A Work Project, presented as part of the requirements for the Award of a Master's degree in International Development and Public Policy

GPEARI:

The impact of tax incentives for investment on firm's economic outcomes

- A PSM evaluation of the Portuguese case of RFAI and DLRR

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Abstract:

This paper draws its relevance from the crescent importance of tax incentives, in particular those which stimulate investment. Previous studies have suggested that their-efficacy in improving firms' productivity and economic outcomes can be significant. This project aims to further the literature by evaluating the impact of two incentives, RFAI and DLRR on Portuguese firms' outcomes. In order to test these effects, a counterfactual analysis, using the Propensity Score Matching method, was carried out for the period 2017-2019, and the findings suggest an important positive effect of the policy in firms that benefitted from the incentives, except for exports and intangible fixed assets.

Keywords: Tax incentives, Productivity, Firms performance, Propensity Score Matching, Investment, RFAI, DLRR

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Disclaimer

Despite being a final submission, all values here presented are possible to not be accurate, as they were based on a perturbed dataset provided to us by Banco de Portugal Microdata Research Laboratory (BPLIM) due to a confidentiality agreement signed. Nevertheless, we expect the values and findings to be as similar as possible to the real values, including the statistic significancy of the results.

The raw data file, the do file and every file necessary for the replication of this project can only be accessed via BPLIM.

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1. **Introduction:**

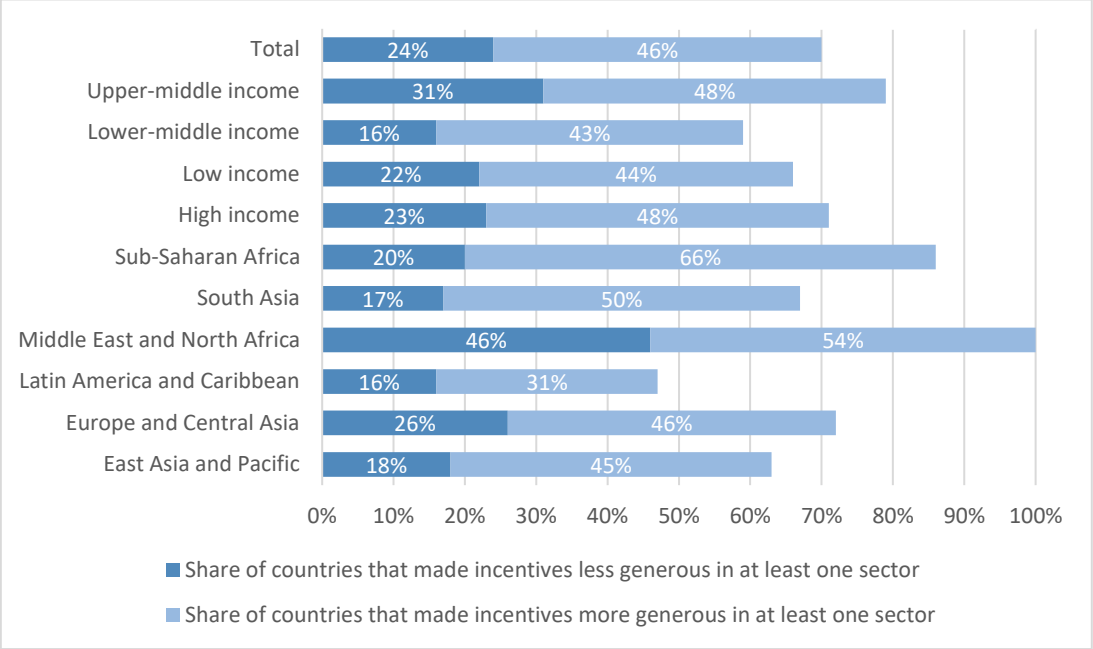
The primary purpose of taxation is to fund government´ spending by reallocating funds from taxpayers, whether individuals or businesses, to public and governmental agencies. The latter act on the greater public behalf in order to maximise social welfare by providing welfare-improving public goods. A tax system can influence behaviour and social welfare through different channels, such as affecting income redistribution, addressing market failures, increasing administrative costs and bureaucracy and influencing or distorting economic decisions such as investment while creating a deadweight loss in the economic system by promoting inefficiencies. In the absence of externalities and market failures, taxation can and normally does distort efficient economic decisions thus leading to inefficient and sub optimal decisions and outcomes that affect the economy and industry of the country. One of the factors that is commonly affected by the government´s need to raise funds via taxation is the scale, location, and sector of an investment.

It is with this problem in mind that many governments have implemented tax incentives to correct for the lack of investment, be it in just a sector, region or at a bigger national and untargeted level. Tax incentives are extremely common throughout the world, from developing to developed countries, and have many uses, from correcting externalities, social and economic deficiencies to improving overall investment levels, productivity, and job creation, as well as fighting the pandemic or even promoting green and sustainable practices. Thus, the importance incentives have on sustainable economic growth cannot be understated. Therefore, it is vital that there is a scrutiny of taxes and of tax incentives, particularly in an economy with budget constrains like the Portuguese.

In the following table we can see the importance that governments from different countries have put on investment incentives between 2009 and 2015. It shows data

presented in the Global Investment Competitiveness Report 2017/2018 from the World bank on 155 countries. The main takeaway is that 46% of the countries either created new tax incentives or improved the pre-existing ones during the 2009-2015 period, with a tendency to make incentives more generous in at least one sector, rather than reducing them in other sectors. This shows that governments are more aware of the importance of tax incentives in investment, especially in upper-middle- and high-income countries, which both registered a 48% share of countries that improved incentives in at least one sector. The Sub-Saharan Africa was the region that registered the biggest improvement in incentives (with 66% of their countries improving in at least one sector), followed by the Middle East and North Africa (54% share of countries) and South Asia (50% share of countries).

Table 1 *Changes made by countries to their investment incentives between 2009-2015*



Portugal is characterised by an economy that despite growing at a sound pace before Covid-19 had strong macroeconomic imbalances, labour productivity below the EU's average and an overreliance on tourism, which deeply affected the economy during 2020

and 2021. Furthermore, the country has a low level of inter, and intra-regional cohesion, as the capital city region concentrates high value-added activities and public services, and strong disparities persist between Lisbon and the rest of the country (EU Country Report, 2022).

