comparing scalers with similar firms that share the same predetermined factors (size and age class, sector, location) but that do not scale. Scalers are compared to peers along a seven-year period: two years before scaling, three years during the scaling phase and two years afterwards. For each year, the values of a broad group of dynamic factors – such as a share of R&D employees, number of exported products or productivity – among scalers are compared against the values for similar non-scalers (i.e. firms that have not scaled up over the seven-year period) in the same age, size and sector group. The methodology is explained in detail in Box 4.1. The results of the analysis reflect the scaling pattern that prevails on average in each country and therefore provide information on which scaling models prevail. Future research can look at different groups of scalers (e.g. scalers in different sectors) within countries to understand whether some scaling models are more strongly associated with some types of scalers.

Box 4.1. A dynamic portrait of the transformation factors

The econometric analysis builds upon the following elements:

- **Time period**: Scalers and their peers are tracked for a period of seven years – two before the high-growth phase, the three years of the high-growth phase and two years afterwards. A shorter period than seven years would limit the ability to observe changes happening before or after the high-growth phase. A longer period would reduce the number of firms in the sample because of entry and exit events.
- **Scalers**: The group of scalers is composed of all firms that end their first high-growth period in the fifth year of the seven-year window.
- **Non-scalers**: Scalers are compared with "peers", i.e. firms with at least ten employees in the same size class, age class, sector and location, that are not entering as new firms, closing operations or scaling up over the seven-year period.

Both the group of scalers and non-scalers include both SMEs with 10 to 250 employees and larger firms with more than 250 employees. Since the first group accounts for more than 95% of all firms across the countries analysed, the results are mainly relevant for the SME population.

Visualising scalers' transformation patterns

For each dynamic factor, the results of the analysis are visualised in a chart. Figure 4.1 provides an example for the case of the export probability in Portugal. For each of the seven years, the line in the chart reports the estimate of the difference in the export probability between scalers and comparable non-scalers in the same sector, year, size class, age class and location (TL2 region), measured in percentage points. The grey shaded area visualises the extent of the possible statistical errors around that estimate – e.g. if the shaded area intersects the zero axis, the estimate is not statistically different from zero. The chart shows that, before and in the first part of the high-growth phase (Years 1 to 4), scalers are around 3 percentage points more likely to be exporters than non-scalers. At the end of the high-growth phase (Year 5), the difference becomes statistically insignificant and remains close to 0 in the 2 years following scaling up. The control variables for firm size and age are time-variant, i.e. they are updated each year. For example, if in Year 1 a future scaler has between 10 and 19 employees, the control group is composed of its peers in the same size (and age, sector and location) category. However, when this firm hits the peak of growth and reaches the 20-49 size class in Years 6 and 7, it is compared with firms in this new size (age, industry, location) category.

The example in Figure 4.1 shows that scalers "punch above their weight" before their high-growth phase, as their export propensity is higher than their peers before scaling up takes place and is aligned with the average in the new size class at the end of the high-growth phase.

Tracking absolute changes in scalers

Absolute changes – i.e. not relative to peers – in all of the variables under scrutiny over the seven years are also computed. In this case, the only factors that are also controlled for in the econometric analysis are the age of the company and the year in which the variable is measured. The absolute metrics allow assessing whether a given variable increases or decreases before, during and after scaling. This information proves to be a useful complement to the analysis based on comparison with peers. Indeed, there may be counterintuitive situations in which scalers reduce their difference compared to their peers in their export propensity for example but the factor may increase in absolute value as they grow. This situation can arise either if peers reduce their export propensity or – as in the example of Portugal above – if export propensity among new (larger) peers is lower than among former (smaller) peers.

Figure 4.1. Example of analysis of dynamic factors

Difference in the export probability in percentage points, scalers vs. non-scalers, Portugal
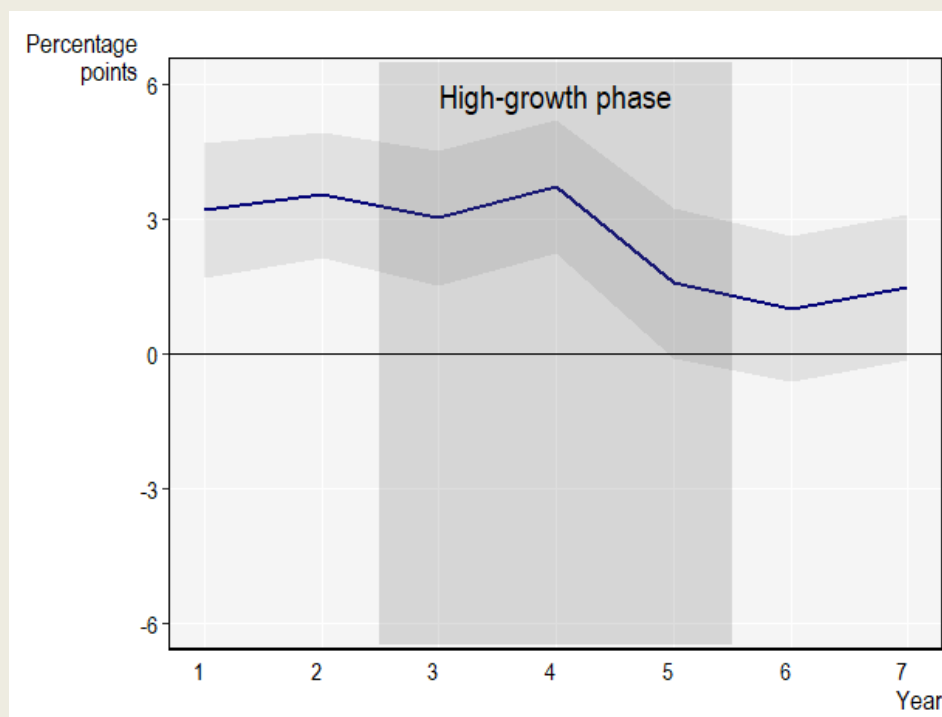
Source: Calculations based on microdata sources from Portugal. See Annex B for more details.

Innovation and digitalisation in scalers

Key findings on innovation and digitalisation

- **Anticipatory differences**: R&D employment grows in anticipation of the scaling-up phase.
  - Scalers employ 15% more R&D staff in Portugal compared to peers.
  - Scalers employ 20-40% more R&D staff in Finland compared to peers.
- **Permanent differences**: The share of IT employees is always higher in scalers – before, during and after the scaling-up phase.
  - Scalers have 2-3 IT specialists for every 100 employees compared to 1 in non-scalers in Portugal.
  - Scalers have 3-4 IT specialists for every 100 employees compared to 2-3 in non-scalers in Finland.

Note: Results are only available for Finland and Portugal due to data constraints.

Innovation is a key driver of firm growth. Process or product innovations improve firm performance by lowering costs, which increases return on investments and value to customers; enhance product quality, which increases competitiveness and value for customers; develop new products, which increases market share; and improve customer service, which increases the value to customers and improves competitiveness (Neely et al., 2001[1]). Organisational innovation, i.e. the implementation of a new organisational method in the firm's business practices, workplace organisation or external relations, can play a key role in complementing product and process innovations (Bresnahan, Brynjolfsson and Hitt, 2002[2]). In this analysis, innovation is measured using workforce data. This approach is possible because of the availability of linked employer-employee datasets that provide detailed occupation classification of all employees working in a given firm, which allows identifying the share of staff with innovation-related functions. The methodology is explained in detail in Box 4.2.

Scalers employ a higher share of R&D staff than their peers. Across countries and for both employment and turnover scalers, the share of R&D personnel is consistently higher than in non-scalers. In Portugal, for instance, the share of R&D staff is around 15% higher in scalers than in their peers, which employ on average around 3% of the workforce in R&D-related positions. The difference is even higher in Finland, where between 5% and 6% of employees work in R&D-related positions in scalers, which is around 20-40% more than in non-scalers. There is some variation, however, in the timing of the increase. For example, turnover scalers in Finland have, on average, always more R&D employees than their peers over the seven years taken into consideration. Turnover scalers in Portugal and employment scalers in both countries are more likely to increase R&D employment in the year before scaling. As scalers reach their new scale, the share of R&D jobs remains higher or reaches a comparable level to the share in non-scalers with similar characteristics (Table A.1).[3]

Box 4.2. Definitions and measurement of innovation indicators

Occupation-based measures of innovation

In this analysis, innovation is measured using workforce data. This approach is possible because of the availability of linked employer-employee datasets that provide detailed occupation classification of all employees working in a given firm. In a knowledge-based economy, implementing innovation requires an educated and skilled workforce. This is not limited to R&D specialists, as the development of new products is often preceded by organisational transformation processes (OECD, 2010[3]). For instance, previous literature argues that marketing capabilities are one of the major determinants of firms' performance, as companies making better use of information show an improved ability to develop an effective response to changes in the marketplace (Cacciolatti and Fearne, 2013[4]).

Transformation is captured by changes in the share of jobs in the total firm's workforce that are classified with the following functions: R&D; HR and training; management; marketing; and IT. The first group – R&D specialists – captures an important input of the innovation process. HR and training functions reflect the firm's efforts in organisational changes and in leveraging its human capital. Management and marketing functions are associated with new business processes and new sale channels. IT specialists are instead an essential component of investments in digitalisation. Further details on the occupations included in each group are reported in the methodological annex (Annex C).

> **Innovation measurement beyond occupations**
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> Measurement of innovation commonly relies on data on R&D expenditures or patenting activity. This approach however entails a narrow definition of innovation as most R&D expenditures and patents are generated by few (and often the largest) firms in few sectors. Firms can also innovate without reporting R&D spending. For example, around 35% of firms not engaged in R&D in Australia introduced new products on the market between 2006 and 2007, compared to 40% of firms declaring to perform in-house R&D (OECD, 2010[3]). The same applies to patents, with survey data showing that the majority of firms prefer secrecy over patenting (Arundel, 2001[5]). Occupation-based measures thus may provide a more comprehensive overview of innovation activities among SMEs. Some surveys, notably Community Innovation Surveys (CIS) co-ordinated by Eurostat, offer more insights into firms' technological processes in countries that opt to participate. The evaluation of CIS data reveals that around 6% of firms that experience high growth in employment also introduce organisational, marketing, product or process innovation. While informative and useful for many purposes, the surveys cover only a small sample of firms. Given the small incidence of scaling up, the CIS data are of limited use in this analysis.
>
> Source: OECD (2010[3]), *Measuring Innovation: A New Perspective*, https://doi.org/10.1787/9789264059474-en; Cacciolatti, L. and A. Fearne (2013[4]), "Marketing intelligence in SMEs: Implications for the industry and policy makers", http://dx.doi.org/10.1108/02634501311292894; Arundel, A. (2001[5]), "The relative effectiveness of patents and secrecy for appropriation", http://dx.doi.org/10.1016/S0048-7333(00)00100-1.

