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Are subsidiaries of foreign multinationals more productive than Portuguese firms?

Mariana Martins Gomes

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Ana Teresa Tavares Lehmann

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Biographic note

Mariana Gomes was born in São João da Madeira on the 29/03/2001.

His academic journey began at the University of Aveiro, where he earned a bachelor degree in economics. During her undergraduate studies, Mariana gained a strong foundation in economic theory, which led to her interest in international economic dynamics and global markets

Building on this solid foundation, Mariana continued her studies at the University of Porto, where she enrolled in a Master's program in International Economics and Management. This program allowed her to delve into the complexities of global financial systems, international trade and strategic planning. During the studies, research interests and academic projects focused on the convergence of financial systems and global business models, further enhancing his knowledge in these areas.

Throughout her academic career, Mariana has demonstrated a commitment to understanding and analyzing the economic challenges and opportunities presented by companies operating in a global context.

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Abstract

The present dissertation studies the productivity in Portugal, specifically the outcome of multinationals with presence on the country in comparison with domestic owned firms.

Engaging in a comprehensive analytical framework, the study explores the definition of key concepts like foreign direct investment and productivity, to better understand what's in cause. The review of literature also includes some theories about foreign direct investment and multinationals referring what influence them when it comes about internationalization.

It is also mentioned some factor influencing productivity, such as organizational structure, managerial practices, technology adoption, and workforce dynamics. The research employs quantitative methods, including data analysis and statistical modeling using data collected from SABI database for the time period of 2013-2022. By comparing and contrasting the productivity levels of multinationals and domestic firms, the dissertation aims to provide valuable insights into the determinants of economic efficiency in the Portuguese business landscape. Using an econometric model, employing the Generalized Least Squares (GLS), we can say that our results are in line with what is predicted in the literature. That is, foreign owned firms are more productive than domestic counterparts. The findings are useful to policymakers, business leaders, and anyone interested in enhancing the overall productivity and competitiveness of firms within the Portuguese economy.

Keywords: Productivity, multinational enterprises (MNEs), domestic firms, foreign direct investment (FDI).

Resumo

A presente dissertação estuda a produtividade em Portugal, especificamente o resultado das multinacionais com presença no país em comparação com as empresas nacionais.

Através de um quadro analítico abrangente, o estudo explora a definição de conceitos-chave como investimento direto estrangeiro e produtividade, para melhor compreender o que está em causa. A revisão da literatura também inclui algumas teorias sobre o investimento direto estrangeiro e as multinacionais, referindo o que as influencia quando se trata de internacionalização.

São também mencionados alguns fatores que influenciam a produtividade, tais como a estrutura organizacional, as práticas de gestão, a adoção de tecnologia e a dinâmica da força de trabalho. A investigação emprega métodos quantitativos, incluindo análise de dados e modelação estatística, utilizando dados recolhidos da base de dados SABI para o período de 2013-2022. Ao comparar e contrastar os níveis de produtividade das multinacionais e das empresas nacionais, a dissertação visa fornecer informações valiosas sobre os determinantes da eficiência económica no panorama empresarial português. Utilizando um modelo econométrico, empregando os Mínimos Quadrados Generalizados (GLS), podemos dizer que os nossos resultados estão em linha com o que é previsto na literatura. Ou seja, as empresas detidas por estrangeiros são mais produtivas do que as suas congéneres nacionais. Os resultados são úteis para decisores políticos, líderes empresariais e todos os interessados em aumentar a produtividade e a competitividade das empresas na economia portuguesa.

Palavras-chave: Produtividade, empresas multinacionais (MNs), empresas nacionais, investimento direto estrangeiro (IDE).

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List of acronyms

DO – Domestic Owned

EU – European Union

FDI – Foreign Direct Investment

FO – Foreign Owned

GLS – Generalized Least Squares

GVA – Gross Value Added

MNE – Multinational

OECD – Organization for Economic Cooperation and Development

OLI – Ownership, Location and Internalization

OLS – Ordinary Least Squares

R&D – Research and Development

SABI – Iberian Balance Sheet Analysis System

TFP – Total Factor Productivity

Introduction

Productivity is a key issue in economic growth and development (Korkmaz & Korkmaz, 2017; Mills, 1952; Timmer, Inklaar, O'Mahony, & Ark, 2011). In Portugal, in particular, it is a subject regularly discussed, as the country displays historically labor productivity levels below most EU (European union) countries (Correia & Barradas, 2021) , leading to low wages, low economic dynamics, and overall competitiveness (Ark, Vries, & Pilat, 2024).

Productivity is one way to measure the firm's economic performance that compares the amount of output with the input (Aronoff & Kaplan, 1995; Syverson, 2011). It can be affected by firm's technological level, employees' soft and hard skills, available infrastructures, and innovation (Christmann, Day, & Yip, 1999; Nicoletti, Rueden, & Andrews, 2020).