Furthermore, Portugal is characterized by sluggish productivity growth, determined by different factors, including low levels of capital per worker, low levels of investment, moderate innovation capacity, overall low skill levels of the population, and a business environment hampered by a judiciary with low efficiency and by a complex tax system as explained ahead.

As in many of the developed European countries, the backbone of the economy are the Small and Medium Enterprises (SMEs). In the case of Portugal, micro, small and medium enterprises accounted for 99% of all enterprises and 60% of turnover, whereas the large enterprises (0.3% of all firms) generated 40% of turnover (Banco de Portugal, 2022). Thus, it is of the interest of the government, regulators, and economists that these SMEs are influenced and incentivized to invest both regionally and nationally at a significant level, as ,in a stagnant and inefficient economy, it is important that investment levels increase since it is the main driver for the development of productivity. Therefore, tax incentives have been a common instrument for the many governments from both sides of the isle, resulting in a current tax code rich and full of incentives, which are one of the factors responsible for Portugal having a high to very highly complex fiscal system (Borrego, Lopes, & Ferreira, 2016), according to certified accountants.

And this is the crux of the matter, as pointed out by various economists and public policymakers, a tax code should be fair, efficient and stable, while also being a mechanism for incentivizing fair, sustainable and significant investment. Thus, a complex

tax code with more than 500 tax incentives, such as the one implemented in 2014, cannot be described as one that fulfils some of the previous characteristics, while promoting inefficiencies, resulting in conflicting interests, bureaucracy, and red tape. In this context it is important to analyse if some of those incentives are actually beneficial for the population and economy at large by looking to the main outcomes such as employment, productivity, and EBITDA.

The choice of the two incentives in particular come from their importance and value. Firstly, in 2018 tax incentives for investment represented 47% of the total value of deductions to the income of the CIT (Dinis and Pereira, 2019), and both RFAI and DLRR are two of the incentives with higher weight on tax expenditure, close to 19% for the RFAI and 9% for the DLRR. Despite these significant values, that if not allocated properly can be a source of losses for the government, no study in Portugal has focused on providing an evaluation of these benefits and their impact in the outcomes which they aim to improve, such as productivity, investment, competitiveness, and employment.

The project has the following structure. In section 2, we provide a brief analysis of the tax incentives system in Portugal and a detailed description of 4 of the main incentives for investment, RFAI, DLRR, SIFIDE and BFCIP. Section 3 presents a review of the fundamental literature on policies that promote investment (of different types) as well as the literature on evaluation of tax incentives, with a focus on those that promote investment on national firms to support business economic growth. Section 4 concerns the presentation of the data used in the research, as well as a statistical description of RFAI and DLRR in the period of analysis (2017-2019). Section 5 presents the methodology and empirical strategy used in the evaluation, while section 6 consists of the main results and, finally, section 7 concludes the project, while discussing possible future projects on the subject, as well as limitations of the current one.

2. **The Portuguese Tax System and established Tax Incentives:**

Portuguese tax benefits comprise, according to the 2nd art. of the Statute of Tax Benefits, measures which alter the normal application of the taxation rule and the existence of a non-fiscal entity that gives a response to a "constitutionally relevant public interest" and for that reason is targeted for such benefit (Oliveira et al, 2019).

Most tax benefits consist of tax exemptions (about 60%), while tax deductions from taxable income are the second largest category of tax benefits (Oliveira et al., 2019). In this project we aimed to study two of the most significant ones, RFAI (Regime Fiscal de Apoio ao Investimento - Tax regime for investment support) and DLRR (Dedução por Lucros Retidos e Reinvestidos - Deduction of profits retained and reinvested). Further detail on these incentives and others can be seen in Pereira (2022). Nevertheless, the following table resumes the information on 4 of the main tax incentives.

Table 2 *Summary of the benefits established in the CFI*

Summary of the benefits established in the CFI				
Specifications	**Benefit**			
	BFCIP	**RFAI**	**DLRR**	**SIFIDE II**
Benefit tax	10% to 25% of the relevant applications		10% of retained profits	32.5% of R&D expenses and an incremental rate of 50% of the increase in expenditure
Other benefits	• Exemption/reduction of IMI • Exemption/reduction of IMT • Exemption from stamp duty			
Duration	10 years	10 years	Same year	8 years
Investment permanence period	3 to 5 years	3 to 5 years	5 years	
Investment	≥ 3 M€			
Cumulations	DLRR	DLRR	BFCIP and RFAI	x
Limitations	• Investment project; • Financial contribution ≥ 25%; • Eligible costs; • Balanced financial situation.	• Financial contribution ≥ 25%; • Eligible costs; • In the general case, deduction up to the limit of 50% of the IRC collection.	• Maximum amount of retained and reinvested profits is 12M€; • In the general case, deduction up to the limit of 50% of the IRC collection.	• Application project.
Obligations	• To have organised accounts; • Taxable profit is not determined by indirect methods; • Regularized tax and social security situation; • They must not be considered to be companies in difficulty; • Deduction to the taxable income has to be justified by a document to be included in the tax documentation file.			

Source: Peixoto (2016, p.20)

3. **Literature Review:**

Literature on Taxation and Tax Incentives:

It is factual that taxation can influence companies´ investment decisions and its sustainable growth. The existing empirical literature on the relationship between taxes and investment has found that while other factors are also important determinants of investment, taxes have significant effects (Hines and James, 1999 and Klemm and Parys ,2011). Thus, governments make extensive use of incentives in an effort to attract and influence the magnitude of investments. Nevertheless, their effectiveness has been the subject of debate, and an all-encompassing consensus has not emerged. Some researchers, economists and experts even have argued that there is little evidence of them being effective, while others have argued that investment incentives have contributed to the rapid economic growth of several countries (Slemrod, 1990).

Nonetheless as policymakers and students of public economy, we should and must not forget that these tax incentives are just one of the many factors that can influence investment. Typically, countries pursue growth-related reforms using a combination of approaches, including macroeconomic policies, investment climate improvements, and industrial policy changes. Thereby, for the evaluation of the effectiveness of the incentives, the method used is determinant to identify causality effects. Nevertheless, studies have tried to disentangle the effects of the reforms so that the evaluation made can reach the real (treatment) effect of tax incentives for investment, just as we aim to do.