Finnish and Portuguese scalers display little differences in employment of human resources, management or training specialists compared to peers. The finding suggests that organisational innovation plays a minor role in scaling (at least to the extent that it can be measured with workforce indicators). The share of managers in scalers increases as they scale up but remains aligned to peers in the new size class. In addition, the transformation process of scalers in the organisation of the business process, as measured by the share of workers employed in human resources (HR), marketing or training functions, is not any different from peers. In Portugal, scalers and non-scalers employ similar shares of HR professionals among their workforce; the share of employment in jobs with marketing functions is also similar to non-scalers. In Finland, scalers employ a smaller share of HR professionals or managers before, during and after scaling than peers (Table A A.1).

Digitalisation is an important enabler of innovation and, for many SMEs, innovation has a strong digital component. Digitalisation reduces transaction costs by providing better and quicker access to information and communication between staff, suppliers and networks. It facilitates access to resources, including training, finance (e.g. peer-to-peer lending) and recruitment channels, and enable firms to generate data and analyse their operations in new ways (OECD, 2021[6]). Digitalisation also provides greater access to innovation assets, acting as an enabler of innovation, in particular for product and marketing innovation (Spiezia, 2011[7]; Bertschek, Cerquera and Klein, 2013[8]). Scalers and firms that plan to grow show a considerably larger adoption rate of digital technologies than other enterprises (Benedetti Fasil et al., 2021[9]). This points to the importance of addressing the digital divide among SMEs to create more opportunities for scaling, as discussed in Chapter 1.

Digitalisation is strongly associated with scaling up in Finland and Portugal. Scalers hire more IT specialists than their peers in anticipation of their new scale and the difference persists during scaling. In Portugal, about 1 in 100 workers is an IT specialist in non-scalers, whereas scalers employ 2-3 IT specialists on average. Similarly, the average Finnish scaler employs 3 to 4 IT specialists in every 100 employees, about 1 employee more than comparable non-scalers (this corresponds to a 1 percentage point difference as shown in Figure 4.2). The need for IT specialists remains relevant after reaching the

new scale, as Portuguese turnover scalers and Finnish employment scalers employ higher shares of IT specialists over the full seven-year period analysed.

The findings on R&D and digitalisation suggest that many scalers follow the transformation model of the "disruptive innovator" and the "gradual innovator". Scalers embark on an innovation and digitalisation strategy in anticipation of scaling. Many scalers prepare their expansion by investing in innovation inputs, in the attempt to develop a disruptive innovation or to increase their productivity through more incremental improvements of their products or production processes. Furthermore, the stronger digitalisation component is a distinctive feature of scalers that persist before, during and after scaling. This confirms that, for SMEs, the ability to unleash the productivity advantages of digitalisation is a game-changer.

Figure 4.2. Finnish scalers employ a higher share of IT staff than their peers

Difference in the share of IT employees between employment scalers and their peers in Finland, 2010-16
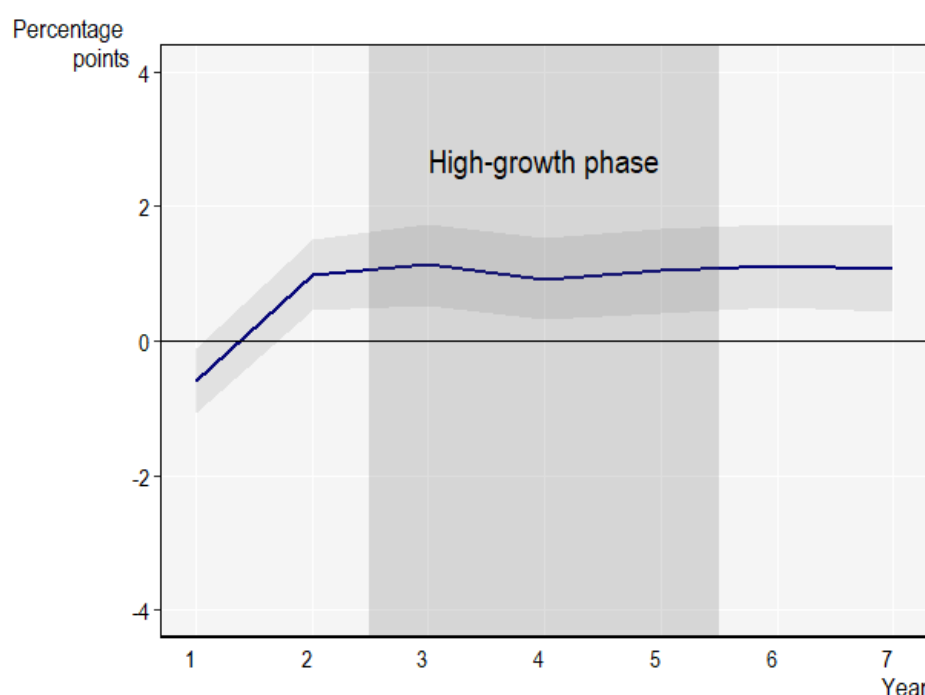
Note: The graphs indicate the difference between scalers and peers in the share of IT employees before (Years 1-2), during (Years 3-5) and after (Years 6-7) the high-growth phase. The years on the x-axis correspond to years 2010 to 2016. The line represents yearly estimated values and the grey bands around the line represent 90% confidence intervals. The difference between scalers and their peers is statistically significant when the confidence interval band does not intersect the horizontal line at zero. Grey vertical bands indicate the period of scaling up (scaling-up phase starts at 3 and ends at 5). Scalers grow in employment or turnover by at least 10% per year over 3 consecutive years on average, as defined in Box 1.2. The results are based on 84 219 observations for Finland. The regressions control for year, age, size bin, sector and region fixed effects. The sample is limited to firms with at least 10 employees in the first year and surviving for the whole period. See Box 4.1 for a detailed description of the methodology.
Source: Estimations based on microdata sources from Finland. See Annex B for more information.

Scalers' workers are younger and more educated than those of their peers

Key findings on human capital and workforce composition

- **Permanent differences**
  - The share of university-educated workers is higher in scalers than in their peers before scaling up and the difference persists during and after scaling up.
    - Finnish scalers employ 15-20% more workers with a master's degree than peers.
    - Portuguese scalers employ 5-10% more workers with a graduate degree and 20-40% more workers with a PhD than peers.
  - Scalers' employees and senior managers are two years younger than those in peer firms.
- **Transformational factors**
  - Wages are 1-2% higher in scalers than in their peers for comparable workers during and after scaling.
  - As scalers grow, they employ 10-30% more foreign-born employees than their peers.

Note: Results are only available for Finland and Portugal due to data constraints.

Human capital is a key driver of firm growth. Studies on data in Belgium, Italy, Portugal and Spain provide evidence that firms that scale in employment have higher human capital (as measured by employees' education level)[4] and successful firms invest more in training (Barringer, Jones and Neubaum, 2005[10]). Gender and ethnic diversity are associated with better firm performance in growth-oriented firms and, if properly managed and valorised, it proves to be an important complementary asset that enhances firm core competencies (McMahon, 2010[11]; Richard, Triana and Li, 2020[12]). For instance, studies on French and Israeli firms show that foreign workers have complementary skills that help firms increase productivity (Mitaritonna, Orefice and Peri, 2017[13]; Gandal, Hanson and Slaughter, 2004[14]).

Scalers in Finland and Portugal employ a more educated workforce than their peers before, during and after scaling. A firm that will scale in turnover has, on average, a 15% to 30% higher share of employees with a graduate or postgraduate degree.[5] In the case of Portugal, this means that about every 6th employee has a graduate degree in a scaler firm, which compares to only every 7th employee in a non-scaler firm. The share of university graduates continues to increase slightly in scalers after they scale up. In Finland, scalers employ 15-20% more university-educated employees before scaling up. For turnover scalers, the difference remains stable at about 15%, corresponding to 1.5 percentage points before scaling and about 1 percentage point during and after scaling (Figure 4.3). For employment scalers, the difference with their peers disappears as they scale. Thus, workers' education is an important factor for scaling and may represent a bottleneck for scalers in places that struggle to develop, attract or retain highly educated workers. The higher share of highly educated workers compared to peers in anticipation of scaling points to the importance of the disruptive and gradual innovator models. These workers may be instrumental to develop disruptive innovations that lead to a competitive advantage or to improve the production processes to achieve higher productivity.

Scalers also retain employees with low education levels as they scale. The share of low-educated workers does not increase in itself but becomes larger than in peers as scalers move to an upper size class and are benchmarked with larger firms. In Finland, the share is aligned with peers before scaling up and becomes larger than in peers by 2% to 4% after scaling. In Portuguese scalers, the share of workers with basic education (up to 9 years of schooling) is lower than in peers before scaling by 1% to 2% and

becomes comparable to the new peers as they scale. Retaining employees may be a strategy adopted by scalers to preserve the company's tacit knowledge and know-how, and to facilitate the integration of a large number of new employees.

Scalers employ a younger workforce and have younger managers. The average age of employees in both employment and turnover scalers in Finland and Portugal (Figure 4.4) is about one to two years younger than in non-scaler firms. This holds for the entire period of seven years under scrutiny. Already before scaling, scalers start with a younger workforce than non-scalers. As they scale, scalers consolidate the age gap. In-depth analysis of Portuguese data shows that this is driven by additional hiring of middle-aged (sometimes referred to as "prime-age") workers that are between 30-49 years old, rather than hiring of "young" workers below the age of 30.[6] Scalers, therefore, look for workers with some experience, who are still younger than the average worker in a non-scaler. Middle-aged employees may be more attracted by higher wages and learning and career opportunities than older ones, and this may explain their preference for more dynamic companies. Younger workers may be also more suited to training on the job and learning specific skills. The most senior manager in scalers is also younger than in peers: in both Finland and Portugal, the most senior manager (proxied by the most paid worker in a management position) is two years younger in scalers than in their peers, on average across firms. This difference with peers persists before, during and after scaling.

