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SCALE-UPS IN PORTUGAL: IMPROVING POLICY DESIGN BY UNDERSTANDING HIGH-GROWTH IN SMEs

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Abstract

Policymakers have for a long time tried to target firms with potential to gain scale, yet much remains unknown on what features differentiate these firms from their peers. Increasing firm scale is particularly relevant for Portugal, where average firm size is noticeably smaller than the EU average (a phenomenon frequently associated with the country's slow productivity growth in the last decades) and where 11% of SMEs are responsible for 42% of total turnover. In 2019, the OECD started a workstream on this topic, opening important opportunities for countries to coordinate policies efforts aimed at fostering SMEs growth. Borrowing from micro-level data on all non-financial firms in Portugal, this analysis contributes to the OECD's work on scale-ups by investigating what features are associated with higher probabilities to gain scale, considering both employment and turnover as growth metrics. We then study how current tax credit policies are allocated among SMEs. We conclude these policies target preferably firms in high-technology manufacturing, even if firms in other sectors also have similar or greater chances to gain scale. Larger firms are also more frequently supported, when instead both younger and smaller firms display more potential to scale-up. Additionally, while most productive firms are the ones that benefit the most from these policies, results confirm them as priority for employment growth but not for turnover growth, a trade-off that needs to be considered carefully when designing these policies.

Keyword: Scale-ups, SMEs, firm growth, firm dynamics, Portugal

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1. Introduction

The small group of fast-growing SMEs have increasingly caught policymakers' attention for their disproportionally high contributions in job creation among their peers. Designing policies to foster firms' growth potential is particularly relevant for Portugal, where most firms remain relatively small when compared to other European countries, a phenomenon often associated with the country's productivity gap[3] observed in the last decades (Pinheiro Alves 2017). Despite researchers' best attempts to differentiate these firms from the rest, investigation has often offered more questions than answers. The lack of a clear stablished framework means that countries often adopt generic policies at their own discretion, based on stereotypical views of these firms (Brown et al 2017). Firms gain scale in many sectors and are not the typical high-tech firm some believe them to be. A lot of focus is also given to gazelle firms (young high-growth firms), but most jobs created by SMEs that gain scale come from mature firms (OECD 2021). Previous research on the topic of high-growth firms is often spread across non-comprehensive data sets, which in turn limits the ability to compare results and stablish general guidelines for policy. There are many valuable insights that can be taken by better leveraging the availability of broader firm-level data compiled by governmental agencies.

In 2019, the OECD created a new workstream[4] dedicated to this topic, offering a platform for countries to coordinate policies aimed at unlocking SMEs potential to gain scale. The project released a pilot study (OECD 2021) compiling the results of a cross-country analysis based on micro-level data from 5 countries, including Portugal. The study considers as scalers firms that growth, on employment or turnover, at a minimum annualized rate of 10% over a period of 3 years. According to the study, employment scalers accounted for 13% to 15% of SMEs, while represented 47% to 69% of gross job creation. Similarly, around 20% to 26% of SMEs scaled up in turnover, accounting for 51% to 71% of gross turnover creation. Around 1/3 of the scalers scale in both employment and turnover. One condition is often preceded by the other, as about one third of turnover scalers in Portugal scaled up in employment afterwards. For many firms, however, scaling is an isolated event. Young firms are 2.5 to 3.5 times more likely to scale than older firms, but account for only 1 out of 4 scalers. Furthermore, scalers in Portugal differed from their peers before scaling in productivity, access to external markets and R&D.

Then the OECD (2022) released a report detailing policy initiatives allowing SMEs to finance their growth across several countries. It compares how these differ in their institutional framework, the police instruments deployed, and the criteria adopted when targeting firms. In Portugal, tax credits and public loans represent most existing policies supporting investment in SMEs. The country also adopts a more decentralized institutional setting when coordinating these policies. In comparison to the OECD average, Portugal's policies are less often targeted explicitly at SMEs or subpopulations of firms, based on criteria like age, size, previous performance or productivity.

Borrowing from a comprehensive data set covering all non-financial firms in Portugal, this analysis contributes to the OECD workstream by analyzing which firm features are associated with increased probabilities to gain scale. We focus on firm age, size, productivity, previous growth, access to external markets and financial vulnerability as explanatory variables. Both employment and turnover are explored as metrics to define firm growth, highlighting how a multidimensional approach can better inform policymakers. To access how current tax credit policies support investment across SMEs, we analyze how likely firms are to receive tax credits based on the same set of explanatory variables, employing publicly available data on fiscal benefits recipients. The set of fiscal benefits that were considered are the ones that are more relevant for SMEs, specifically the special tax regime to support investment (RFAI), the tax incentive system for Business R&D (SIFIDE) and the deduction for retained and reinvested profits (DLRR). As these policies can play an important role in allowing more firms to scale

[3] In 1995, Portugal's GDP per hour worked equaled 77.2% of the EU 27 average, dropping to 72.8% in 2019, according to OECD Data

[4] See https://www.oecd.org/cfe/smes/sme-scale-up.htm

up, we analyze whether they are effective at targeting firms with the most potential to gain scale.