It is important to note that every tax incentive policy to promote investment has potential costs and benefits. The benefits arise from higher revenue from possibly increased investment as well as future tax revenues, social benefits, such as jobs, and positive

externalities. On the other hand, the main costs are the tax revenue costs, which are expenditures defined as revenue decreases due to preferential tax provisions (Caiumi, 2011), the deadweight losses from investments that would have been made even without the incentives (crowding out), and indirect costs such as economic distortions, administrative and leakage costs (James, 2009).

Most studies on tax incentives for investment have, so far, focused on incentives for Foreign Direct Investment in developing countries and on investment in R&D, which is a key driver of innovation, productivity and long-term economic progress (Schoonackers, 2020 and European Commission, 2020).

Literature on Tax Incentives for R&D Investment:

On the issue of the effects in productivity and growth of R&D tax incentives, multiple papers reach the same conclusion. That, on average, R&D tax incentives stimulate the level of expenditure and investment on R&D, intangible assets and staff (Grupo de Trabalho para o Estudo dos Beneficios Fiscais, 2019 and Blandinières and Steinbrenner, 2021 and Basto, et al, 2021 and Santi,2019 and Soares et al., 2014 and Westmore, 2013 and Czarnitzki and Hussinger. 2004). On this subject, multiple studies, using firm level data for different countries estimate that the tax price elasticity of total R&D spending is close to unity, meaning that a reduction in the cost of R&D due to taxes, causes an increase in the quantity of R&D of the same percentage, with some studies suggesting an even larger elasticity (Parisi and Sembenelli, 2003 and Mairesse and Mulkay 2004).

Nonetheless, the number of papers and studies that have more mixed results, where partial crowding-out is not excluded, is not insignificant. As despite the incentives contributing to a greater R&D investment, the additional investment does not exceed the cost of the policy (Zuniga-Vicente et al., 2014). Despite the importance of innovation in firm

productivity, when studies analyse not the short run impacts of the R&D incentives, like output of research or firm performance, the results are even more dispersed and not significant (Bravo-Biosca et al., 2013).

So, a tax incentive, despite being a possible inductor of complexity on the tax code, can be a positive effect policy for governments to use, since it acts as desired by stimulating investment in a specific area and a specific type of investment, such as R&D, but can it work for more general firm and business investment?

Literature on Tax Incentives for Investment:

Regional and focused on SMEs, tax incentives for investment have been studied in some peripheric European countries, as well as one of the biggest European economies, Italy. Caiumi's (2011) findings suggest that providing a tax-based subsidy targeted to the accumulation of capital is not an optimal tool for regional policy aiming at fostering local development. While a tax credit automatically administered and not restricted to profitable firms represents an important support for SMEs, low credit and or low productivity firms. However, the increase in values of investment, compared to what firms would have done in the absence of the fiscal stimulus, does not overcome the tax bonus amount, thus suggesting mixed results with a policy and environment similar to the Portuguese one that we aim to study. Furthermore, Caiumi (2011) reveals that deadweight losses associated with a universalistic, non-targeted and non-personalized support are unsustainable, particularly in recessive macroeconomic conjunctures. Kersten et al. (2017) concludes that SME support has positive effects on firm performance, capital investment and employment, while insignificant effects on profitability and wages, whereas Piza et al. (2016) conclude that the effects on not only the firm's performance, but employment and labour productivity as well, are positive, thus if our incentives are

deemed to be supportive, they can therefore stimulate positive returns, in an expected more cost-effective way than other policies.

Harris and Trainor (2005) look into the effects of tax incentives as well as capital grants, directed to manufacturing firms in Northern Ireland, using long run and detailed micro-level panel data, the results are mixed, showing that public support does appear to have had different impacts across different industries. Furthermore, Bronzini et al. (2008) estimates the impact of the Italian programme eligibility by comparing both subsidized and non-subsidized firms located in eligible areas to firms located in non-eligible areas, finding that the programme and incentives have been effective in stimulating investment. The paper finds that, in contrast to other tax incentives policies for investment implemented elsewhere in the world, it is not restricted to profitable firms with tax liabilities, thus representing "a source of finance that alleviates the sensitivity to the availability of internal resources in credit-constrained firms". It concludes that although the programme was fiscally unsustainable and was therefore downsized well ahead of the expiry date, the findings suggest that it had been effective in stimulating investment, thus suggesting a possible sustainable and stimulating program if the loss in tax revenues does not reach unbearable levels.

A further outcome of interest for us is employment, where Chirinko and Wilson (2016) not only find a positive effect of tax credits for job creation in the USA on employment, but also suggest that tax credits appear to be economic development policy with a longer run focus, thus suggesting caution when evaluating results in t+1 and t+2, as in our project. Garsous et al. (2017) and Fuest et al. (2018) also find a positive effect of a tax incentive policy on employment and wages in Brazil and Germany respectively. While in Camino-Mogro (2022), which used the Difference in Differences approach, the policy implementation does not have an effect on the attraction of new investments and creation

of new employment for prioritized sectors compared to non-prioritized sectors over the last quarter of 2018 and the 2019, nevertheless this paper dataset refers to a developing country, Ecuador while the others refer to developed economies which, despite being at a larger scale, are still closer to the Portuguese reality.

On the Portuguese case, and due to the high number of benefits as pointed previously, multiple studies have been made on the issue of tax incentives in the Portuguese market, but again, these have focused on R&D, such as Santi (2019) and Basto, et al (2021).

Literature on the methodologies for evaluation of Tax Incentives:

On the topic of methodologies, the method based on financial statements is used by several authors to assess the impact of tax subsidies on companies' results (Eckert & Bertolla, 2016). This method is common as the financial statements are characterised by being relevant, reliable and comparable and seek to translate a true and appropriate picture of the financial position and results of the entities' operations (CMVM, 2002). Thus, as the entities that benefit from tax incentives make transparent in their results the impact of such incentives (Saac & Rezende, 2019), this method can be more easily applied and studied at a surface level. Nevertheless, for a deeper and significant finding, econometric methods, such as regression analyses and propensity score matching, must be used in partnership with financial indicators.

