Linking Size and Productivity of High-Growth Firms

Eleonora Santos
Centre of Applied Research in Management and Economics Polytechnic Institute of Leiria. Leiria, Portugal
eleonora.santos@ipleiria.pt

ABSTRACT

Since the beginning of the XXI century, several factors, largely triggered by the global financial crisis, have led to a drop of the aggregate productivity of the Portuguese economy. Despite the evidence that High-Growth Firms (HGFs) contribute significantly to economic growth, empirical literature falls short on exploring the link between HGFs and productivity in Portugal. Using panel data form SABI and Quadros do Pessoal, this paper investigates the link between HGFS' output growth [size] and productivity growth, across sectors and regions. The sample comprises 432 large firms, for 2015-2019, of which 16 are HGFs. Results confirm the link between size and productivity growth, but in what concerns HGFs this link only occurs in firms located in The Metropolitan Are of Lisbon operating in Publishing activities.

CCS CONCEPTS

• :; • **Applied computing**; • **Law, social and behavioral sciences**;

KEYWORDS

Firm size, management practices, high-growth firms, productivity

ACM Reference Format:
Eleonora Santos. 2022. Linking Size and Productivity of High-Growth Firms. In *2022 8th International Conference on E-business and Mobile Commerce (ICEMC 2022), May 13–15, 2022, Seoul, Republic of Korea.* ACM, New York, NY, USA, 5 pages. https://doi.org/10.1145/3543106.3543131

1 INTRODUCTION

The literature on industrial organization shows that the distribution of corporate growth rates follows a symmetric or Laplace exponential distribution [1], according to which few firms experience a very rapid growth or a very rapid decline. This suggests that the dynamics of industries is driven not by the stagnant majority, but by a minority of discrepants [2]. HGFs, also known as gazelles [3], provide evidence of a region's competitiveness and dynamism, potentially contributing to economic growth and job creation [4-6]. Although there are several definitions of HGFs [6-7], the one from OECD is widely adopted: a HGF is "a firm with annualized average growth [in number of employees or turnover] of over 20% per year over a three-year period with a minimum of 10 employees at the beginning of the growth period" [8].

ICEMC 2022, May 13–15, 2022, Seoul, Republic of Korea

ACM ISBN 978-1-4503-9716-2/22/05…$15.00
https://doi.org/10.1145/3543106.3543131

In recent decades, Europe is lagging other economies located on the technological frontier in terms of generating innovative HGFs that can become global leaders. This gap has raised concerns among European institutions, which are leading to growing interest in promoting the emergence of innovative HGFs. Accordingly, the Horizon 2020 framework recommended a new systematic approach to develop the capacity of small and medium-sized enterprises (SMEs) to innovate and create jobs. In particular, the European Enterprise Policy aimed to promote firms' competitiveness to promote investment, innovation, human capital, internationalization, and productivity growth.

Thus, there has been a focus on research on HGFs to assist public policy decision-making as well as managerial policies related to strategic decision-making, namely regarding resource allocation [9]. Empirical literature suggests that there is a virtuous cycle between productivity and high growth: High productivity firms are more likely to grow faster in terms of sales, while HGFs are more likely to achieve high productivity growth [10]. Therefore, there is a positive relationship between the dynamism of corporate growth rates and the aggregate productivity growth [11].

Portugal is currently facing a slowdown in productivity growth and, as productivity growth is the main source of differences between countries regarding per capita income, there has been a slower improvement in living standards. However, few studies have addressed the behavior of HGFs in Portugal, and none focused on the regional dimension. Since HGF resources vary across regions, due to their differing resource endowments, economic structures, and business environments [12], it is necessary to adapt the best policy to support specific regional characteristics. Thus, this paper investigates the link between size and productivity growth of HGFs across sectors and regions of mainland Portugal. Using data from the SABI database and Quadros do Pessoal, a sample of 432 large firms was collected for 2015-2019. The choice of large firms is justified by the relationship between productivity and firm size, assuming that the largest are the most productive. There are mechanisms that explain the link between firm size and productivity growth: growing firms can use more specialized inputs and/or better coordinate their resources, invest in new technologies and adopt more efficient production methods [13], and are more likely to experience higher productivity growth in the future [10].

The paper is organized as follows. Section 2 covers a literature review. Section 3 presents the data and methodology used to calculate productivity and concentration level. Results are reported in Section 4. Section 5 provides concluding remarks.