Our results confirm younger firms are more likely to scale in both dimensions and that smaller firms are more likely to scale in employment. However, tax credits are in general allocated within industries preferentially to large firms, with little to no consideration of firm's age. Their allocation is also particularly biased towards high-tech manufacturing firms, excluding a considerable share of potential scalers. Regarding previous growth, exports and financial vulnerability, firms are mostly targeted accordingly to their probability to gain scale. On the productivity dimension, no final recommendation can be given to policymakers as we find evidence of a trade-off when targeting firms: most productive firms are better suited to scale in employment but less suited to scale in turnover. As current tax credits policies are already given to more productive firms, they are more likely to promote job creation but may entail productivity losses, at least in the short run.

This paper starts by reviewing the exiting literature on firm growth and high-growth firms. The data and methodology section detail the steps taken to model both SME's probability to scale up and to receive tax credits conditionally on our explanatory variables. Finally, the proposed models' results are presented, followed by a discussion of the key takeaways from the analysis for policymakers.

2. Literature Review

A Many alternative definitions of firm growth and high-growth firms have been adopted by previous literature. The variety of definitions stems from whether absolute, relative, or composite metrics are employed, the chosen indicator (employment, turnover, value-added, productivity, etc.) and the length of time over which growth is measured. The OECD (2021), defines a firm as a scaler if it displays an annualized growth greater than 10% over a 3-year window, adopting both employment (as employee headcount) and turnover separately as metrics. This definition is similar to that adopted for high-growth firms by the OECD/Eurostat, for which the growth threshold is defined at 20%. Both definitions (scalers and high-growth firms) set an additional requirement for firms to hire at least 10 employees before scaling, as micro-firms may easily trigger the definition in any growth process they go through. Recent work by Eurostat has attempted to include micro firms in this definition, but no standard guideline has been adopted so far[5]. When compiling statistics on high-growth firms, different organizations may adopt additional considerations. Nordic Innovation (2019) sets an additional minimum of 2 million euros annual turnover cut-off and adopts employment as a growth metric. Banco de Portugal (2019) adopts turnover as their growth metric and sets a 50 000 euros threshold while considering any firm with at least 1 employee. While adopting a common frame to define scalers is certainly positive for policymakers, employment and turnover metrics should not be treated as equivalents. As illustrated by Daunfeldt, Elert and Johansson (2014), different choices of growth indicators lead to different firms being considered high-growth firms and therefore different preferential targets for policy. Age was the only firm characteristic the authors found to always be linked with increased probability to gain scale, with younger firms being a priority target regardless of the choice of indicator.

The relevance of scalers or high-growth firms as a policy goal has often been debated, given most studies have concluded that high-growth is an isolated event for most firms (Mogos, Davis, and Baptista 2021; Erhardt 2021; Daunfeldt and Halvarsson 2014; OECD 2021). While some firms indeed manage to sustain high growth for longer, they represent a very small share of firms. Attempts to predict which firms go on to gain scale have also delivered unsatisfactory results, even when accounting for larger set of information (Coad and Srhoj 2020). Therefore, policies aiming to "pick winners" are unlikely to be successful, since the potential to gain scale is not limited to a few select firms. While policies may be unable to precisely target firms that go on to gain scale, many firm features have been associated with increased probabilities to gain scale, and can therefore help improve policy design. The available literature on firm growth also offers many valuable insights on what firm characteristics help differentiate scalers from the rest.

[5] See https://ec.europa.eu/eurostat/web/experimental-statistics/micro-high-growth-enterprises

The two determinants of firm growth that have been studied most extensively in the literature are **age and size**. Most recent results on firm growth defend the existence of a negative size-growth relationship, challenging the classical result known as Gibrat's Law, which states that the growth rate of a firm is independent of its size at the beginning of a given period. Evans (1987a; 1987b) found that firm growth and growth volatility decrease with age and size for manufacturing industries in the United States. Variyam and Kraybill (1992) and Yasuda (2005) found similar results using data on small businesses in Georgia and Japanese manufacturing firms, respectively. On the other hand, some authors have attempted to reconcile Gibrat's Law with this contradictory evidence. Haltiwanger et al. (2013) used data tracking all firms and establishments in the United States nonfarm business sector for the period 1976-2005 and found that the negative relationship between firm growth and firm size disappears if we control for firm age. Lawless (2014), using a panel of Irish international traded services and manufacturing firms, found a negative relationship between growth and size for young firms, but it declined significantly for older firms. This supports Gibrat's Law prediction of independence between size and growth but only if the firm is beyond the start-up stage. Lotti et al. (2003) obtained similar results using a sample of Italian manufacturing firms.