But why do econometric models enable us to reach a more significant treatment effect? Evaluations based on the comparison of differences in outcomes between tax incentives beneficiaries and non-beneficiaries is scarce, and even when the tax policy is available to every firm, a significant proportion of companies might still be reluctant to apply for the credit, owing to different issues like bureaucracy or budget constraints. Therefore, selection bias might arise, as there will be doubts whether the companies that undertook

investments without applying for the credit can represent a suitable control group in order to identify the causal effect of the policy. The issue of selection bias is addressed in Czarnitzki et al. (2004) by investigating whether the performance of firms who benefitted from the R&D tax credit differs from that of non-beneficiaries still conducting R&D and whether the positive difference in performance can be attributed to the effect of the tax incentive, through the application of a matching approach on cross-sectional data for a sample of Canadian manufacturing firms, and it concludes that tax credits increase the R&D engagement at the firm level and that the R&D activities induced by fiscal incentives lead to additional innovation output.

In Caiumi (2011), the methodology also consists of applying the matching approach and selecting a sample of firms composed of both recipients and non-recipients such that for each subsidised firm a comparable unsubsidised counterpart is found, which is similar in every respect except for the tax incentive. A further empirical model of firm's investment behaviour was estimated to obtain the tax-price elasticity and to test the sensitivity of investment decisions. This approach not only allows to deal with the problem of the endogeneity of firms' participation decisions but goes further and accounts for the different channels through which tax incentives operate, thus showing the benefits and significance of econometric approaches. Finally, Bronzini et al. (2008) also follows the matching approach, where the treatment group is matched with a comparable control group using the propensity score matching with exact matching, but additionally adopts a difference-in-differences framework to reach the results.

Thus, from this literature review we can take the conclusion that despite a consensus not being fully reached due to reasons such as the type of data used, the methodology, cross-country or single country analysis, different outcomes studies and vastly distinct period

of analysis, the general idea is that the effect of tax incentives on investment is positive and that the returns do exist and can correspond to the objectives of policymakers.

4. **Data:**

In order to reach the results and conclusion to our research question the microdata on firms was provided by Bank of Portugal´s Microdata Investigation Laboratory (BPLIM, 2022) that provided access to the Portuguese Simplified Corporate Information (Informação Empresarial Simplificada, IES) and incorporated the list of tax incentives beneficiaries taken from the Tax Authority public records (Autoridade Tributária, 2022).
The dataset provided for this project contains detailed harmonized central balance-sheet data of an anonymized list of firms, both those that benefited and those who did not, so that we can have a control group to compare and find the effect of both incentives, DLRR and RFAI. The years considered for this analysis range from 2017 to 2019, the years where both incentives achieved a higher and stable volume and level, nevertheless the data provided for some of the companies go beyond these years, therefore we trimmed the dataset according to our needs and objectives while following explicit criteria, such as the obligation of having the total assets variable filled out with information and no observations post 2019 and pre-2014.

Despite both RFAI and DLRR having the objective of stimulating investment and sustainable growth in SMEs, those companies are not the only beneficiaries, therefore we did not trim the data set according to companies being considered SMEs and instead used the dimension variable to control for differences and for robustness checks.

For our project at first, and for a first general analysis, a firm is considered treated if it benefitted from one (or both) incentives in the period 2017-2019, nevertheless for the model used to evaluate the policy, only firms treated in 2017 (but not in 2018 and 2019) are considered treated as explained further ahead. Furthermore, we decided to disregard the data from 2020 due to the Covid pandemic, which could skew results and negatively

affect the real treatment effect of the incentives. Taking all this into consideration we have an initial dataset of 22 565 treated observations, the entire universe of firms who benefitted from the incentives in the period, of which 6 620 benefitted from RFAI, 18 139 from DLRR and of these 2 194 benefitted from both. The untreated observations in this period correspond to 1 233 813, thus giving us a quite significant and large dataset to start off from.

Before the evaluation we decide to proceed with a general analysis of the benefits in the period 2017-2019, taking into consideration both the distribution of these incentives by company size (Table 3) and the average value of benefit retained by firms each per year (Table 4).

Micro and small enterprises make for most of the treated units benefitting from the DLRR tax benefits in the year of 2017, followed by a small percentage of medium enterprises and an even smaller number of large enterprises, who correspond to less than 1% of the treated units, despite the criteria defining that only SMEs are capable of benefitting from the incentive. We attribute this result to the different criteria used by the provider of our dataset (Banco de Portugal) and the criteria used by the Portuguese tax authority to define what is a large firm. These figures remain stable in the following years, with only a small increase in the number of treated micro enterprises who benefit from the DLRR, from 2018 to 2019. As for the number of beneficiaries, it shows a positive evolution over the years, starting at 5317 in 2017 and increasing to 6086 and 6736 in the following years.

As for the RFAI, the statistics for the dimension of the enterprises affected by the incentives are very different, with medium sized companies making up for a much larger percentage of the beneficiaries (a combined average of 53% for the three-year period, when compared to the 39% that they represent for the DLRR). The second biggest

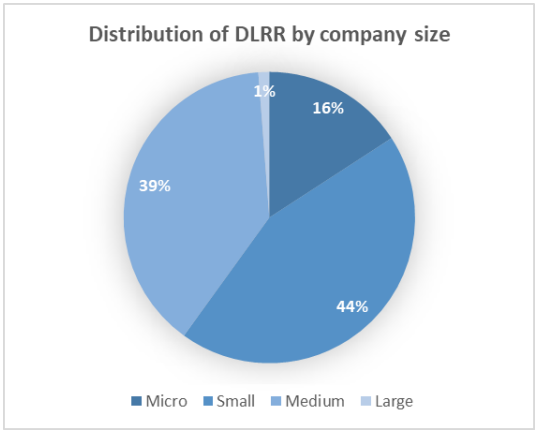
difference is the fact that large enterprises are much more likely to benefit from the RFAI. The number of firms benefitting from the RFAI remains steady over the years, showing that the outreach of this tax incentive has not increased (Table 5).