The Portuguese economy has become increasingly diversified, with the service sector gaining prominence as the sector that employs the most people. This development has accelerated since joining the European Union. Given that the services sector tends to have slower productivity growth than other sectors, a country's total productivity growth based on this sector is naturally greatly affected. However, the emergence of new technologies, for example artificial intelligence, could play a decisive role in changing this paradigm of low productivity growth (Sorbe, Gal, & Millot, 2018).

Foreign direct investment (FDI) is also one of the factors that affects productivity (Helpman, Melitz, & Yeaple, 2004). The presence of FDI in a host economy is materialized in the operations of foreign-owned affiliates (Blomstrom & Kokko, 1996). The presence of such firms is considered, in most of the literature, beneficial to the economy, and productivity is a key variable studied (Kim, Lee, & Jeong, 2018; Csafordi, Lorincz, Lengyel, & Kiss, 2020). Such foreign subsidiaries tend to be larger in comparison with local firms which may lead to higher export propensity, more qualified workers, higher wages and, thus, higher productivity (Cardoso, 2008; Broniatowska & Strawinski, 2021).

The role of new technologies is fundamental, as already mentioned (Ark, Vries, & Pilat, 2024). Their implementation is subject to the level of availability and capacity of companies to innovate. Here, the position of multinationals in Portugal is essential because they are the

companies that are most committed to innovation due to their greater financial availability, higher salaries, greater ability to attract talent, etc. (Silva, Afonso, & Africano, 2013).

The present study aims to understand if, as expected in most literature, foreign-owned subsidiaries display higher productivity than their domestic Portuguese counterparts. In order to achieve this main objective, it is important to research and analyze the productivity levels of the two types of companies (multinationals and domestics) in order to identify patterns. The domestic firms can be divided in exporters and non-exporters to evaluate how that characteristic can influence their performance.

The research question underlying this study will be: “Are subsidiaries of foreign multinationals more productive than Portuguese firms?” and its relevance is justified by the centrality of this topic for our economy, and also given that, to the best of your knowledge, no study has been dedicated specifically to this topic in Portugal, hence allowing us to contribute to extant literature.

The investigation will be divided into two parts:

- 1- A comprehensive literature review on productivity and FDI including the literature that can be found in the Portuguese case, from which hypotheses will be derived, to be tested empirically later.
- 2- An empirical study, consisting on an econometric model, with data extracted from the SABI database. The model will have productivity (measured by GVA (€)/number of employees) as the dependent variable and foreign ownership as the main explanatory variable. The model will also include other independent/control variables such as size, age and sector.

Chapter 1. Literature review and theoretical framework

1.1. Concepts

1.1.1. Productivity and its metrics

The term productivity is often considered multidimensional depending on the context in which it is used (Tangen, 2005). It is one of the most important economic variables in managing and increasing the competitiveness of a wide variety of activities at both micro and macro level (Tangen, 2005).

The first idea of the concept of productivity dates back to 1766 by Quesnay (Quesnay, 1766), in the same century as the start of the industrial revolution (Tangen, 2005). However, as mentioned above, there are numerous possibilities for defining and calculating productivity that various authors have suggested over time. Some chose only to mention what the calculation formula would look like (mathematical definitions), and others chose to describe what would define productivity as a concept described in full (verbal definitions) (Björkman, 1992).

That being said, we can list some examples of those definitions. In relation to the mathematical ones, we have Productivity = units of output/units of input (Chew, 1988); Productivity = actual output/expected resources used (Sink & Tuttle, 1989); Productivity = (output/input) * quality = efficiency * utilization * quality (Al-Darrab, 2000).

In regard to the verbal ones, Björkman (1992) affirmed that to achieve good levels of productivity is necessary to involve material resources, capital, and technology and as a matter of personal approach it is an ongoing commitment to improvement of surrounding environment. Thurow (1993) gives other approach where he says that productivity (as output per hour of work) is what primarily influences the quality of living in the long run. And Moseng and Rolstadås (2001) state that productivity is the capacity to meet the market's demand while minimizing the utilization of resources to do it.

Verbal definitions are especially useful in helping companies define their strategies according to their objectives (Björkman, 1992). Alternatively, mathematical definitions do not aim to explain the concept itself, but rather to provide ways to help understand how to increase productivity, since they mention which variables need intervention (Tangen, 2005).

It is important to mention that we can use single-factor productivity or total factor productivity (TFP). Single-factor productivity measures quantify the output generated per unit of a specific input. Among these, labor productivity is the most frequently utilized metric, although measures of capital productivity and, on occasion, materials productivity are also employed. It is important to note that single-factor productivity levels are influenced by the utilization intensity of inputs that are not accounted for in the measurement (Syverson, 2011). Therefore, to address this limitation, researchers frequently adopt the TFP because it remains invariant to the intensity of use of all observable inputs (Kim, Lee, & Jeong, 2018; Xin & Wei, 2024).

Conceptually, TFP captures differences in output derived from a fixed set of inputs, with higher TFP indicating that a producer can generate greater output with the same combination of observable inputs compared to producers with lower TFP (Syverson, 2011).