Figure 4.3. Scalers employ more highly educated workers than peers

Difference in the share of employees with graduate degrees in Finnish turnover scalers and their peers, 2010-16
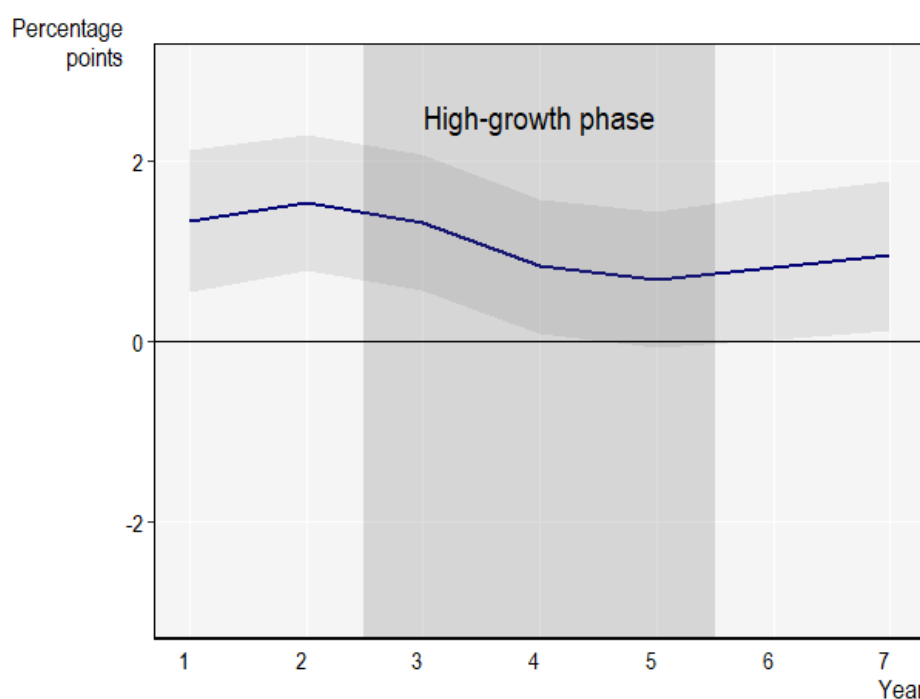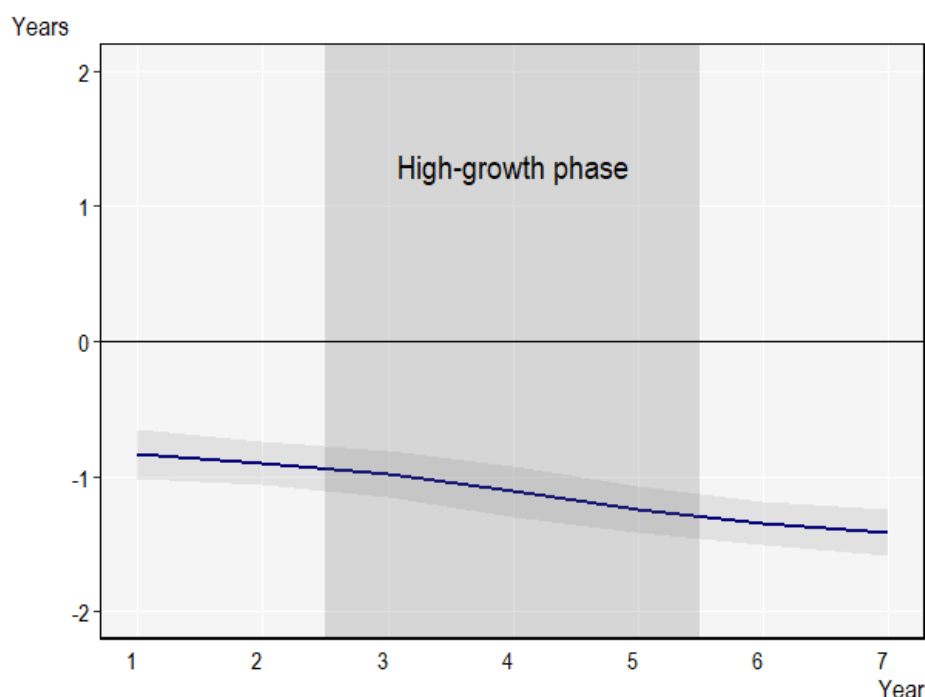

Note: The graphs indicate the difference between scalers and peers in shares of employees with a graduate degree before (Years 1-2), during (Years 3-5) and after (Years 6-7) the high-growth phase. The years on the x-axis correspond to years 2010 to 2016. Grey vertical bands indicate the period of scaling up (scaling-up phase starts at 3 and ends at 5). The line represents yearly estimated values and the grey bands around the line represent 90% confidence intervals. The difference between scalers and their peers is statistically significant when the confidence interval band does not intersect the horizontal line at zero. Scalers grow in employment or turnover by at least 10% per year over 3 consecutive years on average, as defined in Box 1.2. Results based on 68 590 observations for turnover scalers. The regressions control for year, age, size bin, sector and region fixed effects. The sample is limited to firms with at least 10 employees in the first year and surviving for the whole period. See Box 4.1 for a detailed description of the methodology
Source: Estimations based on microdata sources from Finland. See Annex B for more information.

Figure 4.4. Scalers' workforce is younger than that of their peers

Difference in the average age of employees between turnover scalers and their peers in Portugal, 2011-17
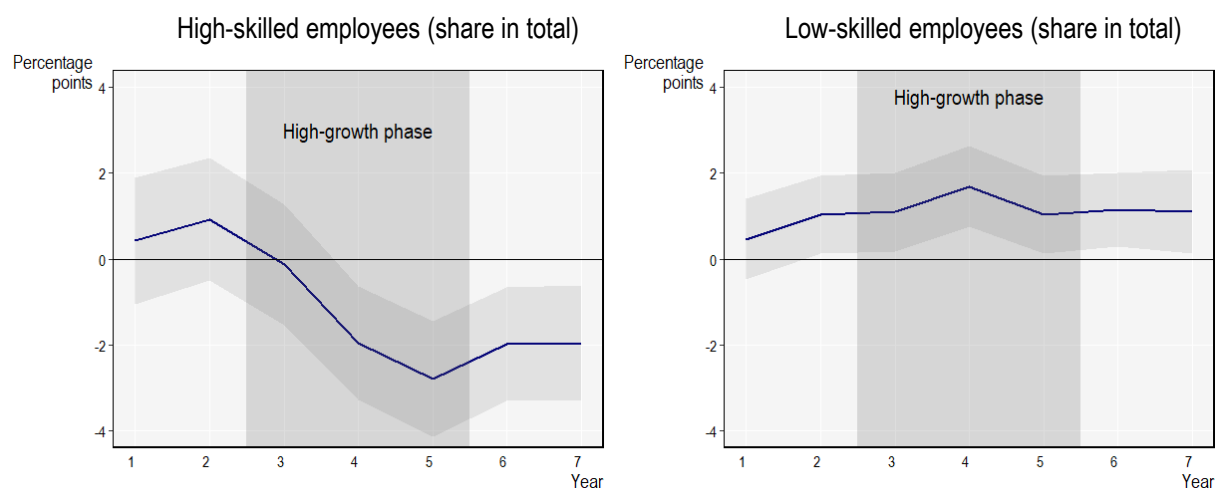

Note: The graphs indicate the difference between scalers and peers in employees' average age in scalers as compared to non-scalers before (Years 1-2), during (Years 3-5) and after (Years 6-7) the high-growth phase. The years on the x-axis correspond to years 2011 to 2017. Grey vertical bands indicate the period of scaling up (scaling-up phase starts at 3 and ends at 5). The line represents yearly estimated values and the grey bands around the line represent 90% confidence intervals. The difference between scalers and their peers is statistically significant when the confidence interval band does not intersect the horizontal line at zero. The regressions control for year, age, size bin, sector and region fixed effects. The sample is limited to firms with at least 10 employees in the first year and surviving for the whole period. Scalers grow in employment or turnover by at least 10% per year over 3 consecutive years on average, as defined in Box 1.2. See Box 4.1 for a detailed description of the methodology. Results based on 190 335 observations.
Source: Estimations based on microdata sources from Portugal. See Annex B for more information.

Workforce education and skill requirements in scalers changes compared to peers. Educational attainment is one way to look at the skills of the workforce; another way is to consider the roles that workers fill, i.e. their occupations. Employment scalers employ relatively more workers in low- and medium-skilled occupations as they grow. As a result, the share of high-skilled employment is smaller by 5% in Finland and by 10% in Portugal in comparison with peers during and after scaling (in the example of Finland, this drop is equivalent to fall by 2-3 percentage points as shown in Figure 4.5, left panel). This may come from the composition effect of the new versus existing workforce. New workers might be younger and more educated and they may accept low-skill occupations in exchange for opportunities for learning and a fast career progression in the longer term. It can also mean that scalers prefer hiring employees in low-skill occupations and training them. Low-skill occupations in scalers may therefore attract highly educated workers looking for career opportunities. This points to a disconnect between education and skills that is observed in the data for Portugal: workers in low-skill occupations are not necessarily low-educated. The relative increase in low- and medium-skill occupations as scalers enter the expansion phase may also reflect a shift from R&D to production, which is aligned with the disruptive innovator model.

Figure 4.5. Scalers hire low- and medium-skilled workforce as they transform

Difference in the share of workers in high-skilled or low-skilled occupations between employment scalers and their peers in Finland, 2010-16

Note: The graphs indicate the difference between scalers and peers in shares of high- and low-skilled employment before (Years 1-2), during (Years 3-5) and after (Years 6-7) the high-growth phase. The years on the x-axis correspond to years 2010 to 2016. The vertical axes report differences in percentage points. Grey vertical bands indicate the period of scaling up (scaling-up phase starts at 3 and ends at 5). The line represents yearly estimated values and the grey bands around the line represent 90% confidence intervals. The difference between scalers and their peers is statistically significant when the confidence interval band does not intersect the horizontal line at zero. The results are based on 84 167 observations for both charts. Scalers grow in employment or turnover by at least 10% per year over 3 consecutive years on average, as defined in Box 1.2. See Box 4.1 for a detailed description of the methodology.
Source: Estimations based on microdata sources from Finland. See Annex B for more information.

Scalers hire foreign-born employees as they scale. The difference between scalers and peers in the share of foreign-born employees increases by up to 1 percentage point during their high-growth phase. Given the small baseline share of foreign-born employees – e.g. about 5% in Portuguese firms – the increase is substantial. Foreign-born employment remains higher in scalers than in peers after the scaling period. For example, Finnish employment scalers employ 2-3 percentage points more foreign-born workers than peers after scaling, which corresponds to a 30% higher share (Figure 4.6). Foreign-born employees can represent an asset to the firm. They might increase productivity with their complementary skills, bring specialised knowledge such as information about foreign markets, help expand the firm's network or contribute to workforce diversity spill-overs by, for example, lowering management costs.[7]

Scalers employ fewer women than their peers. In Portugal, the share of female workers in non-scalers is around 45% and is about 5 percentage points lower in scalers. The gender imbalance further increases during the transformation period by around 1 percentage point. Finnish turnover scalers have always a lower share of female employment – by about 10% - than non-scaler SMEs.