It is noticeable, nevertheless, that there is broad consensus regarding the negative relationship between firm **age and firm growth**. Additional evidence is offered by Zhang et al. (2022) that with a sample of SMEs from 12 countries (primarily emerging and transitional European economies) found that younger firms grow faster than older firms. Barba Navaretti et al. (2014) argues that this effect may, however, depend on firms' growth trajectory. They analyzed a sample of French, Italian and Spanish manufacturing firms with over ten employees and found that, although firm age does have a negative effect on growth if the firm is on an upsizing path, it has no effect if the firm is on a downsizing path. Jovanovic (1982) developed a theory of firm learning consistent with these empirical findings, in which firms learn about their true efficiency over time and the more efficient grow and survive whereas the least efficient decline and fail.

Firm's productivity may also play an important role in allowing them to gain scale. Guillamón et al. (2017) found evidence that Spanish firms are more likely to display high-growth in employment after displaying high-growth in productivity. The reverse effect also holds, but to a smaller magnitude. Du et al. (2013) arrived at similar effects for turnover high-growth firms when analyzing British firms. Additionally, firms with lower productivity levels were more likely to display high growth in turnover. For employment scalers, the opposite effect seems to hold, as the OECD (2021) concludes employment scalers are in general more productive than their peers. Coad and Broekel (2008), on the other hand, present contradictory evidence when studying French manufacturing firms' growth under several growth indicators. They've concluded that firm growth was not meaningfully impacted by previous productivity growth but noted that previous employment growth is generally associated with decline in productivity growth, a phenomena potentially reflecting adjustments costs when gaining scale.

Another relevant factor affecting the growth rate of firms is their **participation in external markets**. Grazzi and Moschella (2017) used data on Italian firms to examine whether the export status of firms influences the patterns of employment growth at different age classes. They were able to conclude that exporting firms grow more than non-exporting firms conditional on size and age. Moreover, the positive relationship between export status and growth declines with firm age. The OECD (2021) arrives at similar conclusions, with scalers being more likely to export and import by 25% to 60% when compared to similar firms.

Firm's debt and equity is an important factor allowing firms to grow. Bank loans increased in anticipation to scaling in employment or turnover (OECD 2021), highlighting the role of access to credit for many scalers. Rodrigues et al (2020), when studying Portuguese high-growth firms, find that indebtedness positively affects the probability of displaying high-growth up to a maximum threshold, when the effect then starts to reverse. The effect is no longer present when firm heterogeneity is controlled for, and instead positive effects are found for firm's financial autonomy. The authors interpret this effect as evidence of correct credit-worthiness assessment, as firms access credit accordingly to their potential to

scale. Equity would therefore be more important in determining firm's potential for growth. It should be noted that the methodology adopted limits our ability to compare results, as the authors employ a composite metric (based on employment) and measure growth annually.

The growing availability of broad employee data has also led to recent developments on the role of human capital in firm's ability to gain scale. In Portugal, scalers employed 15% more R&D staff and 2 to 3 times the number of IT specialist of other similar firms (OECD 2021). Scalers also had 5% to 10% more workers with graduate degrees and 20% to 40% more workers with a PhD. While scaling, however, firms do not seem particularly selective when hiring, and instead, are generally more likely to hire immigrants, younger, less educated, and unemployed workers (OECD 2021; Coad et al 2014). In doing so, they create opportunities for labour market participants that would otherwise not be available. Finally, entrepreneurial human capital is also an important force driving firm growth, as Portuguese firms started by more educated entrepreneurs are born larger and grow faster (Queiro 2021).

3. Data and Methodology

Our data set covers all non-financial firms operating in Portugal, based on their yearly reports to *Informação Empresarial Simplificada* (IES, Simplified Corporate Information), made available through Banco de Portugal Microdata Research Library (BPLIM). We focus our attention to SMEs, considering only entries for which firms hired between 10 to 249 employees in the years between 2013 and 2016. This restriction also ensures the minimum 10 employee threshold adopted when defining scalers. The chosen period reflects a balance of avoiding structural breaks[6] in data and ensuring that tax credit policies remained mostly unaltered. Firms in sectors not relevant for this analysis are excluded following the same guidelines adopted by the OECD's 2021 measurement report. Additionally, firms with headquarters located in Portugal's autonomous regions (Azores and Madeira) are excluded from the sample given they are entitled to other regional policies. Table 1 displays the number of entries available from 2013 to 2016 according to firm size and sectoral aggregations defined by the OECD.