1.1.2. Foreign Direct Investment (FDI) and related concepts

When companies decide to internationalize, they have several alternatives, i.e. entry modes, at their disposal. Their decision varies according to their objectives in this process and their willingness to commit resources (Dunning & Lundan, 2008).

Entry modes are divided into equity modes and non-equity modes. Non-equity modes are processes external to the company, while equity modes are the opposite (Yang, Wang, Lyu, & Yang, 2021). Non-equity includes exports, licensing/franchising, subcontracting, management contracts, production sharing, turnkey contracts, and strategic alliances. Equity covers joint ventures and one hundred per cent subsidiaries. Only equity modes of entry are considered as FDI (Holtgrave & Onay, 2007).

FDI is considered the most powerful mode of entry into foreign countries due to the large amount of resources (technological, human, financial, etc.) it requires (Datta, Hemmann, & Rasheed, 2002).

The most accepted definition of FDI is the OECD Benchmark Definition (OECD, 2009), which states that “Direct investment is a category of cross-border investment made by a resident in one economy (the direct investor) with the objective of establishing a lasting interest

in an enterprise (the direct investment enterprise) that is resident in an economy other than that of the direct investor”. This is a strategic and long-term relationship in order to ensure a substantial level of influence in the management of the receptor (OECD, 2009).

This definition has the purpose of setting a standard for the definition of FDI in order to standardize worldwide statistics in relation to this parameter (OECD, 2009).

When undertaking FDI, a choice must be made on the level of control of the foreign operation. That is, whether to opt for total control (subsidiary involving 100% of control of the foreign firm – wholly-owned subsidiary) or partial control (joint venture with at least one more company).

Choosing between joint ventures and subsidiaries needs a balance between advantages and disadvantages to minimize the risks and maximize the profit.

The creation of a joint venture requires the formation of a new legal entity involving the equity provided by at least two parent companies. That said, there is a reduction in risk due to the sharing of costs, a lower initial investment (compared to the level of investment required when conducting the business individually) and a greater gain in resources. It will be particularly advantageous when one of the companies already has extensive knowledge of the market in which they will be operating (Stewart & Maughn, 2011).

However, it should be borne in mind that this mode of entry involves individually distinct companies with potentially different strategic interests, which can lead to possible disagreements in management. When sharing resources, there is also a risk that access to knowledge or technologies that differentiate one of the companies will be passed on (Stewart & Maughn, 2011).

In the case of opting for a wholly-owned subsidiary, these risks disappear because there is no sharing of decisions or knowledge with other companies. Of course, this implies greater risk and resources.

1.1.3. Multinational and subsidiary companies

A multinational enterprise (MNE) is a company that operates in many countries beyond its home country, usually through direct investments, such as manufacturing facilities,

research and development facilities, or other locations located in the area. The goal is usually to improve efficiency, reduce costs, reach new markets, and adapt to local market conditions (Dunning & Lundan, 2008).

A subsidiary is a separate legal entity that is owned or controlled by the parent company (usually an MNE). Subsidiaries operate in host countries and contribute to the MNE's global strategy by providing specific services such as manufacturing, sales, and services. (Birkinshaw, Hood, & Young, 2005).

Subsidiaries of multinational corporations (MNEs) are pivotal actors in the contemporary global economy. Bouquet and Birkinshaw (2008) highlight that, although subsidiaries operate under the overarching control of their parent companies, they also possess their own sources of power and influence. Researchers contend that effective subsidiary management extends beyond merely executing the directives set forth by the parent company and involves excelling in the current mandate while simultaneously pursuing strategic initiatives that generate new value for the corporation (Delany, 2000).

The concept of subsidiary role development, nowadays, is often described as a shift from a focus on meeting baseline expectations to one of engaging in actions that are strategically beneficial and make sound business sense (Sargeant, 1990).

Although existing literature provides various prescriptive strategies for subsidiary role development, these approaches often lack the flexibility necessary for practical application. Therefore, we advocate for a more open and discursive approach that critically examines and enhances current practices, allowing for a more nuanced understanding of subsidiary management (Corry & Cormican, 2019).

1.2. Theories of FDI and MNEs

The theories related to FDI and MNEs that matter for this dissertation are related to the concept of advantage. So, it is relevant to talk briefly about the contribution of Stephen Hymer about FDI operations, the OLI paradigm, the theory of internalization, and the contribution of Melitz about heterogenous firms.

1.2.1. The contribution of Hymer

Hymer (1960) was the first author to state that the existence of advantages in carrying out FDI was based on the presence of market imperfections.

The existence of these market imperfections means that certain companies have more market power than others giving them competitive advantage. According to the author, this market power is the compensation that companies obtain because the internationalization process involves high risks. The intent of internationalization is not to reduce costs, but to enable but to exploit the firm's advantages better.

For Hymer, the main factor influencing the decision on the FDI and the activity of multinationals as a whole is the integration advantages acquired. These advantages can come either from the value acquired or, for example, from the powers of a monopoly (Dunning & Pitelis, 2007).