2 LITERATURE REVIEW

There is a growing interest in Academia in the characteristics of HGFs, since the seminal work of [14]. Accordingly, worldwide policymakers aim to contribute for an environment that sustain and foster the development of HGFs to increase employment [15].

The discussion of the link between HGFs and productivity has been limited. One of few exceptions is [4]. With US data for 1998-2002, they compare statistical means between high-and low-impact firms, and find that, in general, HGFs have higher labor productivity than low-impact firms. Another study uses data for 12 OECD countries, for 2002–2005, to test the relationship between TFP growth and the dynamics of the growth distribution. Results show that the share of growing and shrinking firms is associated with faster productivity growth. In particular, the greater the share of firms that remain static, the lower the productivity growth observed. Thus, he suggests that a reason for Europe's lower productivity is having a larger share of static firms.

Using static and dynamic decomposition estimates of labor productivity growth changes, for the UK over the period 1998–2007, [16] show that HGFs experience large productivity growth, but their contribution to the aggregate productivity is limited. Another study [17] investigate whether HGFs, defined in different ways, are equally important to the growth in different economic output variables, namely productivity. Using correlations according to [18] methodology, and data for Sweden, in 1997-2010, they find that HGFs contribute largely to TFP growth. Also, for the UK [10] investigate the empirical link between TFP growth and HGFs, in 2001-2010. The quantile regression analysis shows that HGFs tend to experience faster TFP growth. The study of [7] evaluate if HGFs contribute to output and productivity growth. The authors perform decompositions of industry level productivity growth for US firms, in 1976-2013. Results indicate that HGFs contribute greatly to output and productivity growth. Another study [19] analyze the productivity contribution of Finnish firms in the business sector and assess the role of the dependency status. They decompose the productivity growth using [20] methodology, for 2002-2014. They find that dependent firms provide a larger contribution to aggregate productivity growth, compared to the independent ones, regardless of the industry, size, and age. The interactions between high growth episodes in terms of size and productivity in Spain, for 2002-2012 are investigated by [21]. The results, using fixed effects, indicate that firm size increases the likelihood of high growth in productivity. However, the effect from size to productivity is smaller than the effect from productivity to size. Another study [22] compares the performance of Scottish HGFs with other UK regions, regarding high-growth performance, for 2013-2016. The statistics show that HGFs in Scotland contribute less to productivity growth than those in other parts of the UK. Finally, another study [23] analyzes HGFs in Ethiopia, in 1996-2009. Using the [24] methodology to estimate plant-level TFP, the author concludes that past high-growth experience is significant and positively associated with subsequent growth in firms' productivity.

3 EMPRICAL STRATEGY AND DATA

This paper calculates the labor productivity as the ratio between turnover and the number of employees. to assess the relative performance of large firms1 across NUTS II regions in mainland Portugal, during 2015-2019.

Data on larger firms are obtained from SABI financial reports. Bureau van Dijk (BvD) collects and harmonizes the data from the mandated firms' reports. Data come from Informação Empresarial Simplificada (IES).2 This information is collected in a massive way by Coface, BvD's partner for Portugal, that send it to BvD for consequent upload in the SABI database. The balanced panel data set includes 432 large firms for the 5 years. The sample size allows to draw conclusions with 95% confidence. The sample was split into 16 HGFs and the remaining non-HGFs, using the OECD definition, with turnover being the measure of growth, in line with previous studies [10, 25]. Regarding the sectoral distribution of firms, the largest sector in terms of number of firms is the human health activities followed by the retail trade, except of motor vehicles and motorcycles, with 44 and 42 firms, respectively, adding up to 20% of total firms in the sample. The region of Lisbon concentrates 43% and 81% of firms belonging to those sectors. In fact, regarding spatial distribution, 54% of firms are in the Metropolitan area of Lisbon, 29% in the Northern region and 13% in the Centro region. The regions of Alentejo and Algarve hosted only 4% of larger firms, in 2015-2019. There are 6 HGFs in the Northern region and 10 in the Lisbon region, representing 38% and 63% of the sample of HGFs, respectively.