Scalers are likely to be less selective in hiring as they need additional workers quickly, which can create opportunities for disadvantaged workers. The lower selectivity of scalers, dictated by the need to hire many workers in a short period of time or to fill in positions that require a specific set of skills, translates into hiring opportunities for workers that may face discrimination or stigma in the labour market, such as foreign-born individuals or long-term unemployed.[8]

Scalers pay a wage premium as they transform. The wages of workers with similar characteristics (e.g. level of education or working in the same occupation) often differ across firms. Aggregating these

differences for all workers in a firm gives the firm average wage premium (Box 4.3). Before their high-growth phase, scalers pay similar wages to their peers. Transformation brings a temporary wage premium in employment scalers in Finland. In Portugal, employment scalers' wage premium is not different from non-scalers as they scale but is still higher than before scaling, meaning that scalers increased their wages to match their new peers and competitors in the labour market. For turnover scalers, the wage premium lasts beyond the period of transformation, as they continue paying wages higher by 1% in Portugal to 2% in Finland for the same type of workers than comparable firms (Figure 4.7). A wage premium might attract workers and help fill the staffing needs in a short period of time, which is particularly important for demand-driven scalers that need to expand production quickly. However, a wage premium may also indicate higher labour productivity. Its increase in scalers relative to peers during and after scaling is thus consistent with the gradual innovator model.

Box 4.3. Definitions and measurements of human capital and workforce composition indicators

Information on human capital at the firm level leverages the strength of linked microdata on employees and their employers (linked employee-employer data). The data contain detailed information on workers' education levels and other personal characteristics, as well as their occupation and pay. To capture scalers' transformation with respect to the human capital of its workforce, several indicators are derived from the data.

Education

Education level reports the highest attained education of an employee, categorised according to the European Qualifications Framework (EQF) classification; the indicators used are the percentage of employees with less than undergraduate (low-educated), undergraduate (middle-educated) and postgraduate education (high-educated) respectively.

Occupations and skill requirements

Skill levels are obtained from job classification by the International Standard Classification of Occupations (ISCO 2008) and occupations are classified as high-skilled, medium-skilled and low-skilled. For example, managers and science and engineering professionals are considered as high-skilled occupations and sales workers and clerical support workers as medium-skilled occupations (ILO, 2012[15]).

Senior manager

The senior manager is identified as the person with a managing position corresponding to the 1-digit sub-group "Managers" of ISCO 2008 and paid the highest hourly gross wage (if there are several managers). The senior manager's characteristics of age, gender and educational attainment, depending on their availability, then serve as a proxy for leadership characteristics. If there are no workers classified in management occupation, the most senior manager is the worker with the highest wage.

Wage premium

The wage premium is defined as the average difference in hourly wage for comparable workers in the same sector. It is calculated as the average firm-year residual in regression at the worker-year level of the hourly wage on workers' observable characteristics (skills, education, age, age squared, work experience) and 2-digit industry dummies. The indicator measures the extent to which a firm pays its workers more or less than other firms in the same sector in a given year.

> **Workforce characteristics**
>
> Workforce characteristics include the average age of the workforce, the share of foreign-born employees and gender balance.
>
> The age of the workforce is defined as the average age (in years) of all employees in the firm.
>
> The share of foreign-born employees is defined as the share of employees with a country of birth other than the country of analysis in total employment.
>
> The gender imbalance is calculated as the share of male workers in total employment.
>
> Source: ILO (2012[15]), *International Standard Classification of Occupations 2008 (ISCO-08): Structure, Group Definitions and Correspondence Tables*, http://www.ilo.org/global/publications/ilo-bookstore/order-online/books/WCMS_172572/lang--en/index.htm (accessed on 9 June 2021).

Figure 4.6. Scalers' increase their share of foreign-born workers as they scale

Difference in the share of foreign-born employment in employment scalers and their peers in Finland, 2011-16
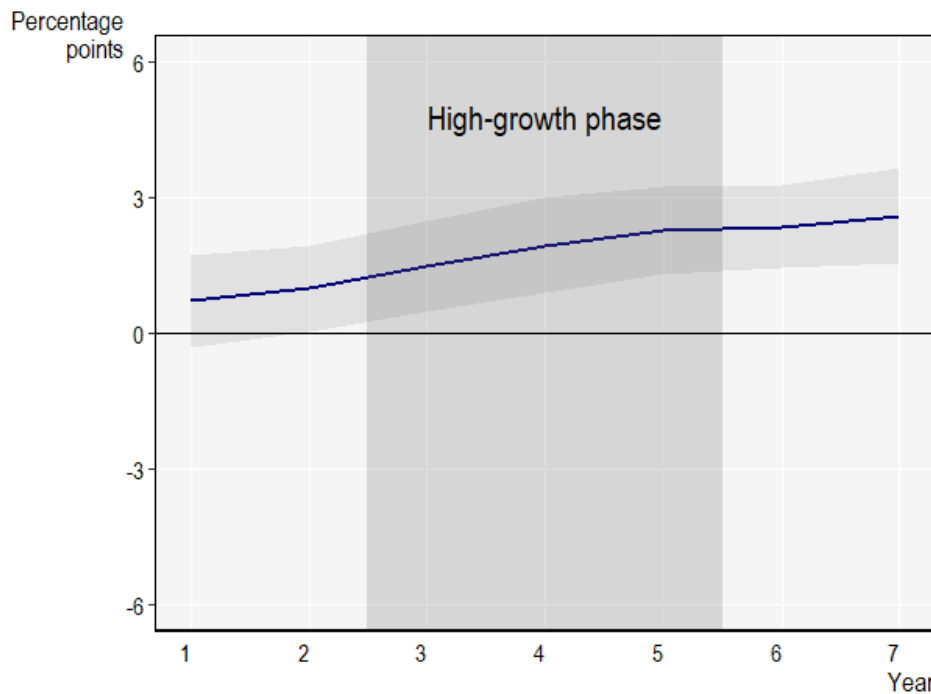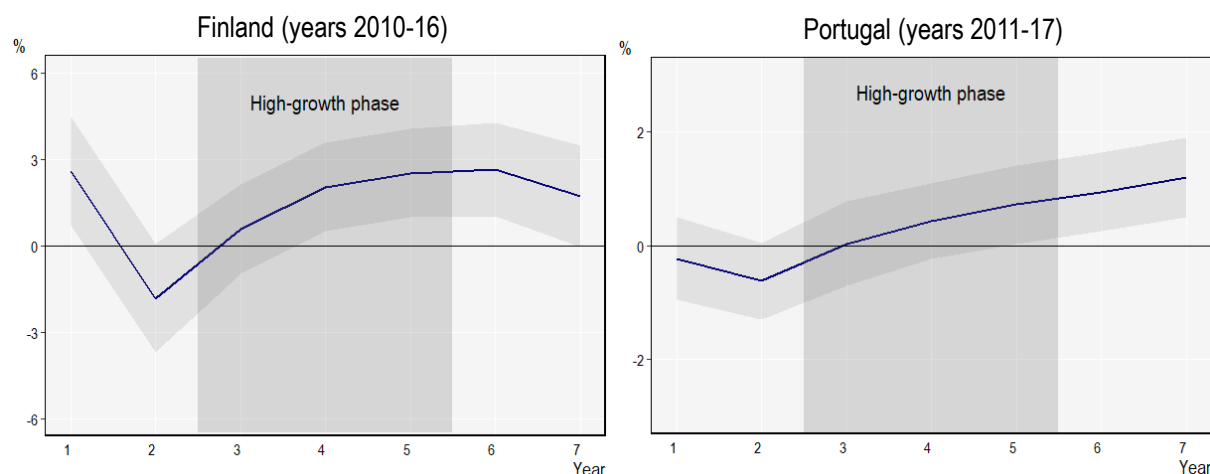

Note: The graphs indicate the difference between scalers and peers in the share of foreign employees share before (Years 1-2), during (Years 3-5) and after (Years 6-7) the high-growth phase. The years on the x-axis correspond to years 2010 to 2016. Grey vertical bands indicate the period of scaling up (scaling-up phase starts at 3 and ends at 5). The line represents yearly estimated values and the grey bands around the line represent 90% confidence intervals. The difference between scalers and their peers is statistically significant when the confidence interval band does not intersect the horizontal line at zero. Results based on 84 219 observations. The regressions control for the year in which the variable is measured and for firm age and size class, sector and region. The sample is limited to firms with at least 10 employees in the first year and surviving for the whole period. Scalers grow in employment or turnover by at least 10% per year over 3 consecutive years on average, as defined in Box 1.2. See Box 4.1 for a detailed description of the methodology.
Source: Estimations based on microdata sources from Finland. See Annex B for more information.

Figure 4.7. The wage premium paid by turnover scalers lasts beyond the high-growth phase

Difference in the wage premium between turnover scalers and their peers

Note: The graphs indicate the difference between scalers and peers in wage premium before (Years 1-2), during (Years 3-5) and after (Years 6-7) the high-growth phase. The years on the x-axis correspond to years 2010 to 2016 in Finland and 2011 to 2017 in Portugal. Grey vertical bands indicate the period of scaling up (scaling-up phase starts at 3 and ends at 5). The line represents yearly estimated values and the grey bands around the line represent 90% confidence intervals. The difference between scalers and their peers is statistically significant when the confidence interval band does not intersect the horizontal line at zero. The results are based on 84 167 observations for both charts. The results are based on 68 181 observations in Finland and 189 545 observations in Portugal. The regressions control for the year in which the variable is measured and for firm age and size class, sector and region. The sample is limited to firms with at least 10 employees in the first year and surviving for the whole period. Scalers grow in employment or turnover by at least 10% per year over 3 consecutive years on average, as defined in Box 1.2. See Box 4.1 for a detailed description of the methodology.

Source: Estimations based on microdata sources from Finland and Portugal. See Annex B for more information.

Global markets provide opportunities for scaling

Key findings on exposure to global markets

- **Anticipatory differences**:
  - Employment and turnover scalers in Portugal are more likely to export and import by about 25% to 60% compared to their peers before scaling up.
  - In Finland, the probability of trading grows by around 3 percentage points in anticipation of scaling in turnover scalers compared to peers; trade intensity (as measured by the number of export countries and exported products) also grows by around 5%.
- **Transformational factors**:
  - In Finland, the probability of trading decreases by around 3 percentage points in employment scalers as they grow; the trade intensity also decreases by around 5%.

Note: Results are only available for Finland and Portugal due to data constraints.