Table 1: Number of Entries Across Sectoral Groups and Firm Size

	Less Knowledge Intensive Services	Knowledge Intensive Services	Low-Medium Tech Manufacturing	Medium-High Tech Manufacturing	Construction	Education, Health and Social Services	Excluded Sectors*
Micro (1 to 9 employees)							
2013	111 820	29 809	18 579	1 525	22 112	16 889	16 645
2014	113 204	30 880	18 694	1 476	21 796	17 473	17 672
2015	115 461	32 048	18 994	1 486	21 826	17 983	18 551
2016	117 452	33 128	19 167	1 468	22 118	18 312	19 395
SMEs (10 to 249 employees)							
2013	14 255	2 876	9 692	1 011	4 177	1 867	1 981
2014	14 483	2 967	9 881	1 051	4 084	1 869	2 028

[6] The period compromises mostly the recovery following Portugal's debt crisis from 2011 to 2014, when the country exited its economic adjustment programme

Table 1: **Number of Entries Across Sectoral Groups and Firm Size**

	Less Knowledge Intensive Services	Knowledge Intensive Services	Low-Medium Tech Manufacturing	Medium-High Tech Manufacturing	Construction	Education, Health and Social Services	Excluded Sectors*
2015	15 414	3 117	10 168	1 099	4 350	2 012	2 152
2016	16 170	3 232	10 374	1 105	4 510	2 082	2 250
Large (250+ employees)							
2013	238	136	165	78	45	29	43
2014	247	147	170	76	44	28	36
2015	261	155	178	78	44	28	46
2016	262	155	188	80	39	32	45

Values reflect firms operating in continental Portugal, already excluding Azores and Madeira autonomous regions

* NACE Sectors A, B, O, U, T excluded, following the guidelines adopted by the OECD`s measurement report on scalers (2021)

Each observation is identified as a scaler if it displays an annualized growth in turnover or employment greater than 10% over the following 3-year period (1), considering turnover and employment metrics separately. Firms that do not survive in the following 3 years are left out of the sample, as growth can't be defined. This approach will lead to some survival bias as firms have heterogenous probabilities of survival, in particularly younger firms, which are more likely to exit.

$$Scaler_t = 1 \; if \; \left(\frac{Y_{t+3} - Y_t}{Y_t} \geq (1.1)^3\right) \qquad (1)$$
$$Y = employment \; or \; turnover$$

To estimate how firms' characteristics impact their probability of becoming a scaler, the indicator variable identifying scalers is regressed on a set of variables describing firm's characteristics observed before the 3-year growth period considered. The full set of regressors considered is presented in table 2. As a firm's previous status as a scaler is considered, firms younger than 3 years old are excluded from the final sample.

Table 2: **Variable Description**

Variable	Definition
Log Age	Log of years of activity based on the reported year of foundation. Value is set to missing if this definition leads to negative values.
Log Size	Log of employee headcount.

Table 2: Variable Description

Variable	Definition
Log TFP	Estimated using Woolridge's method for each 3-digit NACE industry, based on firms' value added (turnover – intermediary inputs). Also a proxy for this estimation, intermediary inputs are considered the sum of input costs, external services, and supplies. Employment is defined as employee headcount and capital is measured as firms' total assets. Nominal values are adjusted by aggregate price levels and the estimation considers the period from 2013 to 2019. Industries with less than 20 observations in any given year are excluded from the final sample.
Previously Scaling in Employment/Turnover	Dummy variable equal to one if firms met the employment/turnover scaler criterion from t-3 to t. The minimum of 10 employees before scaling is not considered at this point, as some were micro firms at t-3.
Exports to EU	Dummy variable equal to one if any share of firm's revenue is originated from EU markets exports.
Exports to Extra-EU	Dummy variable equal to one if any share of firm's revenue is originated from extra-EU markets exports.
Financially Vulnerable	Dummy variable equal to one if the firm's interest coverage ratio is greater than 0.5 or EBITDA is negative, following *Banco de Portugal*'s definition.

We fit a linear probability model with fixed effects, nesting observation in panels according to the NACE 3-digit industry where they operate and by year of observation (2). This approach helps alleviate endogeneity issues due to unobserved heterogeneity across industries while also allowing different time effects for each. Errors are clustered at each industry, allowing for serial correlation from firms being observed in multiple years and the heteroskedasticity natural to linear probability models. Additionally, the same specification is run separately for different sectoral groups[7] to verify the robustness of results.

$$Scaler_{s,t,i} = X_{s,t,i}\beta + \alpha_{s,t} + \varepsilon_{s,t,i} \quad (2)$$

To assess how current tax credit policies support firms with the most potential to scale up, public data from Portugal's Tax and Customs Authority was merged with the main data set to understand which firms received any support from 2014 to 2019. There are 4 main relevant tax credit policies supporting investment SMEs in Portugal, of which 3 are considered for this analysis. The Contractual Tax Benefits System for Productive Investment (BFCIP) was excluded since its only allocated to a very small share of SMEs, given it requires investment projects of at least 3 million euros. Table 3 details all considered policies, particularly on whether they are exclusively targeted at SMEs and if any subpopulation criteria based on firm characteristics is adopted.