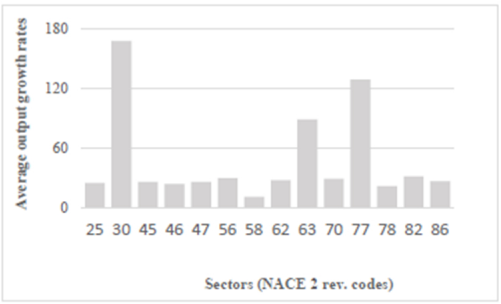

Figure 1: Average output growth rate of HGFs, 2015-2019

In terms of average firm size (using the number of employees), the sectors of land transport and transport via pipelines (4,700); social work activities without accommodation (2,488) and publishing activities (1,646), are the sectors with the largest firms in the referred five-year period. In contrast, when average firm size is measured by the value added in Euros, the sectors with higher mean value added are coke and refined petroleum products; telecommunications; and electricity, gas, steam, and air conditioning supply. In the Northern region the larger firms operate in information service activities (33,473), followed by food and beverage service activities (21,359); while in Lisbon the larger firms operate in sectors of office administrative, office support and other business support activities (66,689), activities of head offices; management consultancy activities (41,175) and human health activities (39,735).

Fig. 1 shows the average output for the sample of HGFs, in 2015-2019, using the NACE 2 revision codes.

In this period, firms operating in other transport equipment (NACE code 30) record the larger average output growth; followed by firms in rental and leasing activities (NACE code 77) and in information service activities (NACE code 63).

Table 1: Average Productivity by Region, 2015-2019

Region	Labor Productivity
North	0.56
Centro	0.60
Lisbon	0.44
Alentejo	0.49
Algarve	0.27

Table 2: Average Productivity Growth of HGFs by Region, 2015-2019

Region	Labor Productivity
North	0.38
Lisbon	0.25

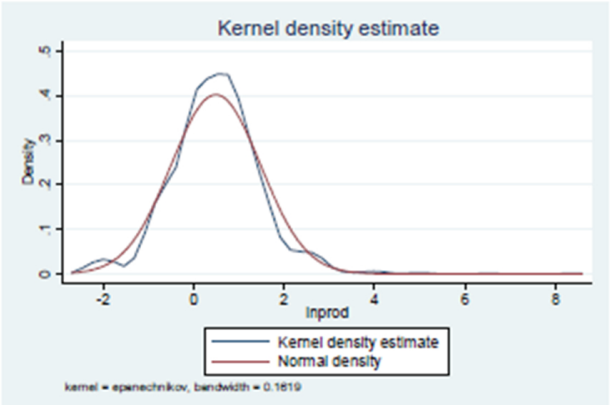

Figure 2: Distribution of the logarithm of the labor productivity

4 RESULTS AND DISCUSSION

On average, sectors operating in electricity, gas, steam, and air conditioning supply; activities of head offices; management consultancy activities; and coke and refined petroleum products, display the highest values of labor productivity in the referred period.

Table 1 shows the average productivity for the whole sample of firms, by region. The average labor productivity is higher in the Centro region followed by the Northern region. The region of Algarve shows the lowest average level of productivity.

Note- values in logs. Source: Author's calculations using Stata 16.0

Table 2 shows the average labor productivity of HGFs, by region.

Note- values in logs. Source: Author's calculations using Stata 16.0

The average labor productivity of HGFs is higher in the Northern region.

Table 3 shows that, in the Northern region, firms with higher labor productivity operate in wholesale trade, except of motor vehicles and motorcycles (1.70), rental and leasing activities (1.35) and other transport equipment (1.04); while in Lisbon, firms operating in employment activities (2.04), metal products (1.18) and wholesale and retail trade and repair of motor vehicles (1.07) display higher levels of labor productivity.

Note- values in logs. Source: Author's calculations using Stata 16.0

Fig. 2 plots the distribution of the logarithm of the labor productivity for the entire sample.

Empirical studies at firm level report that firms are strongly heterogeneous in various performance measures, namely size and productivity [26]. Thus heterogeneity, within sectors, matters for assessing the link between size and productivity. Fig. 2 confirms that there is a considerable amount of heterogeneity in productivity at firm level. The observed heterogeneity across firms makes crucial the analysis at microeconomic level of the link between turnover growth and productivity growth, to ascertain if growth in larger firms involve productivity increases, or not. Results on the correlation between the growth rates of output and labor productivity growth rates show that, in the Northern region, output growth of the largest firms is significantly and negatively related to labor productivity growth in the sectors of administrative office, office support and human health activities. However, it is significant, strong, and positively related with labor productivity growth in the sectors of metal products, other non-metallic mineral products, and furniture.