Selling products (or services) to foreign markets can be an important way to scale up for SMEs in the tradable sector. Going global can increase the potential for firms to scale up through several mechanisms. Beyond having the opportunity to sell their products or services to more consumers, they can also "learn from exporting" – i.e. improve product quality and adopt higher-quality standards – and optimise their sourcing strategies by choosing higher-quality inputs. Some evidence documents that access to global markets is associated with scaling up. Manufacturers in the People's Republic of China (China hereafter) that scale are at least occasional exporters (Moschella, Tamagni and Yu, 2019[16]). Similarly, the value of exports predicts scaling up in turnover in Croatia and Slovenia (Coad and Srhoj, 2019[17]). A sudden surge in export – e.g. because some trade barriers are removed – can underpin a demand-driven scaling model. At the same time, accessing global markets is an innovative marketing strategy that requires dedicated investments and can thus be part of a gradual innovator growth pattern.

Scalers increase their global market presence as they scale. The analysis of firm-level trade data (Box 4.4) shows that 20% of scalers in Portugal and 15% of scalers in Finland export before they start scaling up. By the end of the high-growth phase, 26% of scalers are exporters in Portugal and about 20% in Finland. Given that both countries are open economies with relatively small internal markets, it is not surprising that fast growth in size is intertwined with integration in foreign markets.

Box 4.4. Definitions and measurement of global markets indicators

Foreign trade data are maintained by customs agencies and their structure is harmonised across European countries. The data includes yearly information on volumes and values of external trade for each firm, classified by product and by origin or destination country. The traded products are defined using the Combined Nomenclature (CN) classification or the Harmonised System (HS) classification. In this report, only trade in goods is analysed as data are more readily accessible, although statistics on trade in services are increasingly becoming available.

The analysis relies on the consolidated six-digit (HS6) level of products and only considers imports or exports of a given product for a given firm if the trade is valued over EUR 1 000 in a given year.

Using the value of the HS6 product level identifier of exports and imports per product and country, the following indicators are used:

1. Trade participation
   a. Export status.
   b. Import status.
2. Trade intensity
   a. Number of export destination countries (products can vary across destinations).
   b. Number of products exported (count of different HS6 codes).
   c. Number of source countries (products can vary across destinations).
   d. Number of imported products (the same product can be imported from multiple source countries).

The indicators are aggregated on the level of the firm as an indicator of import or export status or count of products and destinations.[9]

Scalers "punch above their weight" by exporting as much as larger firms. Trade participation indicators show that future scalers in Finland and Portugal overperform in export and import participation in anticipation of scaling, with their propensity to trade being similar to firms of larger size to whom they eventually catch up after scaling. Turnover scalers in Portugal continue overperforming in export and import participation also after their transformation (Figure 4.8). Trade intensity indicators show the same pattern. Portuguese employment scalers export to about 5% more destinations and their portfolio of exported products is larger by a similar margin. However, by the end of the scaling, they resemble firms of their size (Figure 4.9). Employment scalers in Finland tend to have an even narrower portfolio of exported products after scaling compared to firms in the new size category, which explains the decreasing trend (compared to peers) during the transformation (Figure 4.10). The reduction in the number of exported products may reflect a strategy aimed at focusing on a limited number of core successful products as scalers consolidate, after a period of experimentation of different products in several foreign markets.

Figure 4.8. Turnover scalers are more likely to be engaged in trade than non-scalers

Difference in the probability of being an exporter between turnover scalers and their peers in Portugal, 2011-17
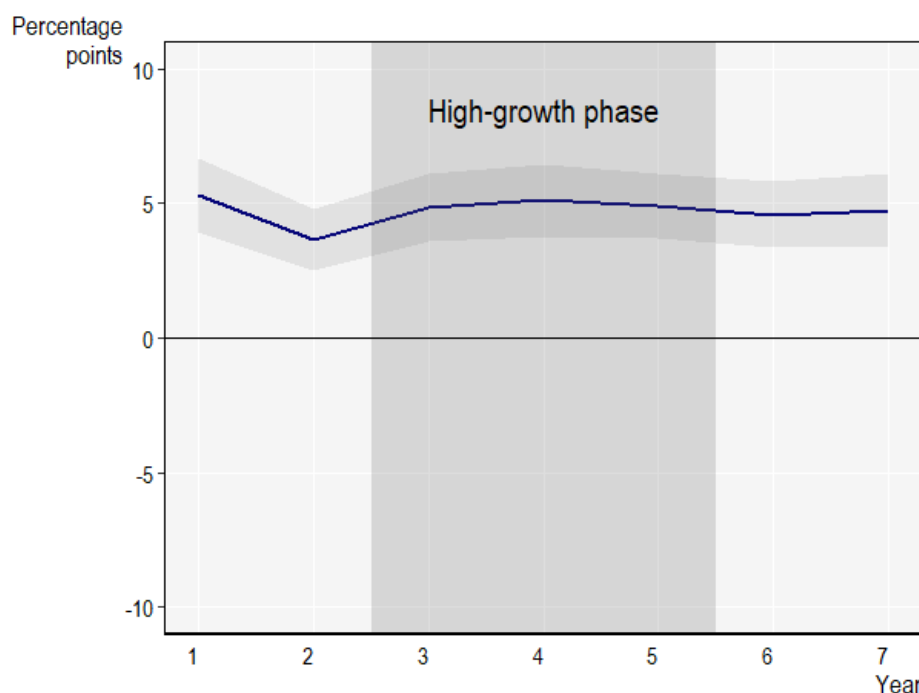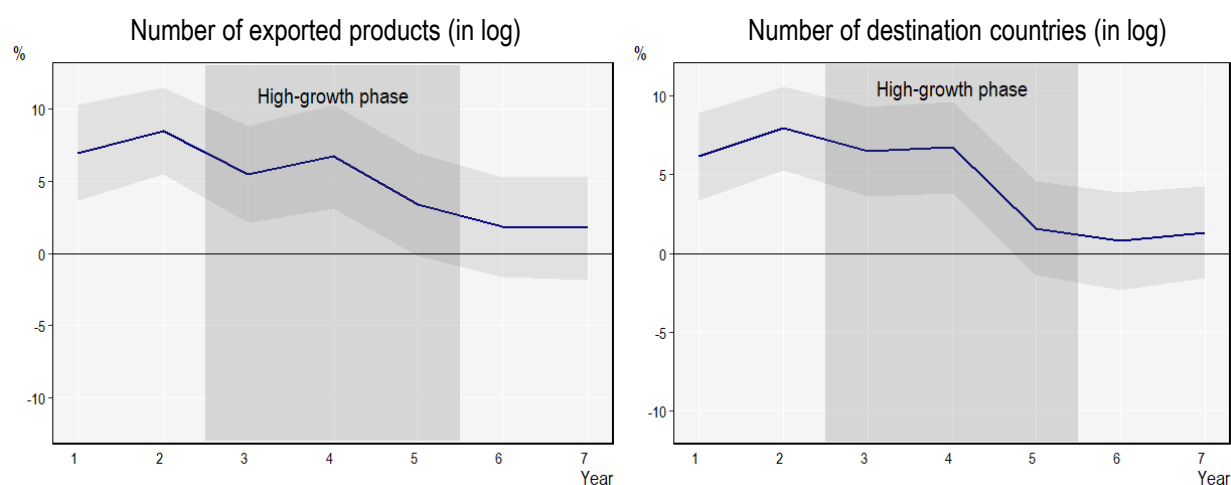

Note: The graphs indicate the difference between scalers and peers in the export status before (Years 1-2), during (Years 3-5) and after (Years 6-7) the high-growth phase. The years on the x-axis correspond to years 2011 to 2017. Grey vertical bands indicate the period of scaling up (scaling-up phase starts at 3 and ends at 5). The line represents yearly estimated values and the grey bands around the line represent 90% confidence intervals. The difference between scalers and their peers is statistically significant when the confidence interval band does not intersect the horizontal line at zero. Results are based on 190 339 observations. The regressions control for the year in which the variable is measured and for firm age and size class, sector and region. The sample is limited to firms with at least 10 employees in the first year and surviving for the whole period. Scalers grow in employment or turnover by at least 10% per year over 3 consecutive years on average, as defined in Box 1.2. See Box 4.1 for a detailed description of the methodology.
Source: Estimations based on microdata sources from Portugal. See Annex B for more information.

The timing of the increased exposure to the global market, as compared to peers, suggests that access to global markets is part of a scaling strategy. Scalers do not appear to grow because of a sudden increase in foreign demand, i.e. scaling does not seem to be a random lucky episode but rather a strategic choice to experiment with more products and destinations. This evidence is therefore more aligned to the transformation model of the gradual innovator that prepares its growth with targeted investments, rather than the demand-driven model in which growth is driven by factors that are external to the firm. The results also suggest that scale-up policies could aim to facilitate the integration into global markets, e.g. by providing related training or advisory services to the firm's management.[10]

Figure 4.9. Portuguese scalers "punch above their weight" by exporting as much as larger firms

Difference in the number of exported products and destinations between employment scalers and their peers in Portugal, 2011-17
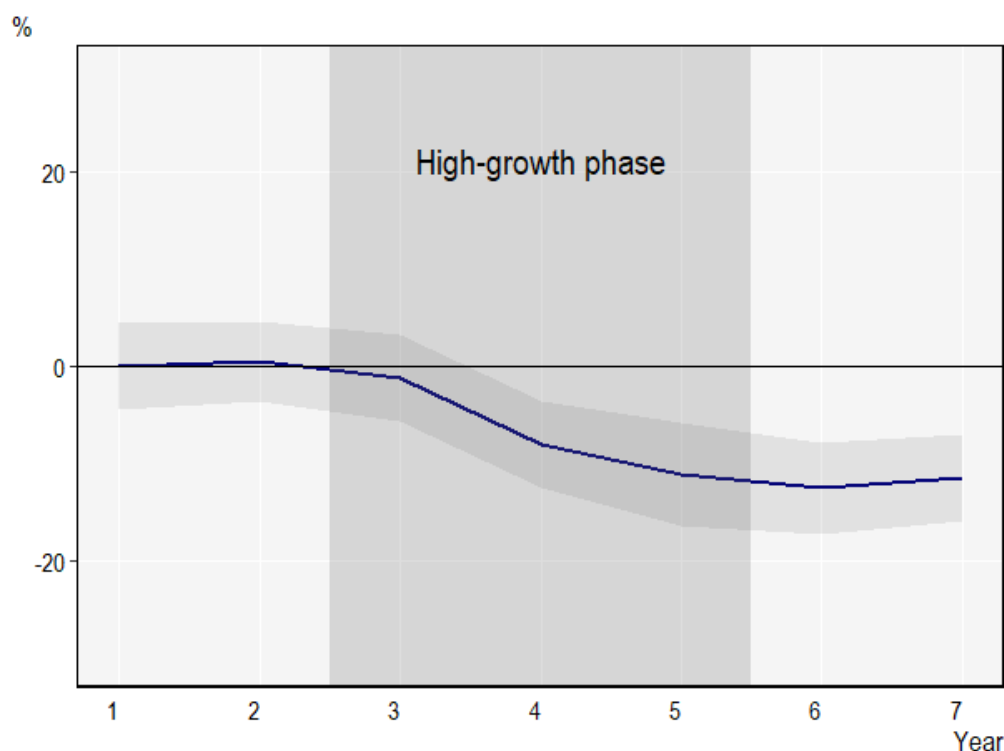

Note: The graphs indicate the difference between scalers and peers in the number of exported products and the number of destination countries before (Years 1-2), during (Years 3-5) and after (Years 6-7) the high-growth phase. The years on the x-axis correspond to years 2011 to 2017. Grey vertical bands indicate the period of scaling up (scaling-up phase starts at 3 and ends at 5). Scalers grow in employment or turnover by at least 10% per year over 3 consecutive years on average, as defined in Box 1.2. The line represents yearly estimated values and the grey bands around the line represent 90% confidence intervals. The difference between scalers and their peers is statistically significant when the confidence interval band does not intersect the horizontal line at zero. Results are based on 221 420 observations for Portugal. The regressions control for the year in which the variable is measured and for firm age and size class, sector and region. The sample is limited to firms with at least 10 employees in the first year and surviving for the whole period. See Box 4.1 for a detailed description of the methodology.
Source: Estimations based on microdata sources from Portugal. See Annex B for more information.