Table 3: Tax Credit Policies Summary

	Special Tax Regime to Support Investment (RFAI)	Tax Incentive System for Business R&D (SIFIDE)	Deduction for Retained and Reinvested Profits (DLRR)
Tax Benefit	10% to 25% of investment	32,5% of R&D expenses + 50% of increase in expenditure	10% of retained profits

[7] Firms are divided in 6 sectoral groups, as defined by the OECD 2021 measurement report

Table 3: Tax Credit Policies Summary

	Special Tax Regime to Support Investment (RFAI)	Tax Incentive System for Business R&D (SIFIDE)	Deduction for Retained and Reinvested Profits (DLRR)
Duration	10 years	8 years	Same year
Investment Permanence Period	3 to 5 years	-	5 years
Cumulations	DLRR	-	RFAI
Targeted exclusively at SMEs?	No	No	Yes
Subpopulation Targeting	Age criterion, no restriction in max. deduction in first 3 years of activity, 50% otherwise	-	Size criterion, higher maximum yearly deductions for small and micro firms (50% vs. 25%, if not greater than 12M €)
Additional Limitations	• Financial contribution ≥ 25% • Eligible costs	• Application project	
Obligations	• To have organized accounts • Taxable profit not determined through indirect methods • Regularized tax and social security situation • Not be considered a company in difficulty		

A variable identifying whether firms receive any support in the following 3 years is then created. A firm is considered to receive tax credits if any of the reported tax credits values are greater than zero in any year from t+1 to t+3. This is done separately for each one of the 3 considered policies. This variable is then regressed under the same specification presented in (2), also introducing fixed 3-digit NACE industry and time effects. As tax credit data ranges from 2014 to 2019, all entries from 2013 to 2016 are considered, ensuring the same sample is used when estimating both firms' probability to scale and to receive tax credits. In both regressions, since it is not always possible to observe all explanatory variables and firms must survive for at least 3 years for growth to be defined, 111006 observations are considered in our final sample, representing 78.3% of available observations[8].

4. Descriptive Statistics

We begin this section by analyzing how scalers and tax credits are distributed among sectors, followed by an analysis of summary statistics for all variables used to estimate the probability of firms gaining scale or receiving tax credits. In table 5, the share of employment and turnover scalers as well as the share of firms receiving tax credits under each of the 3 policies is presented separately for each sectoral group. Firms gained scale in all sectors, and not only in high-technology sectors, even if these firms are more likely to produce scalers when compared to their counterparts in manufacturing and services. In fact, most scalers are operating in less knowledge intensive services, given that they represent the largest share of firms (table 4), as shown by the OECD (2021). Moreover, the percentage of scalers in turnover is always higher than the percentage of scalers in employment in all sectors.

[8] Available observations already considering exclusions due to size and sector, also excluding firms in autonomous regions, as presented in table 1

The allocation of tax credits among firms is, however, much more dependent on the sector they operate in. Manufacturing firms have a higher percentage of tax credit recipients compared to other sectors and regardless of the policy under consideration. As expected, manufacturing firms and knowledge intensive services have an interest in R&D related tax-credits – SIFIDE . Tax credits under RFAI are also less often demanded outside the manufacturing sector, probably reflecting low levels of investment. However, profit retention and reinvestment credits (DLRR) are demanded in most sectors.

Table 4: Sectoral Distribution of Sample

	Less Knowledge Intensive Services	Knowledge Intensive Services	Low-Medium Tech Manufacturing	Medium-High Tech Manufacturing	Construction	Education, Health, and Social Services
Number of Firms Th. of Firms	11.95 (43.0%)	2.21 (8.0%)	8.10 (29.2%)	0.85 (3.1%)	3.14 (11.3%)	1.50 (5.4%)
Employment Th. of Employees	319.13 (38.3%)	70.60 (8.5%)	284.99 (34.2%)	38.43 (4.6%)	80.31 (9.6%)	39.47 (4.7%)
Turnover Bi. of Euros	61.40 (56.5%)	6.23 (5.7%)	26.17 (24.1%)	6.60 (6.1%)	6.08 (5.6%)	2.08 (1.9%)

Values reflect the average across all 4 years, equally weighted

Table 5: Share of Scalers and Tax Credit Recipients in each Sectoral Aggregation

	Less Knowledge Intensive Services	Knowledge Intensive Services	Low-Medium Tech Manufacturing	Medium-High Tech Manufacturing	Construction	Education, Health, and Social Services
Employment Scalers	17.2%	22.3%	13.9%	18.6%	20.5%	16.7%
Turnover Scalers	26.1%	28.7%	23.1%	26.9%	39.0%	18.2%
Received SIFIDE	0.9%	10.3%	4.0%	16.6%	0.9%	1.0%
Received RFAI	2.0%	2.6%	16.6%	22.4%	1.3%	0.3%
Received DLRR	14.0%	9.1%	17.6%	22.9%	9.7%	8.6%

Values reflect the average across all 4 years, equally weighted

In table 6, summary statistics for all variables are presented, separating the between and within deviations observed when clustering the data by year and 3-digit NACE industries, following the same panel structure presented in the methodology section. For most variables considered, a considerable share of the variation observed is contained within panels. Estimating the impact of these variables is therefore reasonable under the fixed effects model proposed. Estimates for the effects of exports and the probability to receive tax credit might, however, be less reliable, since both seem to display a larger share of variation between panels.