Concluding, both tax incentives tend to maintain the same trends over the years regarding the size of the enterprises who most benefit from them, however they show disparities in the outreach total number of treated units, with DLRR accounting not only for much larger numbers but for a steady increase in the number of firms benefitted (Table 5). One common point between both incentives is the fact that small and medium enterprises are always the largest beneficiaries in total values of the benefits amount (Graph 3).

The number of firms benefitted should only be one side of the analysis, the average values of both benefits must also be taken into consideration in this analysis. Regarding this, we see that RFAI has significantly higher average values of benefits when compared with DLRR, and that they both show a different evolution, with RFAI registering a higher increase over the three years (Table 4). This notable difference in amounts may explain why the number of beneficiaries is different. When the tax deductions and credits are of such a high value as the ones in RFAI, the criteria and necessary steps to benefit from the policy will be higher, thus reducing the number of those that apply and actually benefit. Furthermore, with these values, the theory and idea that RFAI can have higher positive

effects than DLRR must be present, therefore, in future literature, an individual analysis of RFAI should be done.

Graph 3 *Distribution of the benefits according to company size*



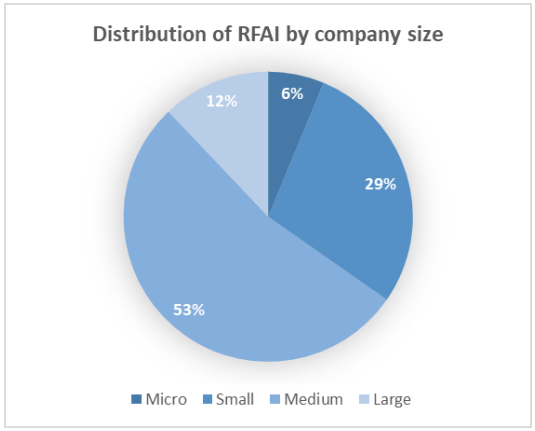
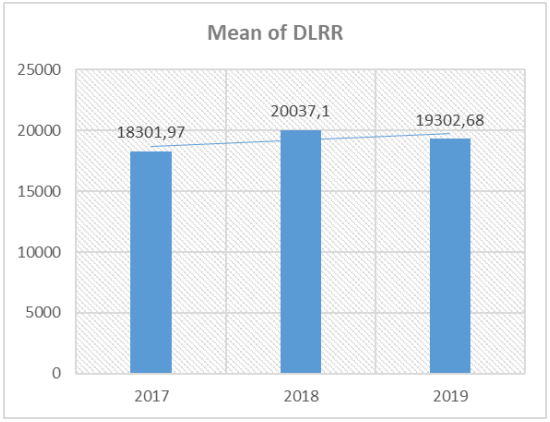


Table 4 *Evolution of the average value of benefit of each firm by year*



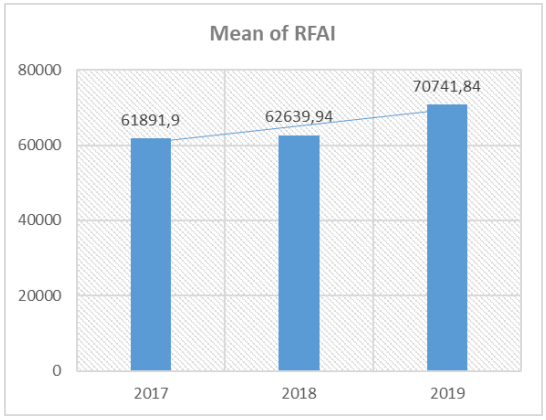
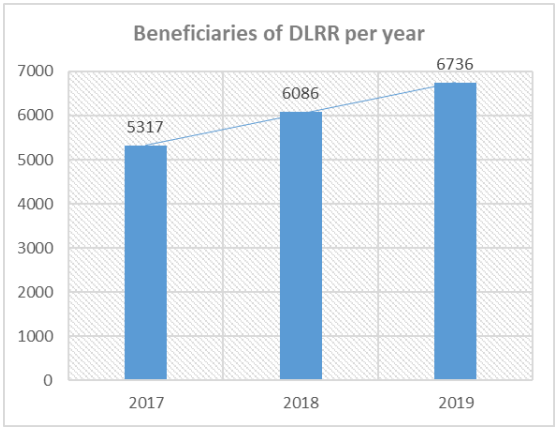
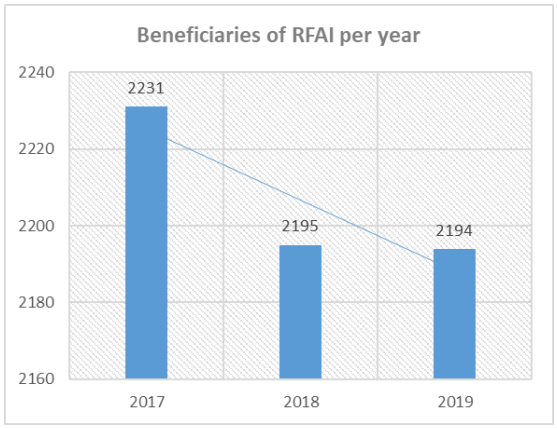


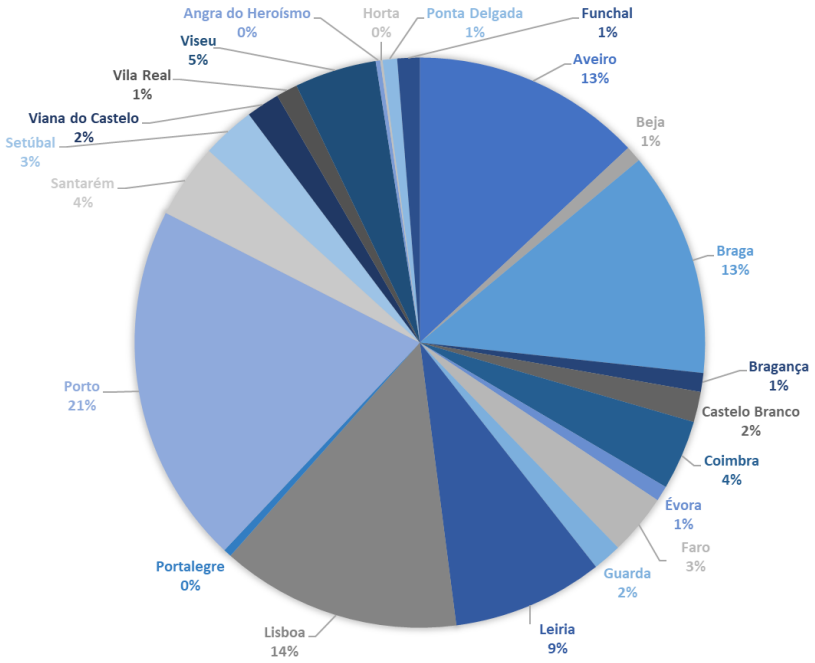
Table 5 *Number of firms benefiting from the incentives per year*