Figure 4.10. Finnish employment scalers export fewer products than peers

Difference in the number of exported products between employment scalers and their peers in Finland, 2010-16

Note: The graphs indicate the difference between scalers and peers in the number of exported products before (Years 1-2), during (Years 3-5) and after (Years 6-7) the high-growth phase. The years on the x-axis correspond to years 2011 to 2017. Grey vertical bands indicate the period of scaling up (scaling-up phase starts at 3 and ends at 5). Scalers grow in employment or turnover by at least 10% per year over 3 consecutive years on average, as defined in Box 1.2. The line represents yearly estimated values and the grey bands around the line represent 90% confidence intervals. The difference between scalers and their peers is statistically significant when the confidence interval band does not intersect the horizontal line at zero. Results are based on 87 094 observations. The regressions control for the year in which the variable is measured and for firm age and size class, sector and region. The sample is limited to firms with at least 10 employees in the first year and surviving for the whole period. See Box 4.1 for a detailed description of the methodology.
Source: Estimations based on microdata sources from Portugal. See Annex B for more information.

Scalers rely on external finance to prepare to grow

Key findings on access to finance

Finance indicators are available for Italy, Portugal and Spain.

- **Anticipatory differences**:
  - Bank loans increase in anticipation of scaling in employment and turnover scalers (in employment or turnover) in Italy, Portugal and Spain.
  - The loan to turnover ratio is higher by 10% to 70% compared to peers in both types of scalers in Italy and Spain and in turnover scalers in Portugal.
- **Transformational factors**:
  - The percentage of current assets in total assets increases during the high-growth period by 2-3 percentage points in turnover scalers compared to peers across countries.

Note: Results are only available for Italy, Portugal and Spain due to data constraints.

Firms that plan to grow make different financing choices than firms with no growth ambition. For SMEs, challenges in access to external finance and an overreliance on internal funds are often major constraints for growth (OECD, 2020[18]). Scalers tend to be more indebted than peers, i.e. they managed to raise external finance. Scalers also pay higher interests per unit of sales – which points to a higher risk rating – and have a larger debt-to-asset ratio than other firms (Bianchini, Bottazzi and Tamagni, 2017[19]). High-risk ratings may arise from investments in innovative activities that may not be fully collateralised and are thus in line with the disruptive scaler model. A large amount of debt to support investments in productivity improvements is also consistent with the gradual innovator model. Bank loans, however, may not be the most suitable form of financing for young, risky and fast-growing firms, with limited collateral and uncertain revenues in the short term. Equity financing would be a more suitable instrument for these companies but market failures make it hard for SMEs to access them (Aernoudt, 2017[20]; Rodrigues, Tavares and de Barros, 2021[21]). Equity financing can include venture capital (VC), initial public offering (IPO), angel investments, private debt or other forms of asset-based lending.[11] While data on equity finance is not currently available for this analysis, their inclusion represents an important direction for future work.

Bank debt supports SMEs in preparing to scale up. The debt ratio (as measured by bank loans as a percentage of turnover (see Box 4.5 for details on definitions and measurement) increases in anticipation of scaling up in both employment and turnover scalers. For example, in Spain, the average scaler increases its debt ratio by 50 percentage points, which corresponds to a 35% higher share than similar firms (Figure 4.11). Borrowing spikes just before the high-growth period in both turnover and employment scalers in Italy and Spain and turnover scalers in Portugal. The debt ratio then tends to fall as the scalers grow, suggesting that the availability of finance is an enabling factor for exceptional growth.[12] The fall in the debt ratio at the end of the transformation also suggests that the new size gives more room for scalers to self-finance their operations and makes them less dependent on bank finance compared to peers in the new size class.

> ### Box 4.5. Definitions and measurement of finance indicators
>
> Finance indicators are extracted from firms' balance sheets. The following two indicators are included in the analysis:
>
> - **Loans** include short- and long-term bank debt and other loans that are listed in the balance sheet. Loans are measured as a ratio of loans over turnover and approximate the propensity of scalers to borrow.
> - **Current assets** include cash, inventory and other assets that can be sold quickly, typically during the same financial year. The variable is expressed as a ratio to total assets and proxy for firms' propensity to immobilise capital for long-term investments or rather to keep it in liquid form to deal with future volatility.

Figure 4.11. Scalers finance their growth by borrowing before scaling up

Difference in bank loan ratio between turnover scalers and their peers in Spain
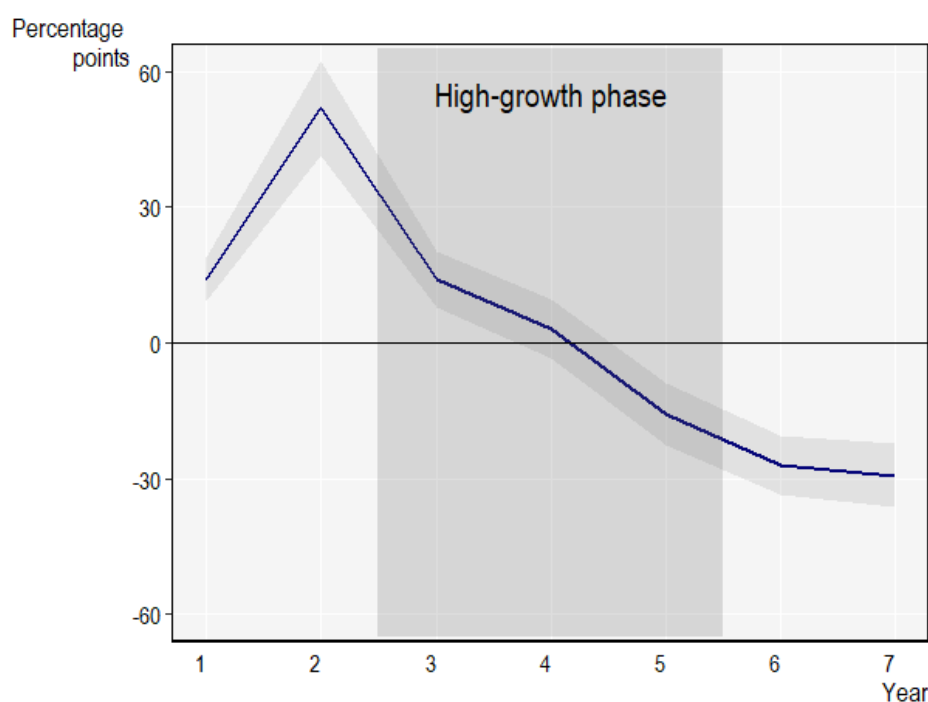
Note: The graphs indicate the difference between scalers and peers in loans (as a share of turnover) before (Years 1-2), during (Years 3-5) and after (Years 6-7) the high-growth phase. The years on the x-axis correspond to years 2007 to 2013. Grey vertical bands indicate the period of scaling up (scaling-up phase starts at 3 and ends at 5). Scalers grow in employment or turnover by at least 10% per year over 3 consecutive years on average, as defined in Box 1.2. The line represents yearly estimated values and the grey bands around the line represent 90% confidence intervals. The difference between scalers and their peers is statistically significant when the confidence interval band does not intersect the horizontal line at zero. Results based on 457 104 observations. The regressions control for the year in which the variable is measured and for firm age and size class, sector and region. The sample is limited to firms with at least 10 employees in the first year and surviving for the whole period. See Box 4.1 for a detailed description of the methodology.
Source: Estimations based on microdata sources from Spain. See Annex B for more information.

Turnover scalers accumulate a current asset buffer. During scaling, turnover scalers in Italy, Portugal and Spain increase the share of current assets in total assets by 2-3 percentage points compared to peers. Italian employment scalers show a similar pattern. Current assets include cash, inventory and other assets that can be converted into cash quickly. The increase in current assets among turnover scalers reflects a choice that can arise from a larger need for liquidity or expected future volatility in profits. For some turnover scalers – especially those for which the fast growth is demand-driven – the success may come suddenly and unexpectedly and thus the fast growth may indicate that a specular downturn may also be hard to predict and prepare for. Therefore, turnover scalers may opt to hold on to more liquidity and refrain from immediate long-term investment choices. External volatility in market conditions thus plays an important role for turnover scalers. In this respect, a policy and regulatory environment that is stable and predictable can help reduce some of the volatility and uncertainty to which SMEs are exposed. The refrain might also simply come from a lack of strategy for further investment. Unlike turnover scalers, employment scalers do not differ in their current asset buffer from peers. Employment scalers are likely to face less demand volatility as changes in the workforce are long-term decisions. It follows that they are less in need to accumulate current assets, which explains why their long-term investment pattern is similar to non-scalers (see Annex A, Table A A.4).

Productivity precedes scaling up, profitability follows

Key findings on productivity and profitability

- **Anticipatory differences**:
  - Employment scalers in Finland, Italy, Portugal and Spain are 5-15% more productive than their peers before scaling up.
- **Transformation factors**:
  - Turnover scalers across the 4 countries are 10-35% more productive than their peers after scaling.
  - In scalers in Finland, Italy and Spain, profitability grows during scaling up to become 15-30% higher for employment scalers and 40-100% higher for turnover scalers than in peers by the end of the scaling period.

Note: Due to data constraints, labour productivity indicators are available for Finland, Italy, Portugal and Spain. Profitability indicators are available for Finland, Italy and Spain.