1.2.2. OLI Paradigm

Developed by Dunning (1977), this paradigm aims to relate the characteristics of countries to the internal characteristics of the company. Therefore, according to this approach, the choice of FDI is only profitable if ownership advantages, internalization advantages and location advantages are combined.

Ownership advantages are divided into asset-based advantages, lower transaction cost advantages and institutional advantages. They are related to the fact that the company has specific assets that differentiate it in the market.

Location advantages arise if the country of destination for internationalization has important characteristics that the country of origin does not have, such as favorable government policies or the availability of production factors.

The advantages of internalization come from the opportunity to create market failures or avoid them. Choosing between internalize or externalize considers the advantages of exploiting the ownership advantages internally.

Generally, the greater the importance of leveraging ownership advantages in a particular foreign country, the higher the likelihood of internalizing operations through FDI (Ferreira, Pinto, Serra, & Santos, 2013).

Different motivations to enroll in foreign investments are proposed by Dunning (1988). They include resource seeking, market seeking, strategic asset seeking, and efficiency seeking. This last one is pertinent in our study because this motivation aims to improve the MNEs efficiency and productivity, for instance, by optimizing the division of labor or by specializing its resources.

1.2.3. Theory of Internalization

Buckley and Casson (1976), with the support of previous studies mainly by Coase (1937), proposed the theory of internalization. Their contribution defines three basic pillars: the purpose of operating in imperfect markets is to make a profit; the existence of imperfect markets for intermediate goods encourages the internalization of operations and, finally, it is the internalization of markets that leads to the creation of multinationals (Ferreira, Serra, & Almeida, 2012).

Therefore, in imperfect markets, carrying out tasks internally (internalization) allows the company to exploit and increase its specific advantages.

The firm's limits are determined by the point where the advantages of additional internalization of markets are balanced with the additional associated costs. Another essential principle is the fact that the firm's profitability and growth are established in a process of innovation originated on research and development (R&D). Lastly, firms seek the most cost-effective location considering interconnections with other activities (Buckley & Casson, 2009).

Buckley and Casson's (1976) theory of internalization emphasizes how firms operating in uneven markets internalize performance to take advantage of unique advantages and maximize profits. This process of internalization is associated with performance in great relationship. By bringing operations in-house, especially in intermediate commodity markets, companies can reduce inefficiencies, control costs and avoid dependence on external suppliers. This improves efficiency, better resource allocation and increased efficiency.

1.2.4. Heterogeneous firms by Melitz

Melitz and Readding (2014) state that heterogeneity is related to the percentage of participation in exports, with exporting companies being larger and more productive, and vice versa.

Globalization and market liberalization have seen the expansion of more productive industries. That contributed to a new paradigm on the world market and clearly impacts the decisions of governments and firms.

We can assume that each country has a specific productivity threshold. Only firms with productivity levels surpassing this threshold will establish affiliates in other countries. Consequently, the model predicts a hierarchy where the most productive firms set up affiliates even in the least attractive countries, while progressively less productive firms expand into increasingly attractive countries (Yeaple, 2009).

Country-specific characteristics determine this productivity threshold and, thus, influence the productivity levels of firms investing there. A crucial aspect of the model is that any change in a country characteristic that encourages more foreign firms to open local affiliates must be attracting progressively less productive firms to enter (Yeaple, 2009).

1.3. Multinationals vs Domestic firms – Productivity

Several studies have already been conducted to show differences in productivity between multinationals and domestic companies. However, for Portugal in particular, this study will be an extension of the literature since no research was found on this specific topic. The study that comes closest is “Corporate performance: does ownership matter? A comparison of foreign – and domestic – owned firms in Greece and Portugal” written by Natália Barbosa and Helen Louri. In this study, after they introduced characteristics that could impact the performance, they concluded that ownership do not make a great impact in firms in Portugal. This conclusion is interesting as it calls into question theories that multinationals are more productive, but they point the compensation for their liability of foreignness as a possible reason. Also, in both countries the intensity of foreign presence appeared to not affect competition.

Helpman et al. (2004) study suggests that within a specific industry, the least productive companies in that industry tend to leave the market because of the risk of operating with negative profits. Those with low productivity tend to operate only in the domestic market and don't bet on internationalization. At the other extreme, it is said that the most productive companies invest in internationalization in order to exploit their advantages.

Fukunari Kimura and Kozo Kiyota (2006) conducted a study to find a relationship between FDI, exports and productivity in Japanese companies. They were able to conclude that the most productive companies were those that exported and engaged in FDI, while the least productive did not invest internationally or export. This could result from multinationals managing subsidiaries across multiple countries or engaging in intra-firm trade between their central offices and foreign affiliates.

Various studies, such as those mentioned above, point to a positive relationship between a company's productivity and the fact that it is foreign owned. Some assets that are more common for multinationals to possess, such as exclusive technology and specific know-how, can be a determining factor in their greater productivity. These assets can be easily transferred to different countries (Halkos & Tzeremes, 2007).