In the Centro Region, the output growth of the largest firms is significantly and negatively related to labor productivity growth in human health activities, and is especially significant, strong, and positively associated with labor productivity growth in paper products and rental and leasing activities. In Lisbon, the larger firms' output growth is particularly significant and positively related to labor productivity growth in the sectors of public administration and defense, and computer programming and consultancy. In Alentejo, there is a significant, strong, and positive correlation between firms' output growth and labor productivity growth in the sectors of mining of metal ores; electrical equipment; accommodation; other transport equipment; and other personal service activities. In Lisbon, significant, strong, and positive correlations are found between HGFs' output growth and labor productivity growth in publishing activities (0.94).

To sum-up, there is a significant, strong, and positive correlation between output growth and labor productivity growth but only in some sectors. This happens, especially in the metropolitan region of Lisbon, followed by the Northern and Centro regions. However, these results are not surprising bearing in mind that most of the largest firms are in Lisbon and the Northern region. Regarding the HGFs, the correlation between firms' output growth and labor productivity growth is found only in firms operating in publishing activities in Lisbon. In such activities, it is recommended that managers attempt to identify the "best practices" that account for higher firm performance and seek to reproduce them within their firms; while policymakers are particularly interested in the identification of these HGFs due to their extraordinary potential regarding employment and ability to boost economic growth.

Table 3: Maximum labor productivity of HGFs, 2015-2019

Sector	North	Lisbon
Fabricated metal products, except machinery	0.95	1.18
Other transport equipment	1.04	
Wholesale and retail trade and repair of motor vehicles		1.07
Wholesale trade, except of motor vehicles and	1.70	
Retail trade, except of motor vehicles and motorcycles		0.72
Food and beverage service activities	0.76	
Publishing activities		0.75
Computer programming & consultancy		0.94
Information service activities	0.34	
Activities of head offices; management consultancy		0.02
Rental and leasing activities	1.35	
Employment activities		2.04
Office administrative, office support and other business		0.58
Human health activities		0.41

5 CONCLUDING REMARKS

It is often argued that, because Portugal is a small open and moderately innovative economy [27-28] with a high prevalence of small firms, located on the periphery of Europe, it is vulnerable to external factors that undermine economic growth. In addition, the potential of convergence of the economy has been threatened by the sluggish growth of productivity, since 2000. Notwithstanding, the role of manufacturing labor productivity has been historically important. In 1986-2016, the productivity per worker was, on average, the double of that of services and three times higher than in agriculture. Furthermore, in the last 30 years, Portugal has quadrupled the share of resource allocation to R&D activities, from 0.4% of GDP in 1986, to a maximum of 1.6%, in 2009. However, the effects of innovation on economic growth have not been translated into real convergence (measured by real GDP per capita) of Portugal towards the EU-28 level [29]. In this context HGFs are regarded as a world panacea to tackle employment and economic growth difficulties. However, an interesting omission within the HGF empirical literature is the lack of regional dimension. The present study aims at filling this gap.

Results suggest a positive correlation between HGFs' output growth and productivity growth but only in firms operating in publishing activities in Lisbon region. Thus, it is recommended that top management of these firms continue to implement the "best practices" that account for their firms' higher performance. Smaller firms should learn from HGFs in the publishing sector to improve their performance. On the part of Government action, promoting HGFs may be difficult at country level due to regional differences. Thus, it is necessary that policies address structural reforms that remove barriers to entry and growth, promote innovation and support sectorial clusters to provide an adequate environment for the emergence of HGFs. Evaluation from a productivity perspective can create better policies, since policy evaluation is not applied regularly, jeopardizing the ability to constantly learn and improve public policy. In this context, policy reforms supporting resource allocation that might improve competitiveness are likely to promote higher economic returns.

ACKNOWLEDGMENTS

This research is financed by National Funds of the FCT – Portuguese Foundation for Science and Technology within the project «UIDB/04928/2020».