Table 6 - Descriptive Statistics for Panel Variables

111 006 observations nested in 632 panels representing 158 NACE 3-digit industries from 2013 to 2016									
Continuous Variables		Mean	Std. Dev.	Min	Max	Dummy Variables	Mean	Std. Dev. Overall	Std. Dev. Between	Std. Dev. Within
Log Age						Employment Scaler	0.171	0.377	0.090	0.372
	Overall	2.923	0.638	1.099	5.303	Turnover Scaler	0.266	0.442	0.119	0.429
	Between	-	0.268	2.129	3.697	Received SIFIDE	0.031	0.172	0.087	0.163
	Within	-	0.607	-2.122	2.695	Received RFAI	0.068	0.251	0.109	0.235
Log Size						Received DLRR	0.142	0.349	0.097	0.342
	Overall	3.075	0.715	2.302	5.517	Previously Scaling in Employment	0.243	0.429	0.127	0.418
	Between	-	0.326	2.360	4.325					
	Within	-	0.675	-2.012	2.799	Previously Scaling in Turnover	0.284	0.451	0.131	0.437
Log TFP *						Exports to EU	0.440	0.496	0.288	0.412
	Within	-	0.704	-5.384	5.744	Exports to Extra-EU	0.293	0.455	0.245	0.396
						Financially Vulnerable	0.306	0.461	0.125	0.929

Overall statistics reflect variable values regardless of panel structure, between represent panel means and within values represent values demeaned at each panel. * Only within values reported for log total factor productivity as this variable is estimated separately for each NACE 3-digit industry

5. Results

The estimated effects for the probability to scale in employment and turnover are presented in table 7. On the first columns the estimation is performed for the full sample, followed by the estimation at each sectoral aggregation.

In line with the OECD and previous literature on firm growth, we find that younger firms are more likely to scale up in both employment and turnover. While some difference in the magnitude of the estimated effect is found at different sectoral groups, its significance remains robust. Smaller firms are more likely to scale up in employment, a result only not confirmed for knowledge intensive services. This size effect is not found with regards to scaling up in turnover, except for knowledge intensive services (positive effect). In any case, age is certainly the dominating effect, both due to its estimated magnitude and robustness across sectoral groups.

Productivity also plays an important role in determining a firm's probability to scale, with more productive firms being more likely to scale in employment (except for Knowledge Intensive Services) but less likely to scale in turnover, which can be related with the need to have time to materialize gains. This result is robust across sectoral groups and is the only case where the direction of the estimated effect is reversed depending on the growth metric employed (employment or turnover). This illustrates the importance of the metric under analysis and how there might trade-offs to be considered when targeting firms: while frontier firms have more potential to create jobs, laggards are more likely to increase in productivity and therefore to catch-up.

Firms previously scaling in employment or turnover have increased probability to scale again when compared to similar firms that were not scaling. These results are observed both for scaling in employment and in turnover. The estimated effect is

greater for previous turnover scalers scaling in employment, possibly indicating a demand-driven growth process. Sectoral analysis confirms this effect for manufacturing and services for both cases of scaling, while firms in construction display no significant effect for previous employment growth on employment and turnover growth and also a negative effect for previous turnover growth on future turnover growth.

While firms exporting to either EU or extra-EU markets are more likely to scale in employment or turnover, this result is not robust across all sectoral groups. We highlight that exports to European markets seem to impact the probability to scale for firms in knowledge intensive services and low to medium tech manufacturing while exports to extra-European markets display greater impact for firms in less-knowledge intensive services and low to medium tech manufacturing. Since engagement with external markets differs between industries, our ability to estimate these effects is limited, but an overall positive impact is observed, in line with previous results.

Financially vulnerable firms scale less often in employment and turnover, likely due to their decreased ability to finance the investment associated with gaining scale. Sectoral analysis only confirms this result for the service sector and for construction firms scaling in employment.