Foreign-owned plants tend to offer higher wages, exhibit greater capital intensity, utilize more advanced technologies, and achieve higher productivity levels compared to the average (Doms & Jensen, 1998). Results from a study with companies in the United States. However, the findings indicate that these superior operating characteristics are not merely a result of foreign ownership. Instead, it is the ownership by multinational corporations that significantly influences these attributes.

The size of companies influences their level of productivity. Larger firms tend to be more productive (Halkos & Tzeremes, 2007).

However, exists studies that state the opposite. Rajeev Dhawan (2001) published an analysis of a panel of United States firms and after their econometric analyses, they concluded that small firms exhibit higher productivity compared to large firms. The observed productivity advantage of small firms, coupled with their heightened exposure to risk. Specifically, small firms operating

under market uncertainties and capital constraints can endure and achieve higher profitability only if they maintain superior technological efficiency relative to their larger counterparts

Finally, we have the following assumption:

H₁: There is a positive relationship between productivity and foreign ownership.

Chapter 2. Econometric study

The present chapter is focused on the methodology used, on the estimation procedures of the econometric model, more specifically a linear regression to find the relation between productivity and foreign ownership and compare with the relevant theoretical literature. The several sections will provide information about the data selection and about the variables and its construction (section 2.1). Then we have the formula used on the econometric model (section 2.2) and finally we have the results and proper discussion (section 2.3).

2.1. Data

As already mentioned, will be used the SABI database that contains all the information needed about Portuguese companies. In order to refine the selection of companies for the study, a filter was applied to include only active companies, as it is most relevant to examine firms that are currently operational. Subsequently, the selection was further narrowed to include only companies, thereby excluding insurance firms and banks based on the classifications available in the database. Finally, the sectors most pertinent to productivity were selected for analysis. In accordance with the Portuguese Classification of Economic Activity (CAE Rev. 3), only companies operating within the following sectors were included: A (Agriculture, Animal Production, Hunting, Forestry, and Fishing), B (Mining and Quarrying), C (Manufacturing), D (Electricity, Gas, Steam, Hot and Cold Water, and Air Conditioning), E (Water Collection, Treatment, and Distribution; Sanitation, Waste Management, and Remediation), and F (Construction).

We defined the time frame of 2013-2022. Initially, an experiment was conducted to analyze data over a ten-year period, from 2013 to 2023. However, due to significant data gaps for the year 2023, it was decided to exclude this year from the sample to ensure more reliable results.

As already mentioned, the study focuses on the differences between domestic and foreign-owned companies. In order to make this differentiation, the option of knowing the country of origin of the company's final owner was selected in the database. The database itself describes the companies with foreign owners as companies with the “minimum percentage that characterise the path from a subject company up to its ultimate owner: 50,01%”. Many studies

focus their studies with different levels of ownership, but with 50,01% we ensure that the company that effectively controls the subsidiary on Portugal is based abroad, and it is the most used in literature (Teixeira & Lehmann, 2014).

Finally, to refine the dataset and remove any irrelevant information, all companies with missing values or implausible data, such as those with zero employees, were excluded. This final step resulted in us only having companies constituted in the years prior to and including 2013.

Following the steps outlined, the final dataset comprised a total of 9,258 companies, of which 1,019 (11%) were FO, while the remaining 8,239 (89%) were DO.

2.1.1. Descriptive statistics

After using SPSS to analyze the descriptive statistics, we could find the maximum and minimum values, the mean, the median and the standard deviation.

Looking at the results of Table 1, which includes all the companies in the sample, we can conclude that the average age is approximately 30 years (considering that the sample only includes companies that are 11 years old or older) and that they have an average of 40 employees.

The productivity average is about 64 thousand euros per employee while the average of total sales is about 9 million euros.

Table 1 - Total Sample's Descriptive Statistics 2013-2022

	Total Sample's Firms 2013-2022			
	PD (€)	N° Employees	Total Sales (€)	Age
Máx. Value	127 557 143,00	8 873,00	14 864 569 665,00	309
Min. Value	- 20 532 220,72	1,00	0	11
Mean	64 520,60	41,40	8 941 976,32	29,83
Median	20 713,46	8,00	470 556,01	26
Stand. Dev.	1 558 256,42	157,10	121 577 597,70	15,9
Total observations	92 580,00	92 580,00	92 580,00	92 580,00

Source: Own elaboration using SPSS 29.0

Now, if we compare the DO firms and the FO, we can see that, on average, the productivity per employee is about 3 times higher than DO, which proves what is said on literature. But we, also, can see that the total of sales e much higher on FO firms. About the number of employees, FO firms employ much more worker than DO. This contributes to determine the companies' size. In relation to the average number of years, the difference is not relevant.