REFERENCES

[1] Bottazzi, G., & Secchi, A. (2006). Explaining the distribution of firm growth rates. The RAND Journal of Economics, 37(2), 235-256.
[2] Bottazzi, G., Cefis, E., Dosi, G., (2002). Corporate Growth and Industrial Structure: Some Evidence from the Italian Manufacturing Industry. Industrial and Corporate Change 11, 705-723.
[3] Lopez-Garcia, P., & Puente, S. (2012). What makes a high-growth firm? A dynamic probit analysis using Spanish firm-level data. Small Business Economics, 39(4), 1029-1041.
[4] Acs, Z. J. (2011). High-impact firms: Gazelles revisited. In M. Fritsch (Ed.), Handbook of research on entrepreneurship and regional development: National and regional perspectives Cheltenham: Edward Elgar Publishing, 133–174.
[5] Coad, A., Daunfeldt, S. O., Hölzl, W., Johansson, D., & Nightingale, P. (2014). High-growth firms: introduction to the special section. Industrial and corporate change, 231, 91-112.
[6] Daunfeldt, S. O., & Halvarsson, D. (2015). Are high-growth firms one-hit wonders? Evidence from Sweden. Small Business Economics, 44(2), 361-383.
[7] Haltiwanger, J., Jarmin, R. S., Kulick, R., & Miranda, J. (2016). High growth young firms: contribution to job, output, and productivity growth. In Measuring entrepreneurial businesses: current knowledge and challenges. University of Chicago Press, 11-62.
[8] OECD (2007) High Growth Enterprises and Gazelles, OECD, Paris.
[9] Ireland, R. D., Hitt, M. A., & Sirmon, D. G. (2003). A model of strategic entrepreneurship: The construct and its dimensions. Journal of management, 29(6), 963-989.
[10] Du, J., & Temouri, Y. (2015). High-growth firms and productivity: evidence from the United Kingdom. Small business economics, 441, 123-143.
[11] Bravo-Biosca, A. (2011). A look at business growth and contraction in Europe. In 3rd European Conference on Corporate R&D and Innovation CONCORD. Working Paper No. 11/02.
[12] Mason C, Brown R (2013) Creating good public policy to support high-growth firms. Small Bus Econ 40(2):211–225.
[13] Halkos, G. E., & Tzeremes, N. G. (2007). Productivity efficiency and firm size: An empirical analysis of foreign owned firms. International Business Review, 16(6), 713-731.
[14] Birch, David L. (1981). Who Creates Jobs? The Public Interest 65, 3-14.
[15] Storey, D. J. (1994), Understanding the Small Business Sector. London: Routledge.
[16] Mason, G., Robinson, C., & Bondibene, C. R. (2012). Fast-growing firms, product strategies and skills development. NESTA, London.
[17] Daunfeldt, S. O., Elert, N., & Johansson, D. (2014). The economic contribution of high-growth firms: do policy implications depend on the choice of growth indicator? Journal of Industry, Competition and Trade, 14(3), 337-365.
[18] Shepherd, D., & Wiklund, J. (2009). Are we comparing apples with apples or apples with oranges? Appropriateness of knowledge accumulation across growth

studies. Entrepreneurship Theory and Practice, 33(1), 105-123.
[19] Fornaro, P., & Luomaranta, H. (2017). Small and medium firms, aggregate productivity, and the role of dependencies No. 47. ETLA Working Papers.
[20] Maliranta, M. (2003). Micro level dynamics of productivity growth. An empirical analysis of the great leap in finnish manufacturing productivity in 1975-2000. ETLA A.
[21] Guillamón, C., Moral-Benito, E., & Puente, S. (2017). High growth firms in employment and productivity: dynamic interactions and the role of financial constraints? Banco de España, Documento de Trabajo N. º1718.
[22] Turnbull, J., & Richmond, K. 2018. Performance of high growth firms in Scotland. Fraser of Allander Economic Commentary, 422, 33-43.
[23] Grover, A. G. (2019). Firms Far Up! Productivity, Agglomeration and High-Growth Firms in Ethiopia (No. 9099). The World Bank.
[24] Levinsohn, J., & Petrin, A. (2003). Estimating production functions using inputs to control for unobservables. The review of economic studies, 70(2), 317-341.
[25] Mason, C., & Brown, R. (2010). High growth firms in Scotland. Research report, Glasgow: Scottish Enterprise.
[26] Melitz, M. J. (2008). International trade and heterogeneous firms. The New Palgrave Dictionary of Economics, 2.
[27] Scoreboard, I. U. (2010). The Innovation Union's performance scoreboard for Research and Innovation (2011). The Maastricht Economic and social Research and training centre on Innovation and Technology (UNU-MERIT) with the contribution of DG JRC G3 of the European Commission.
[28] Santos, E., & Khan, S. (2019). FDI Policies and Catching Up. Journal of Applied Economic Sciences, 13(7 (61)), 1821-1853.
[29] Mateus, A. (Ed.). (2015). Três décadas de Portugal europeu: balanço e perspetivas. Fundação Francisco Manuel dos Santos.