Table 7: Probability to Scale in Employment/Turnover

	Full Sample	Less Knowledge Intensive Services	Knowledge Intensive Services	Low-Medium Tech Manufacturing	Medium-High Tech Manufacturing	Construction	Education, Health, and Social Services
	Probability to Scale in Employment (in Percentage Points)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log Age	-6.375*** (0.332)	-5.432*** (0.416)	-6.346*** (1.082)	-6.946*** (0.661)	-9.235*** (1.716)	-8.733*** (0.673)	-5.112*** (1.097)
Log Size	-1.997*** (0.308)	-1.415** (0.498)	0.393 (0.955)	-2.975*** (0.450)	-2.865** (0.865)	-2.647** (0.532)	-2.955* (1.204)
Log TFP	4.747*** (0.414)	4.724*** (0.663)	1.299 (0.994)	5.919*** (0.879)	2.938 (1.578)	5.693*** (0.539)	5.268** (1.480)
Previous Employment Scaler	6.565*** (0.629)	7.097*** (0.972)	4.276* (1.549)	8.217*** (1.001)	11.040*** (1.930)	1.723 (1.355)	3.131 (2.215)
Previous Turnover Scaler	10.487*** (0.760)	11.432*** (0.995)	14.326*** (1.558)	9.620*** (0.851)	11.938*** (2.410)	4.661** (1.089)	16.332*** (3.449)
Exports to EU	1.994*** (0.507)	0.842 (0.423)	7.258*** (1.794)	3.145*** (0.558)	5.250 (3.045)	-1.338 (0.818)	2.956 (2.018)
Exports to Extra-EU	1.945*** (0.482)	1.656* (0.668)	-0.745 (1.096)	2.037** (0.655)	0.251 (1.809)	6.126* (1.972)	10.318*** (2.219)
Vulnerable Firm	-1.795*** (0.350)	-2.253*** (0.577)	-5.040** (1.407)	-0.776 (0.427)	0.845 (1.534)	-2.561** (0.592)	-0.221 (2.003)
	Probability to Scale in Turnover (in Percentage Points)						
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Log Age	-5.200*** (0.545)	-3.758*** (0.746)	-8.156*** (1.124)	-5.790*** (0.851)	-8.358*** (2.102)	-6.801*** (0.967)	-6.643** (1.675)

Table 7: Probability to Scale in Employment/Turnover

	Full Sample	Less Knowledge Intensive Services	Knowledge Intensive Services	Low-Medium Tech Manufacturing	Medium-High Tech Manufacturing	Construction	Education, Health, and Social Services
	Probability to Scale in Employment (in Percentage Points)						
Log Size	0.473 (0.375)	0.191 (0.737)	2.742*** (0.668)	0.544 (0.556)	2.453 (1.485)	0.148 (0.673)	-0.879 (0.685)
Log TFP	-4.137*** (0.599)	-2.174* (0.854)	-7.085*** (1.341)	-5.488*** (0.727)	-5.907** (1.577)	-6.548*** (0.812)	-4.763** (1.399)
Previous Employment Scaler	8.051*** (0.594)	8.883*** (0.744)	6.234*** (1.452)	9.433*** (0.821)	11.347*** (2.300)	0.956 (1.094)	8.666*** (0.816)
Previous Turnover Scaler	7.496*** (1.182)	11.416*** (1.178)	7.923*** (1.218)	6.031*** (0.955)	4.054 (2.552)	-4.401** (1.232)	17.093*** (3.306)
Exports to EU	2.836*** (0.795)	2.840* (1.090)	6.889** (1.977)	3.340** (1.145)	6.094* (2.197)	-1.648 (2.127)	4.813* (1.623)
Exports to Extra-EU	1.989** (0.636)	2.140* (1.032)	0.019 (0.889)	2.015* (0.978)	0.159 (1.675)	2.330 (1.332)	0.293 (3.492)
Vulnerable Firm	-1.332** (0.450)	-1.811** (0.638)	-1.980* (0.950)	-0.852 (0.792)	-1.677 (1.859)	-3.190 (1.635)	2.585 (2.293)
3-Digit NACE Ind.	158	44	29	45	20	9	11
Observations	111 006	47 789	8 831	32 408	3 415	12 558	6 005

Coefficients and std. errors in percentage points, *** ($p < 0.001$) ** ($p < 0.01$) * ($p < 0.05$)

On table 8, results for firm's probability to receive tax credits are presented for the full sample by each policy. Age seems to play almost no role in conditioning how likely firms are to receive tax credits, even if younger firms are more likely to display high growth in both turnover and employment. The sole exceptions are RFAI recipients, since younger firms are slightly more likely to receive tax credits, perhaps due to the additional maximum deductions for firms under 3 years old. Instead, size seems to play a very noticeable role in how tax credits are allocated among SMEs, with larger firms more likely to receive fiscal benefits regardless of the type of benefit under analysis. Therefore, based on the scalers analysis, we can conclude that tax credits are allocated to firms with lower probabilities to scale in employment. Even if DLRR's criterion allows for higher deductions for smaller firms, the policy is not necessarily any less biased than others. A possible explanation for how policies are in general more biased towards larger firms are the managerial costs associated with applying and meeting all requirements. These could represent a disproportional burden for smaller firms.

Along the productivity dimension, more productive firms are more likely to receive tax credits in all considered policies. As previously demonstrated, this will prioritize employment scalers instead of turnover scalers. It is worth noting that the magnitude of the estimated coefficient is smaller for R&D deductions through SIFIDE.