Employment scalers are more productive as they enter their high-growth phase, to then align with peers as they grow. Across the four countries for which data are available (Finland, Italy, Portugal and Spain), the level of labour productivity (Box 4.6) is up to 10% higher in scalers than in non-scalers in the 2 years before scaling and in the first 2 years of the scaling period. Toward the end of the high-growth period, productivity levels align to those of non-scalers (Figure 4.12, left panel), indicating that output grows at a slower pace than employment. For employment scalers in Finland and Italy, the productivity after scaling is lower than in peers.[13]

Turnover scalers prepare for a new scale by hiring new personnel. The expansion of the workforce results in a drop in productivity in the year before scaling (Figure 4.12, right panel). During the subsequent period of high growth in turnover, employment grows on average at a slower pace. This makes scalers more productive than comparable non-scalers. The new productivity level is sustained beyond the high-growth phase as it is still higher two periods after achieving the new scale.


Box 4.6. Definitions and measurement of productivity and profitability indicators

Productivity and profitability measures rely on the information provided by balance sheets.

- **Labour productivity** is measured by the number of units of output per employee. The output is measured with turnover or value-added.

- **Profitability** is measured by the ratio of gross profit over turnover. Gross profit is calculated as the difference between turnover (or sales) and the costs associated with making and selling products or providing services.

Figure 4.12. Scalers are more productive than their peers

Difference in labour productivity between employment (left) and turnover (right) scalers and their peers in Portugal
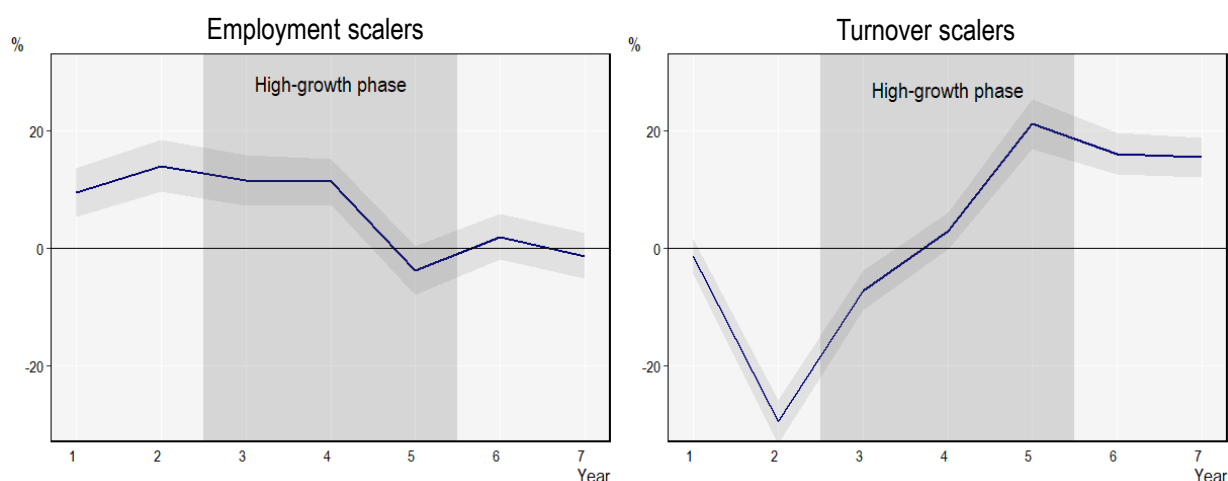
Note: The graphs indicate the difference between scalers and peers in productivity (measured as a log value of turnover per unit of employment) before (Years 1-2), during (Years 3-5) and after (Years 6-7) the high-growth phase. The years on the x-axis correspond to years 2007 to 2013. Grey vertical bands indicate the period of scaling up (scaling-up phase starts at 3 and ends at 5). The line represents yearly estimated values and the grey bands around the line represent 90% confidence intervals. The difference between scalers and their peers is statistically significant when the confidence interval band does not intersect the horizontal line at zero. Scalers grow in employment or turnover by at least 10% per year over 3 consecutive years on average, as defined in Box 1.2. Results based on 215 588 observations for employment scalers and 184 353 observations for turnover scalers. The regressions control for the year in which the variable is measured and for firm age and size class, sector and region. The sample is limited to firms with at least 10 employees in the first year and surviving for the whole period. See Box 4.1 for a detailed description of the methodology.
Source: Estimations based on microdata sources from Portugal. See Annex B for more information.

Scalers become more profitable as they grow – both in absolute terms and compared to peers. By the end of scaling up, turnover scalers become 1-4 percentage points more profitable than peers, which corresponds to a 40-100% difference, given that profitability (measured as profits as a share of total turnover – see Box 4.6), on average, is typically less than 5%. Before scaling, scalers are slightly less profitable or comparably profitable to peers, except for Spanish employment scalers, which tend to be more profitable than peers even before scaling. During scaling, the profitability of scalers grows by up to 4 percentage points, which explains the positive difference compared to peers. The profitability is a sustained change, as it tends to last after the new scale is achieved (Figure 4.13, see also Annex A, Table A A.6 for a summary by country).

Figure 4.13. Turnover scalers show steady growth in profitability

Difference in profitability between scalers and their peers in Spain.
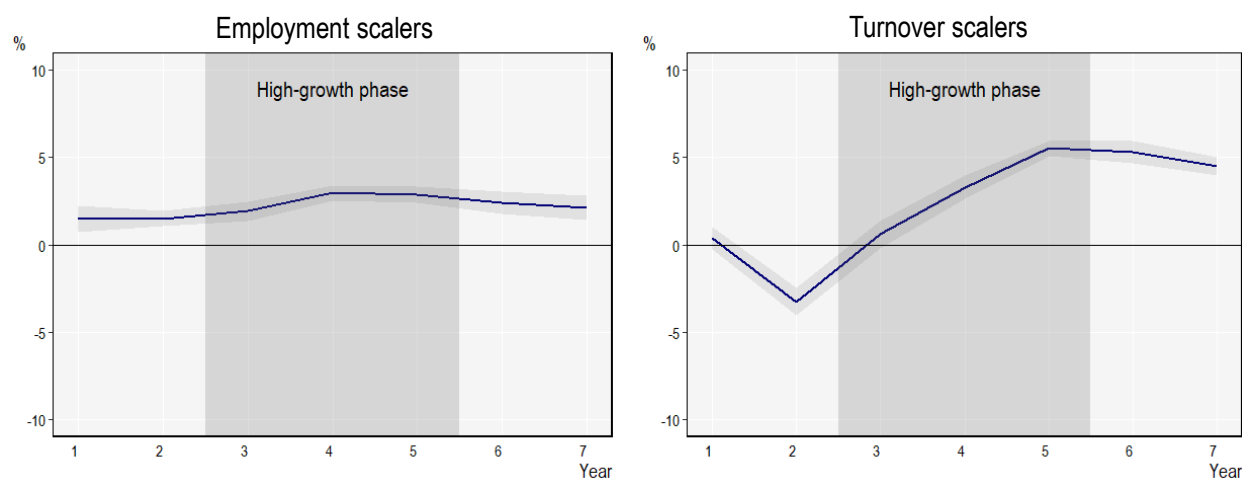
Note: The graphs indicate the difference between scalers and peers in gross profits as a proportion of turnover before (Years 1-2), during (Years 3-5) and after (Years 6-7) the high-growth phase. The years on the x-axis correspond to years 2007 to 2013. Grey vertical bands indicate the period of scaling up (scaling-up phase starts at 3 and ends at 5). The line represents yearly estimated values and the grey bands around the line represent 90% confidence intervals. The difference between scalers and their peers is statistically significant when the confidence interval band does not intersect the horizontal line at zero. Scalers grow in employment or turnover by at least 10% per year over 3 consecutive years on average, as defined in Box 1.2. Results are based on 457 561 observations for turnover and 494 309 observations for employment scalers in Spain. The regressions control for the year in which the variable is measured and for firm age and size class, sector, and region. The sample is limited to firms with at least 10 employees in the first year and surviving for the whole period. See Box 4.1 for a detailed description of the methodology.
Source: Estimations based on microdata sources from Spain. See Annex B for more information.

References

Aernoudt, R. (2017), "Executive forum: The scale-up gap and how to address it", *Venture Capital*, Vol. 19/4, pp. 361-372, http://dx.doi.org/10.1080/13691066.2017.1348724. [20]

Andrews, M., T. Schank and R. Upward (2017), "Do foreign workers reduce trade barriers? Microeconomic evidence", *World Economy*, Vol. 40/9, pp. 1750-1774, http://dx.doi.org/10.1111/TWEC.12486. [38]

Arrighetti, A. and A. Lasagni (2013), "Assessing the determinants of high-growth manufacturing firms in Italy", *International Journal of the Economics of Business*, Vol. 20/2, pp. 245-267, http://dx.doi.org/10.1080/13571516.2013.783456. [30]

Arundel, A. (2001), "The relative effectiveness of patents and secrecy for appropriation", *Research Policy*, Vol. 30/4, pp. 611-624, http://dx.doi.org/10.1016/S0048-7333(00)00100-1. [5]

Barringer, B., F. Jones and D. Neubaum (2005), "A quantitative content analysis of the characteristics of rapid-growth firms and their founders", *Journal of Business Venturing*, Vol. 20/5, pp. 663-687, http://dx.doi.org/10.1016/j.jbusvent.2004.03.004. [10]

Benedetti Fasil, C. et al. (2021), *High Growth Enterprises in the COVID-19 Crisis Context*, Publications Office of the European Union, https://publications.jrc.ec.europa.eu/repository/handle/JRC124469 (accessed on 17 June 2021). [9]

Bertschek, I., D. Cerquera and G. Klein (2013), "More bits – more bucks? Measuring the impact of broadband internet on firm performance", *Information Economics and Policy*, Vol. 25/3, pp. 190-203, http://dx.doi.org/10.1016/j.infoecopol.2012.11.002. [8]

Bianchini, S., G. Bottazzi and F. Tamagni (2017), "What does (not) characterize persistent corporate high-growth?", *Small Business Economics*, Vol. 48/3, pp. 633-656, http://dx.doi.org/10.1007/s11187-016-9790-1. [19]

Bresnahan, T., E. Brynjolfsson and L. Hitt (2002), "Information technology, workplace organization, and the demand for skilled labor: Firm-level evidence", *The Quarterly Journal of Economics*, Vol. 117/1, pp. 339-376, http://dx.doi.org/10.1162/003355302753399526. [2]

Cacciolatti, L. and A. Fearne (2013), "Marketing intelligence in SMEs: Implications for the industry and policy makers", *Marketing Intelligence & Planning*, Vol. 31/1, pp. 4-26, http://dx.doi.org/10.1108/02634501311292894. [4]