Table 2 - Descriptive Statistics of FO firms 2013-2022

	FO Firms			
	PD (€)	N° Employees	Total Sales (€)	Age
Máx. Value	90 915 764,20	6013	3 737 089 643,00	309
Min. Value	- 1 531 578,25	1	0	11
Mean	165 348,97	127,34	29 467 234,27	32,85
Median	36 570,60	40	4 556 877,40	28
Stand. Dev.	2 413 152,87	294,31	111 930 044,03	22,131
Total observations	1 019,00	1019	1 019,00	1019

Source: Own elaboration using SPSS 29.0

Table 3 - Descriptive Statistics of DO firms 2013-2022

	DO Firms			
	PD (€)	N° Employees	Total Sales (€)	Age
Máx. Value	127 557 143,00	8 873,00	14 864 569 665,00	268
Min. Value	- 20 532 220,72	1,00	0	11
Mean	52 050,14	30,77	6 403 411,21	29,45
Median	19 614,74	7,00	383 838,67	25,00
Stand. Dev.	1 416 652,45	126,47	122 479 964,16	14,91
Total observations	82 390,00	82 390,00	82 390,00	82 390,00

Source: Own elaboration using SPSS 29.0

Finally, looking at the descriptive statistics (Tables 4 - 7) of each sector used in this study, we can state that, on average, concerning both FO and DO firms, the productivity is higher on the utilities sector. Regarding the number of employees, the FO and DO differ. FO firms have more employees on the manufacturing sector and the DO on the utilities sector. Both types of firms had a higher number of sales in the manufacturing sector.

Table 5 - Descriptive Statistics of the Primary Sector 2013-2022

	Primary Sector					
	FO			DO		
	Mean	Stand. Dev.	Total	Mean	Stand. Dev.	Total
PD (€)	119 174,20	1 713 265,84	134	39 167,39	126 119,01	853
N° Employees	21,98	72,49	134	11,87	33,62	853
Total Sales (€)	1 521 252,46	3 087 411,01	134	1 377 592,63	5 512 958,27	853
Age	25,25	15,04	134	27,70	15,89	853

Source: Own elaboration using SPSS 29.0

Table 4 - Descriptive Statistics of the Manufacturing Sector 2013-2022

	Manufacturing Sector					
	FO			DO		
	Mean	Stand. Dev.	Total	Mean	Stand. Dev.	Total
PD (€)	49 430,48	72 681,45	681	28 144,72	78 962,00	4287
N° Employees	164,18	322,32	681	38,31	96,92	4287
Total Sales (€)	39 626 980,18	132 680 154,38	681	7 714 269,60	150 545 137,40	4287
Age	35,66	24,25	681	32,21	16,80	4287

Source: Own elaboration using SPSS 29.0

Table 6 - Descriptive Statistics of the Utilities Sector 2013-2022

	Utilities Sector					
	FO			DO		
	Mean	Stand. Dev.	Total	Mean	Stand. Dev.	Total
PD (€)	1 495 830,11	8 595 435,28	73	870 021,10	9 063 289,62	175
N° Employees	65,56	182,94	73	112,70	302,67	175
Total Sales (€)	20 261 342,35	80 019 380,55	73	69 289 207,70	376 854 994,53	175
Age	24,85	9,91	73	24,44	10,81	175

Source: Own elaboration using SPSS 29.0

Table 7 - Descriptive Statistics of Construction Sector 2013-2022

	Construction Sector					
	FO			DO		
	Mean	Stand. Dev.	Total	Mean	Stand. Dev.	Total
PD (€)	73 767,16	290 099,77	131	41 901,93	828 614,95	2924
N° Employees	77,99	294,62	131	20,31	157,45	2924
Total Sales (€)	10 368 033,57	24 961 611,46	131	2 183 971,71	16 528 147,70	2924
Age	30,47	18,03	131	26,23	10,37	2924

Source: Own elaboration using SPSS 29.0

2.1.2. Variables

In this section is presented the variables and its respective description.

Productivity (**PD**) is our dependent variable. As stated in the literature, there are several variables that can be considered in its calculation. For this study, it was calculated by dividing gross value added by the number of employees in each period. This division resulted in the value in euros that each employee produced, which we considered the company's productivity.

The primary explanatory variable in this analysis is the Foreign Ownership (**FO**) variable. This dummy variable is utilized to differentiate companies with foreign ownership from those with domestic ownership. Firms exhibiting the foreign ownership characteristic are assigned a value of 1, while those without are assigned a value of 0. Based on the aforementioned studies, foreign-owned companies are anticipated to exhibit higher productivity levels compared to their domestically owned counterparts.

Finally, control variables are incorporated to see the impact and influence that each factor/characteristic has on the firm's productivity.

To measure the size of companies, the number of employees (**EMPL**) was used as it is considered the most stable indicator of company size. Productivity levels are anticipated to exhibit a correlation with firm size attributable to the advantages of economies of scale and scope. Generally, smaller firms tend to organize their processes distinctively from larger firms. However, as a firm exceeds a certain size threshold, diseconomies of scale may become more

pronounced, potentially leading to a detrimental effect on productivity levels (Halkos & Tzeremes, 2007).

In order to assess the relationship between productivity and the age of companies, the age variable (**AGE**) was included, which shows the number of years they have been in business. As already mentioned, the sample does not include companies founded after 2013.