Regarding exports and previous growth, most policies tend to prioritize firms that indeed have higher probabilities to gain scale in both employment and turnover. Financial vulnerability also decreases the likelihood of firms receiving tax credits, particularly

for DLRR recipients. The magnitude of this effect is also noticeably higher than that observed for firms' probability to scale, suggesting RFAI and DLRR may leave potential scalers excluded due to vulnerability issues. This result is not necessarily surprising for DLRR recipients since firms with lower financial health are likely unable to reinvest profits, either due to low profitability or the need to allocate profits to debt repayment. For RFAI recipients, entrepreneurs are likely unwilling to bring new investments under poor firm performance.

Table 8: Probability to Receive Tax Credits (in P.P. Change)

	SIFIDE (1)	RFAI (2)	DLRR (3)
Log Age	-0.138 (0.141)	-0.670* (0.278)	0.195 (0.465)
Log Size	2.795*** (0.409)	4.668*** (0.621)	4.304*** (0.584)
Log TFP	0.914*** (0.199)	2.289*** (0.512)	3.603*** (0.660)
Previous Employment Scaler	0.788** (0.271)	1.909** (0.394)	1.878*** (0.481)
Previous Turnover Scaler	0.508** (0.194)	2.971*** (0.536)	3.721*** (0.543)
Exports to EU	0.971** (0.360)	2.153*** (0.465)	3.670*** (0.606)
Exports to Extra-EU	2.375*** (0.311)	3.360*** (0.517)	3.277*** (0.636)
Vulnerable Firm	-0.946*** (0.261)	-3.271*** (0.432)	-9.179*** (0.616)
3-Digit NACE Ind.	158	158	158
Observations	111 006	111 006	111 006

Coefficients and std. errors in percentage points, *** (p < 0.001) ** (p < 0.01) * (p < 0.05)

6. Discussion and Conclusions

Previous research on high-growth firms has often been unsuccessful at offering policymakers' insights into how to support SME's potential gain scale. The multitude of methodologies and datasets adopted has made results hard to generalize. By adopting the same guidelines proposed by the OECD and employing administrative firm level data covering all firms in Portugal, we contribute to consolidate knowledge on the topic and narrow down what aspects still call for further investigation. Additionally, we offer insights on how current tax credits policies in Portugal could be more efficiently allocated towards firms with the most potential to gain scale. The methodology employed measures growth on both employment and turnover, while focusing on within-industry differences across firms, alleviating possible endogeneity issues.

Results confirm previous findings that younger firms are more likely to gain scale in both employment and turnover. Firm size plays a secondary role, with smaller firms only confirmed to scale more often in employment, keeping in mind we measure firm's size in terms of the number of employees. Participation in external markets and financial health were also found to positively impact firm's probability to scale, though effects are not statistically significant for all sectors. Perhaps one of our most relevant results is how productivity (measured as TFP) has a positive impact on firm's probability to gain scale in employment but a negative impact for turnover. It is the only studied dimension where the recommendation of which firms to target is contradictory depending on whether growth is measured in employment vs. turnover. Targeting most productive can promote job creation but may fall short on delivering productivity gains associated with larger firms, at least on the short run. We believe this largely reflects adjustment costs as argued by Coad and Broekel (2008). It also provides evidence that laggard firms can catch-up, even if they are less capable of creating jobs while doing so. Regarding the persistence of growth experienced by scale-ups, previous scalers in both employment and turnover were more likely to scale up again in either dimension. Nonetheless, the estimated effect ranges from 6.5 to 10.5 p.p., confirming previous results that repeating growth events is the exception rather than the norm.

Given our estimation results, tax credits in Portugal could be more efficient at targeting firms with the most potential to scale up. R&D tax credits' (SIFIDE) allocation is generally biased towards high-technology sectors, and investment credits (RFAI) are hardly demanded by non-manufacturing firms. Since scalers are primarily represented by firms operating less-knowledge intensive services, many potential scalers did not benefit from these policies. Only profit retention and reinvestment tax credits (DLRR) were allocated more evenly across sectors. Within industries, larger firms were preferential targets while age played little to no role, policies could therefore benefit from explicitly targeting younger firms, especially considering how the country adopts less age targeted policies than the OECD average (OECD 2022). Finally, most productive firms were also preferential targets, with policies therefore being efficient at job creation but potentially at the sacrifice of firm's productivity, an important trade-off that needs to be considered by policymakers.

While our findings help determine which firms are better suited to scale-up and whether they are accordingly targeted, they are no indication of how tax credits are efficient at increasing the number of firms gaining scale, particularly considering how outcomes might not be homogeneous across firms. Increasing the knowledge on how scalers differ among themselves before, during and after gaining scale will allow policymakers to diversify initiatives by adopting a broader set of policy instruments based on firm's particular needs. Our findings regarding firm productivity certainly call for further investigation, since this dimension helps differentiate which firms go on to gain scale in employment but not in turnover (and vice versa). The current lack of standard definition for micro high-growth firms (or scalers) is also a considerable drawback in extending this analysis since they represent the vast majority of Portugal's firm demography.

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