Coad, A. (2010), "Exploring the processes of firm growth: Evidence from a vector auto-regression", *Industrial and Corporate Change*, Vol. 19/6, pp. 1677-1703, http://dx.doi.org/10.1093/icc/dtq018. [23]

Coad, A. (2007), *Firm Growth : a Survey*, https://halshs.archives-ouvertes.fr/halshs-00155762 (accessed on 19 July 2019). [35]

Coad, A. et al. (2014), "Whom do high-growth firms hire?", *Industrial and Corporate Change*, Vol. 23/1, http://dx.doi.org/10.1093/icc/dtt051. [36]

Coad, A. and S. Srhoj (2019), "Catching gazelles with a lasso: Big data techniques for the prediction of high-growth firms", *Small Business Economics*, http://dx.doi.org/10.1007/s11187-019-00203-3. [17]

Daunfeldt, S. and H. Westerberg (2019), "High-growth firms and the labor market entry of first generation immigrants", *HFI Working Papers*, Institute of Retail Economics (Handelns Forskningsinstitut). [27]

Du, J. and Y. Temouri (2015), "High-growth firms and productivity: Evidence from the United Kingdom", *Small Business Economics*, Vol. 44/1, pp. 123-143, http://dx.doi.org/10.1007/s11187-014-9584-2. [24]

Gandal, N., G. Hanson and M. Slaughter (2004), "Technology, trade, and adjustment to immigration in Israel", *European Economic Review*, Vol. 48/2, pp. 403-428, http://dx.doi.org/10.1016/S0014-2921(02)00265-9. [14]

Geroski, P. (1999), "The growth of firms in theory and in practice", *CEPR Discussion Papers*, No. 2092. [31]

Goedhuys, M. and L. Sleuwaegen (2015), "High-growth versus declining firms: The differential impact of human capital and R&D", http://dx.doi.org/10.1080/13504851.2015.1076139. [28]

Hiller, S. (2013), "Does Immigrant Employment Matter for Exports? Evidence From Denmark", *Review of World Economics*, Vol. 149/2, pp. 369-394. [37]

ILO (2012), *International Standard Classification of Occupations 2008 (ISCO-08): Structure, Group Definitions and Correspondence Tables*, International Labour Organization, http://www.ilo.org/global/publications/ilo-bookstore/order-online/books/WCMS_172572/lang--en/index.htm (accessed on 9 June 2021). [15]

Jovanovic, B. (1982), "Selection and the evolution of industry", *Econometrica*, Vol. 50/3, http://dx.doi.org/10.2307/1912606. [32]

Lopez-Garcia, P. and S. Puente (2012), "What makes a high-growth firm? A dynamic probit analysis using Spanish firm-level data", *Small Business Economics*, Vol. 39/4, pp. 1029-1041, http://dx.doi.org/10.1007/s11187-011-9321-z. [29]

Manaresi, F. et al. (2021), "Export management and labor demand. Evidence from a policy experiment", Mimeo. [26]

McMahon, A. (2010), "Does workplace diversity matter? A survey of empirical studies on diversity and firm performance, 2000-09", *Journal of Diversity Management*, Vol. 5/2, http://dx.doi.org/10.19030/JDM.V5I2.808. [11]

Mitaritonna, C., G. Orefice and G. Peri (2017), "Immigrants and firms' outcomes: Evidence from France", *European Economic Review*, Vol. 96, pp. 62-82, http://dx.doi.org/10.1016/j.euroecorev.2017.05.001. [13]

Moschella, D., F. Tamagni and X. Yu (2019), "Persistent high-growth firms in China's manufacturing", *Small Business Economics*, Vol. 52/3, pp. 573-594, http://dx.doi.org/10.1007/s11187-017-9973-4. [16]

Neely, A. et al. (2001), "A framework for analysing business performance, firm innovation and related contextual factors: Perceptions of managers and policy makers in two European regions", *Integrated Manufacturing Systems*, Vol. 12/2, pp. 114-124, http://dx.doi.org/10.1108/09576060110384307. [1]

OECD (2021), *The Digital Transformation of SMEs*, OECD Studies on SMEs and Entrepreneurship, OECD Publishing, Paris, https://dx.doi.org/10.1787/bdb9256a-en. [6]

OECD (2020), *Financing SMEs and Entrepreneurs 2020: An OECD Scoreboard*, OECD Publishing, Paris, https://dx.doi.org/10.1787/061fe03d-en. [18]

OECD (2010), *Measuring Innovation: A New Perspective*, OECD Publishing, Paris, https://doi.org/10.1787/9789264059474-en. [3]

OECD/Eurostat (2018), *Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition*, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, https://dx.doi.org/10.1787/9789264304604-en. [22]

Penrose, E. (1955), "Limits to the growth and size of firms", *American Economic Review*, Vol. 45/2, pp. 531-543, https://www.jstor.org/stable/1823582?seq=1#metadata_info_tab_contents (accessed on 1 September 2021). [33]

Publishing, E. (ed.) (2009), *The Growth of Firms: A Survey of Theories and Empirical Evidence.*   [34]

Raes, S. (2021), "Understanding SME heterogeneity: Towards policy relevant typologies for SMEs and entrepreneurship: An OECD Strategy for SMEs and Entrepreneurship"*, OECD SME and Entrepreneurship Papers*, No. 28, OECD Publishing, Paris, https://doi.org/10.1787/c7074049-en.   [25]

Richard, O., M. Triana and M. Li (2020), "The effects of racial diversity congruence between upper management and lower management on firm productivity", *Academy of Management Journal*, http://dx.doi.org/10.5465/amj.2019.0468.   [12]

Rodrigues, F., N. Tavares and G. de Barros (2021), "Drivers of exceptional job creation – A dynamic probit approach using portuguese firm-level data", *Portuguese Economic Journal*, Vol. 20/1, pp. 45-69.   [21]

Spiezia, V. (2011), "Are ICT Users More Innovative?: An Analysis of ICT-Enabled Innovation in OECD Firms", *OECD Journal: Economic Studies*, Vol. 2011/1, https://dx.doi.org/10.1787/eco_studies-2011-5kg2d2hkn6vg.   [7]

Notes

[1] The Oslo Manual, a joint OECD and Eurostat publication that provides recognised guidelines for collecting and interpreting technological innovation data, defines two major types of innovation that a firm can introduce: innovations that change the firm's products (product innovations) and innovations that change the firm's business processes (business process innovations) (OECD/Eurostat, 2018[22]).

[2] See, for example, Coad (2009[34]; 2007[35]), Geroski (1999[31]), Jovanovic (1982[32]) and Penrose (1955[33]). Raes (2021[25]) also provides a comprehensive review of SME taxonomies that have been developed in the economic and business literature.

[3] It is worth noting that these findings apply to the average scaler. However, the share of R&D employees shows large variation across sectors and types of scalers. For instance, in Portugal, about 60% of employment scalers in the period 2015-17 do not have R&D staff at the end of the scaling period, while in around 10% of scalers more than 1 out of 10 employees is working in R&D. The difference between scalers and peers for the latter group of R&D-intensive scalers are therefore likely to be larger than for the average scalers.

[4] See Goedhuys and Sleuwaegen (2015[28]) for Belgium; Lopez-Garcia and Puente (2012[29]) for Spain; Arrighetti and Lasagni (2013[30]) for Italy; and Rodrigues, Tavares and de Barros (2021[21]) for Portugal.

[5] Until 2005, the Portuguese university education awarded a degree after four- to six-year programmes. Implementing the Bologna Process, the system changed into two-cycle university studies: a three-year first cycle that leads to bachelor's degree, followed by two-year cycle that awards a master's degree. Most of the university-educated employees that are considered for this study received their degree prior to the system change. As no equivalent to bachelor's degree exists prior 2005, the measure of university-educated in this study considers all university degrees up to the master's degree-level combined. As the doctorate degrees remain unaffected by this change, they are examined in further detail. In contrast, the Finnish higher education offered by the universities corresponds to the Bologna system. The split of a master's programme into bachelor's and master's degrees concerned only engineering degrees. Hence, the education measures in this study differentiate between undergraduate (bachelor's) degree and graduate (master's) degree and above.

[6] Non-scalers, instead, hire disproportionately from the below 30-employee group but new hires account for a much smaller share of their entire workforce. Thus, the effect on the average age of the whole workforce is negligible.

[7] Research shows that foreign workers have complementary skills that help firms increase productivity (Mitaritonna, Orefice and Peri, 2017[13]; Gandal, Hanson and Slaughter, 2004[14]). Foreign workers are hired by firms that prepare to export due to their market-specific knowledge (Hiller, 2013[37]; Andrews, Schank and Upward, 2017[38]). Racially diverse upper and lower management increases productivity by lowering co-ordination costs (Richard, Triana and Li, 2020[12]).

[8] Studies on Swedish firms have shown that scalers are thus more likely to hire workers that are unemployed for short or long periods and also hire immigrants, young workers and less educated individuals (Daunfeldt and Westerberg, 2019[27]; Coad et al., 2014[36]).

[9] SMEs, especially the smaller ones, may not have the internal capacity to operate in foreign markets and may therefore rely on external service providers to import or export. Firm-level foreign trade indicators for SMEs may suffer from a bias originating from the presence of "aggregators", i.e. intermediary firms that channel the imported and exported goods and services of the producing firm. The share of exporting and importing firms may therefore be underestimated, as a firm that produces goods that are sold in a foreign market may not report any direct export flow in the customs data. However, there is no reason to assume that the bias may be systematically different in scalers and in their peers.

[10] The Italian government recent implemented a "vouchers for internationalisation" policy that aims at directly increasing export capacity by expanding the managerial skills of firms through a subsidized consultancy service led by a "temporary export manager" (Manaresi et al., 2021[26]).

[11] Although research on equity financing and scaling up is rare because of the lack of comprehensive data, some definitions of scaling up rely on thresholds of equity-based capital. For example, for Mind the Bridge, a global innovation advisory organisation with headquarters in the US, a scaler is a firm that raised at least USD 1 million of funding in its first 10 years.

[12] An absolute decline in the debt ratio is to be expected if firms borrow in anticipation of scaling as turnover increases during scaling up.

[13] Previous research shows that labour productivity, profitability and investment intensity are higher in firms that will scale up in the next period in either employment or turnover (Moschella, Tamagni and Yu, 2019[16]; Coad, 2010[23]). Firms that start as highly productive ones also tend to turn into high-growth firms in their life cycle (Arrighetti and Lasagni, 2013[30]). Similarly, firms with larger productivity growth are likely to become high-growth turnover firms (Du and Temouri, 2015[24]).