On the regional side of things, Porto, Lisboa, Aveiro and Braga are the regions that have the biggest number of companies who make use of at least one of tax benefits, while the smallest percentages correspond to the autonomous regions, followed by Portalegre, Évora, Guarda and Bragança. The north region of the country is the one that captures most of the tax incentives for all years, followed by the center region, the metropolitan area of Lisbon, Alentejo and lastly the south region. It is important to notice that the Algarve region showed surprisingly small numbers, particularly when considering RFAI (for which the numbers were inferior to 1%, except for 2019). Despite the low values in Algarve, at first glance, the policy seems to actually be reaching one of its key targets, the decentralization of the economy of the country, and a potential investment by firms in districts other than Lisbon.

Graph 6 *Distribution of both benefits by district*



Taking the data for both incentives more closely into consideration we can observe that the DLRR treated units tend to be more distributed among regions, with RFAI showcasing bigger percentages for Aveiro, Braga and Porto. Lisbon also shows differences between both tax incentives for the three years under analysis, making up for a smaller percentage

of the companies benefitting from the RFAI when compared to its weight in the distribution of the DLRR beneficiaries, thus reflecting the higher propensity of RFAI to stimulate investment in other regions of the country other than the capital.

When comparing the evolution of the DLRR distribution across the country, we can see there were no significant changes from 2017 to 2019, with cities that used to register a sizable percentage of beneficiary companies, such as Aveiro and Braga, showing a slight reduction, however Lisbon and Porto maintained steady numbers. The numbers for RFAI are steady too, with Porto being the most noticeable outlier and showing an increase in 2019 to a significant 24.48% of the allocation of benefitting firms.

Finally, and by looking at Table 5 that shows the average value of descriptive variables of firms, we see that in average treated firms are more productive, older and the percentage of tangible assets is higher as well as the value of total assets. It is also important to acknowledge that firms that benefitted from the incentives are averagely bigger, with a higher number of employees and higher EBITDAs. Moreover, and importantly for the evaluation of the policy, treated firms are more commonly exporters, which seems to signal the increased competitiveness of treated firms. Nevertheless, this analysis only gives us a small overview of the effects of the policy not accounting for self-selection bias, spillovers and other factors that can skew the evaluation of the policy. To evaluate whether the incentives truly have the positive effects that they may seem to have, we need to perform the evaluation analysis described further ahead and not only rely on these values.

Table 7 *Average statistics for treated and untreated companies*

	Treated	Untreated
Liquidity	3.12	5.24
Solvability	1.95	2.63
% Current Liabilities	0.68	0.66
In Labour Productivity	10.9	10.13
Age	18.54	13.3
% Tangibles	0.32	0.21
% Intangibles	0.02	0.12
In Employment	2.73	1.06
In Total Assets	14.2	11.46
In EBITDA	12.32	9.70
% Volume of Exports / Total Sales	0.19	0.06
In Taxes Paid	9.93	7.36
In Credit	12.27	10.66
Rentability of Assets	0.19	-0.21
Rate of Indebtedness	2.71	4.76
Dimension of Firm	1.85	1.12

To identify the treatment effect of incentives we follow an approach focused on investment level, productivity and economic performance. Thus, this study is conducted on the evaluation of the outcome of multiple variables on treated versus untreated, such as fixed assets (tangible and intangible), employment and wages, EBITDA, total sales and services provided, exports, credit, and labour productivity (Gouveia et al., 2019). Additionally, we need to control for other effects such as firms' liquidity, solvability, age, the sector of activity, region and size (a table summarizing how these variables were constructed it further ahead in the methodology sector of the project).

Ahead we provide descriptive statistics of the variables used for matching on the treated and untreated firms in the year of the matching, 2015.

Table 8 *Average Statistics for treated and untreated firms (2)*

	Treated			Untreated		
	N	Mean	S.Dev	N	Mean	S.Dev
In Net Result	2478	10.66	1.84	174447	8.88	1.93
Liquidity	2662	2.90	4.67	283257	5.04	10.9
Solvability	2675	1.70	4.20	291574	2.63	8.67
% Current Labilities	2681	0.69	0.28	296120	0.68	0.57
Rentability	2689	0.14	0.29	302694	-0.11	2.05
% Personnel Costs / Total Assets	2689	0.29	0.32	302944	5.68	2698.55

We would like to use this section of the paper to acknowledge the possibility that firms that are now untreated in 2017 could have been treated in the previous years. Nevertheless, we do not believe that previous support to untreated is common enough to skew the findings, as both tax incentives have only started to be common in the years covered in our sample. Nonetheless the fact that in previous years, firms could have made use of these incentives and have long-run positive effects (possible according to Alvarez-Ayuso, et al, 2018) cannot be discarded and is an issue that we must take into account.

5. **Methodology - Regression and Matching:**

As said previously, in order to obtain the counterfactual effect of the tax policies, and evaluate whether these tax incentives really stimulate investment, employment and the economic productivity of a firm, we would need to compare the results for the treated firms with what would have occurred in the absence of the policy. This hypothesis is impossible to test simply because these incentives have been implemented and firms have enjoyed the benefits, thus what would have occurred in its absence is not observable; a firm either participates or not in the programme at a point in time.