A positive relationship is expected in this context; specifically, it is anticipated that older companies will exhibit higher productivity levels (kok, Brouwer, & Fris, 2006). Newly established firms that entered the market typically exhibit lower-than-average productivity. In the initial years following market entry, these firms either improve their productivity to converge with that of more established firms or exit the market (kok, Brouwer, & Fris, 2006).

Lastly, companies are divided according to their sector of activity. We include the primary (**PRIM**) sector, the manufacturing (**MANUF**) sector, the utilities (**UTIL**) sector and the construction sector (**CONST**). When the company belongs to a particular sector, a value of 1 is assigned and 0 otherwise. Here we predict neither a positive nor a negative relationship with the productivity variable. The next table (Table 8) summarizes the variable description above.

Table 8 - Variables Description

Measure	SPSS Variable Name	Description	Expected relation
Productivity	PD	Total of GVA per employee	
Ownership Status	FO	Binary variable: 1 if it is FO; 0 otherwise	+
Size	log(EMPL)	Number of employees each year	+
Age	log(AGE)	Difference between the year of analysis and the firm's constitution.	+
Primary Sector	PRIM	Binary variable: 1 if the firm belongs to the primary sector; 0 otherwise.	
Manufacturing Sector	MANUF	Binary variable: 1 if the firm belongs to the manufacturing sector; 0 otherwise.	
Utilities Sector	UTIL	Binary variable: 1 if the firm belongs to the utilities sector; 0 otherwise.	
Construction Sector	CONST	Binary variable: 1 if the firm belongs to the construction sector; 0 otherwise.	

2.2. Econometric Model

The linear regression equation to access the relation between the productivity level and the FO status by firm i at time t is given by:

$$(1) \text{ Productivity}_{it} = \alpha + \beta_1 FO_{it} + \beta_2 \log(AGE_{it}) + \beta_3 \log(EMPL_{it}) + \beta_4 SEC_{it} + \mu_i + \varepsilon_{it}$$

($i = 1, 2, \dots, n$; $t = 1, 2, \dots, 10$)

The adjustment of the **AGE** and **EMPL** variables is necessitated by their substantial skewness and kurtosis values, which underscores the need for enhanced data coherence. Although the dependent variable **PD** similarly exhibited elevated values in both skewness and kurtosis tests, the presence of negative values precludes the application of identical adjustment measures.

The data was reorganized into panel data (longitudinal time-series data), and standard errors can be quite large with fixed effects models, whereas random effects models allow for the estimation of effects for time-invariant variables, as it is our main explanatory variable **FO**. Random effects models can be estimated using Generalized Least Squares (GLS) (Williams, 2018).

2.3. Estimations and Results

Before estimating the results of the regression itself, it is necessary to draw up a correlation matrix between the variables in order to detect possible high values in relation to the independent variable.

By analysing Table 9, we can conclude that between our dependent variable and the more explanatory variable there is a correlation with a value of 0.023. This indicates a weak correlation, there is a linear relationship, but not a very strong one. So, although weak, there is a relationship, meaning that the fact that the company is FO has a positive impact on productivity.

Table 9 - Correlation Matrix of equation (1)

		Correlation Matrix							
		1. PD	2. FO	3. PRIM	4. MANUF	5. UTIL	6. CONST	7. log(AGE)	8. log (EMPL)
1. PD	Pearson Correlation	1							
	Sig.								
2. FO	Pearson Correlation	,023**	1						
	Sig.	<,001							
3. PRIM	Pearson Correlation	-0,003	,028**	1					
	Sig.	0,328	<,001						
4. MANUF	Pearson Correlation	-,023**	,093**	-,372**	1				
	Sig.	<,001	<,001	<,001					
5. UTIL	Pearson Correlation	,105**	,098**	-,057**	-,179**	1			
	Sig.	<,001	<,001	<,001	<,001				
6. CONST	Pearson Correlation	-,010**	-,151**	-,242**	-,755**	-,116**	1		
	Sig.	0,004	<,001	<,001	<,001	<,001			
7. log(AGE)	Pearson Correlation	-0,001	,032**	-,069**	,201**	-,063**	-,146**	1	
	Sig.	0,755	<,001	<,001	<,001	<,001	<,001		
8. log (EMPL)	Pearson Correlation	-,026**	,289**	-,166**	,309**	,078**	-,246**	,302**	1
	Sig.	<,001	<,001	<,001	<,001	<,001	<,001	<,001	

** Correlation is significative at
0,01 level.

Source: Own elaboration using
SPSS 29.0

Table 10 - Correlation Matrix of equation (2)