In policy evaluation, the treatment effect of a policy instrument is the difference between the value observed on a target variable after the intervention and the value that would be observed for the same variable in the counterfactual situation of no intervention (Caiumi, 2011). Thus, if we have the treated firms, we need now to find a counterfactual to these firms, that represent what would have happened if there was no government policy in effect.

This counterfactual group will be a subsample of the untreated firms, those that did not benefit from the incentives. For the evaluation of the impact of the treatment effect, the comparison group must be as similar as possible to the treatment group except for not being treated, otherwise a simple comparison could lead to biased results and a skewed effect of the policy in study. As these tax incentives (despite the favouritism towards SMEs) are universal and not randomly assigned, self-selection into the policy arises as firms choose whether to participate or not to the programme, making it hard to understand why firms that fit the criteria do not apply. If specific features of the policy produced incentives that are randomly more attractive to a particular group of firms, the remaining firms would naturally form a control group, such as comparing between closely

comparable industry sectors where one can benefit from incentives and the other not. Additionally, if the policies had changed in a specific period of time, we could also measure it in the transition period. Nevertheless, we opted to go in a different path, but a future study using such a methodology could be a benefit for the literature on the subject.

Therefore, and according to all these characteristics, the literature on the topic, as well as the wealth of data in our dataset, which includes information for the entire population of firms in Portugal, we rely on the Propensity Score Matching (PSM) methods proposed by Rosenbaum and Rubin (1983) to build a control group that allows us to infer causal effects and estimate the causal Average Treatment on the Treated effect (ATT).

The PSM is a quasi-experimental method, which is performed in two steps. Firstly, the treatment model consists of the identification of a control group composed by firms with a similar probability of being treated, the propensity score, estimated with a probit or logit model that controls for the variables that are likely to affect both the probability of treatment and the outcome of the programme. Secondly, the outcome model is the comparison of results between the matched treated firms and non-treated (control group), after the treatment.

The Propensity Score Matching is further characterized by two assumptions. The first is the Conditional Independence Assumption, which means that conditional on a set of observable covariates X, treatment assignment is independent from potential outcomes for the treated and control group, and thus the selection effect is no longer present. As it relies on selection on unobservable variables being small or non-existent, it is considered a strong assumption. The larger the dataset and the existence of pre-treatment data (strong data requirements), as is the case of the dataset present in this project, the bigger the credibility of the assumption. The second is the Common Support assumption, which

ensures that there is sufficient overlap in the characteristics of treated and untreated units to find adequate matches, thus ensuring a substantial overlap of propensity score distributions.

Nonetheless, despite the reliability of PSM, it still has some important limitations, the most critical one being the fact that, it can only account for observed (and observable) covariates. Factors that affect assignment to treatment but that cannot be observed cannot be accounted for in the matching procedure. As a result, unlike randomized control trials (RCTs), propensity score analyses have the limitation that remaining unmeasured confounding variables may still be present during the first step of the treatment model, thus leading to biased results, endangering the robustness and significancy of the findings (Nutall and Houle, 2008). Other quite common and important limitations of propensity score methods are related with the quality of matching, as inexact matching can cause residual imbalance (which occurs more often in small samples, which contain less outcomes, thus limiting the number of covariates) and incomplete matching that may lead to a generalization of the outcomes and less statistical inference power. Ergo it is paramount to have a thorough understanding of the necessary covariates to incorporate in the model and that they pass the robustness test of good balancing. Furthermore, low common support between treated and control groups can cause results to be insignificant, as firms would be not really comparable, thus endangering the treatment effect between firms that other than treatment should be of similar characteristics (Nguyen et al, 2017 & Okoli et al, 2014).

In this project, we consider as the treatment group the set of firms that benefit from DLRR or RFAI in 2017, but not in 2018 and 2019 in order to avoid capturing more than one treatment. Then, since in the year preceding the treatment a small number of firms could already benefit from those incentives affecting matching conditions, the matching process

was conducted in 2015 (t-2). Moreover, as previously referred, the number of firms that benefit from these incentives was significantly smaller before 2016, enabling us to discredit the potential for skewness in the results. The assessment of the impact was done in 2018 e 2019, one and two years after the treatment to eliminate the possibility of spillovers effects to the non-treated firms. For the definition of the control group, in 2015 we also excluded firms that had benefits in 2018 and 2019 but not in 2017 otherwise we could be catching the benefit of being treated in 2018 and 2019.

In the first stage of PSM, for the estimation of the propensity score, we used a logit estimator. The control variables used for the estimation of the PS include **net income, liquidity ratio, solvability ratio, current liabilities ratio, rentability of assets ratio, ratio of personnel costs against total assets, indebtedness rate[1] and ratio of financial investments against assets[2]**. The variable region is commonly apart of the pscore matching control variables, but as in this case it can cause the matching to be not balanced, we decided that as the country is quite small and the regional asymmetries regarding the benefit are not major, it can be not a part of the control variables for matching without any negative skewness in the results. All these variables are 2015 values, and for those that needed more than a transformation into logarithmic values, the process as they were built are demonstrated in the following table, as well as the variables of interest that also needed further construction pre ln values.

[1] Only for the set of results of Manufacturing Industries;
[2] Only for the set of results of SMEs.

Table 9 *Construction of Some of the Control Variables and Outcome Variables*

Control Variables	
Liquidity Ratio	Current Assets / Current Liabilities
Solvability Ratio	Equity / Total Liabilities
Current Liabilities Ratio	Current Liabilities / Total Liabilities
Rentability of Assets Ratio	EBITDA / Total Assets
Ratio of Personnel Costs against Total Assets	Personnel Costs / Total Assets
Indebedness Rate	Total Assets / Equity
Ratio of Financial Investments against Assets	Financial Investments / Total Assets
% Volume of Exports	Exports / Total Sales
Age of Firm	Dummy==1 if firm age>10
Outcomes of Interest	
Wages	Remuneration of Personnel / Nº of Remunerated Personnel
Labour Productivity	(Sales and Services Provided - CMVMC) / Nº of employees

Despite our estimation of the propensity score suffering from low pseudo R-square, and low pscore for even the observations that should be considered to be the ones with the biggest probability of being treated, we do not consider this to be a failure. According to Ho, et al (2007), the reason to use PSM is to create balanced groups on the set of covariates, and that the R-square is a poor method of assessing the effectiveness of the propensity score, as its consideration about the pscore is irrelevant, except for its ability to achieve balance on the covariates. The low pscore values are mainly due to the variables of control chosen, which nevertheless were the best ones as they enabled us to still pass the robustness tests. Therefore, submitting us to a conundrum, as despite the robustness and soundness of results, their significancy will be affected by the low p-values in the matching process. This issue of significancy mainly comes from the fact that

firms that in our methodology are comparable, in reality could have slightly distinct defining characteristics that can bias the results due to unobservable and unaccountable factors in our methodology.