		Correlation Matrix							
		1. PD	2. FO	3. PRIM	4. MANUF	5. UTIL	6. CONST	7. log(AGE)	8. log(SALES)
1. PD	Pearson Correlation	1							
	Sig.								
2. FO	Pearson Correlation	,023**	1						
	Sig.	<,001							
3. PRIM	Pearson Correlation	-0,003	,028**	1					
	Sig.	0,328	<,001						
4. MANUF	Pearson Correlation	-,023**	,093**	-,372**	1				
	Sig.	<,001	<,001	<,001					
5. UTIL	Pearson Correlation	,105**	,098**	-,057**	-,179**	1			
	Sig.	<,001	<,001	<,001	<,001				
6. CONST	Pearson Correlation	-,010**	-,151**	-,242**	-,755**	-,116**	1		
	Sig.	0,004	<,001	<,001	<,001	<,001			
7. log(AGE)	Pearson Correlation	-0,001	,032**	-,069**	,201**	-,063**	-,146**	1	
	Sig.	0,755	<,001	<,001	<,001	<,001	<,001		
8. log(TSALES)	Pearson Correlation	,040**	,248**	-,132**	,273**	,106**	-,239**	,210**	1
	Sig.	<,001	<,001	<,001	<,001	<,001	<,001	<,001	

** Correlation is significative at 0,01 level.

Source: Own elaboration using SPSS 29.0

With regard to the correlation of the other variables with the **PD** variable, there is a negative relationship, with the exception of the **UTIL** variable. This means that as one variable increases in value, the other decreases and vice versa. Surprisingly, the **log(AGE)** and **log(EMPL)** variables are among those with a negative relationship, but it should be noted that these values are very close to zero, so there is no strong opposite correlation.

We also made a correlation matrix (Table 9) using **log(TSALES)** and not **log(Empl)** to see the level of correlation with **PD**. The value of 0.04 demonstrates that exists a positive correlation, so when the number of sales increases, the productivity tend to also increase. However, this number is low, indicating a weak correlation.

The table also presents the p-value indicating that the correlation is statistically significant, suggesting that the observed relationship is unlikely to occur by chance.

Now, since SPSS does not allow GLS regression, Python was used for the coefficients in our equation. We obtained the results presented in Table 10.

Const. indicates the value of productivity when all the other variables have a value of zero. In this sense, it is logical that the value shown is negative.

As predicted in the literature, the **FO** variable has a positive effect on the **PD** variable. This means that, in fact, FO companies are more productive than DO companies.

The **log(AGE)** variable also has a positive value of 1.55, which means that when **log(AGE)** increases by one, i.e. when companies have been on the market for longer, **PD** will increase by 1.55.

The values corresponding to the different sectors are equal and positive, which represents a positive relationship with the dependent variable.

That said, we believe we can accept the hypothesis initially proposed.

Table 11 - Results of GLS estimation for equation (1)

	Coef.	Stand. Error
Const.	-1,839	5,73
FO	1,263	1,72
log(AGE)	1,554	2,88
PRIM	1,839	5,73
MANUF	1,839	5,73
UTIL	1,839	5,73
CONST	1,839	5,73
log(EMPL)	-1,152	8824,11

Source: Own elaboration using Python

2.4. Robustness checks

Robustness tests are necessary to ensure the best performance of our model. Since total turnover can also be used to determine the size of a company, we decided to test our equation by replacing the variable **log(EMPL)** with the variable **log(TSALES)**. It is expected that this variable may have a positive impact on our dependent variable **PD**. That said, the new equation to be tested is given by:

$$(2) \text{Productivity}_{it} = \alpha + \beta_1 FO_{it} + \beta_2 \log(AGE_{it}) + \beta_3 \log(TSALES_{it}) + \beta_4 SEC_{it} + \mu_i + \varepsilon_{it}$$

$$(i = 1, 2, \dots, n; t = 1, 2, \dots, 10)$$

When attempting to calculate the new equation with the variable **log(TSALES)** instead of **log(EMPL)**, an unexpected problem was encountered, as the software was unable to calculate it.

That said, an OLS regression was carried out, where we could see that all the coefficients were positive (with the exception of the constant), which indicates that the **log(TSALES)** variable also has a positive relationship with the dependent variable **PD**. As companies' total sales increase, productivity will also follow suit. The **FO** variable maintained a positive relationship.

Conclusion

The purpose of this study was to analyze the relationship between productivity and the ownership status of companies in Portugal. Although there are already some studies with the same proposal, the same did not exist for companies in Portugal.

To this end, we analyzed the existing literature on related concepts, theories on FDI and MNEs as well as the literature relating ownership status and productivity.

After this analysis, it was concluded that the consensus was that companies with foreign ownership were in fact more productive than companies with domestic ownership. However, the relationship is not very strong, with some studies reporting that the differences in productivity between the two types were not significant enough to affirm that affiliated FOs were significantly more productive.

After this analysis, we formed a hypothesis: H_1 : There is a positive relationship between productivity and foreign ownership.

Once collected the data from the SABI database for the period 2013-2022 (10 years), various estimates were made. The resulting data showed that the older the company, as well as the number of employees, the higher the productivity for companies in general.

The estimation of the GLS model, proved that our hypothesis is in line with Portuguese reality.

Finally, it is important to mention that our study has limitations. Our sample has only around 9000 companies analyzed since there were several missing values for various companies, which had to be removed in order to carry out our estimations.

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