After we reach the propensity score, and according to it, each treated firm is associated with a similar firm that did not enjoy the tax incentive. Since the propensity score is a continuous variable, exact matching will very rarely be achieved and distance between the P-score values of firms belonging to the two groups needs to be allowed. Thereby, we apply the nearest neighbour method of matching. Which, as the name suggests, searches for the untreated observation with the closest p-score to the treated observation, forming a "pair" between them, in the case of multiple nearest neighbours, the average outcome of those controls is used. During the calculation of both the pscore and the ATT, we imposed common support according to the commands available on stata, in our project and for the main set of results the pscore went from approximately 0,0001 to 0,4175.

Finally, after the matching is performed, the ATT is calculated with the attnd command in stata, where the ATT is computed by averaging over the unit-level treatment effects of the treated where the controls matched to a treated observation are those observations in the control group that have the closest propensity score (Becker & Ichino, 2002). For the calculation of the ATT and the robustness of its results we used as control, **variables such as, firm size, age and sector of activity as well as financial indicators (liquidity ratio, solvability ratio and exports as percentage of sales)**. Not all these variables were used as control variables in the matching because it would not respect the robustness test of balancing. Nevertheless, we replicated the same methodology on two other distinct datasets, one that only comprise the manufacturing industry and the other that only includes SMEs to overcome the fact that we did not include the sector of activity and the dimension as control variables as part of the pscore matching.

We would also like to acknowledge that, firms can be compared with methods other than the nearest neighbor matching such as stratification and kernel, nevertheless, to save computational time and time to focus on other parts of the project we decided to focus on the nearest neighbor methodology.

Taking into account all this information, in our paper we developed a methodology that focused on 3 sets of samples: all firms treated, treated firms of the manufacturing industry and treated firms that are classified as SMEs (tables 10-12). The procedure passed the robustness test of good balancing, as the combination of control variables were chosen taking into consideration not only the best pscores possible, but the best robustness results, thus enabling us to focus on the calculation of the ATT and the evaluation of results (Rosebaun and Rubin, 1985).

6. **Results:**

On this section we look at the results given by the evaluation method used. As according to the methodology previously described we evaluated the outcomes on 11 variables of interest for two years, 2018 and 2019, through the Average Treatment Effect of Treated. As to further our research as well as check the robustness of the findings, we decided to study the effects of the treatment on only firms which belong to the *cae* C, manufacturing Industries, as well as on only SMEs, as they are the main target of the policy.

The outcomes of interest analysed are: labour productivity, employment, wages, EBITDA, assets, tangible and intangible, taxes, sales, exports and credit. For all outcomes, we focus on the ATT rate in percentual points, as we defined each outcome variable as the natural logarithm of the variable in the year of interest, 2018 and 2019 respectively (e.g., Labour Productivity = ln(Labour Productivity 2018)).

Table 10 *Results for treated firms*

	All firms treated					
	2018			2019		
Outcomes of Interest	**ATT**	**S.Dev**	**t**	**ATT**	**S.Dev**	**t**
ln Labour Productivity	0.092	0.026	3.526	0.050	0.027	1.876
ln Wages	0.093	0.021	4.504	0.106	0.019	5.598
ln EBITDA	0.650	0.051	12.620	0.604	0.052	11.573
ln Employment	0.620	0.039	17.752	0.627	0.040	15.763
ln Tangible Fixed Assets	0.977	0.065	14.998	0.849	0.064	13.291
ln Volume of Exports	0.529	0.119	4.439	0.624	0.122	5.106
ln Intangible Fixed Assets	-0.310	0.157	-1.980	-0.112	0.166	-0.675
ln Taxes	0.668	0.057	11.741	0.584	0.058	10.013
ln Sales	0.797	0.050	14.858	0.753	0.052	14.546
ln Credit	0.356	0.071	4.995	0.224	0.069	3.253
ln Assets	0.501	0.048	10.485	0.481	0.049	9.752

Firstly, it is important to note that, has said previously, the Portuguese economic environment is mainly composed by micro and small firms, thus they compose the majority of the observations as well, from the firms treated in 2017, where we distinguish

between treated and non-treated, 1134 (40,06%) are micro and 1260 (44,51%) are small on the treated while 346697 (89,55%) are micro and 34882 (9,01%) are small on the untreated, therefore, small differences in values can result in a treatment effect of a larger magnitude in percentual points.

The main outcome is that the public support measures under analysis have a positive and significant effect for all variables of interest, except exports and intangible assets and for both years. As one of the policies is not devoted to the investment in intangible assets this is an expected outcome. Moreover, the insignificant increase of exports can be related with the time needed to expand the firm to other markets. The fact that most of the results are consistent in 2019, can be related with the fact that according to the policy rules the beneficiaries need to maintain those investments/assets over a certain period.

The first outcomes of interest and of which we expected positive and significant results are assets, in particular tangible assets. On Assets the policy has different results across the board, on total assets we see an increase of close to 0,500 pp on both years showing that investment and the acquisition of all types of assets can be seen as a result of the policy. This increase of assets is mainly supported by the spectacular increase in Tangible Fixed Assets, 0,977 pp and 0,849 pp in 2018 and 2019 respectively, enabling us to conclude that the regulations and objectives of the incentives are directed to tangible fixed assets, as predicted due to DLRR focusing on the acquisition of tangible fixed assets. Moreover, as these assets are easier to quantify and audit, it enables firms to apply to the incentives, respecting the obligation to have its accounts in order. Thus, it was predictable that the investment available for intangible assets is left aside due to financial constraints or just opportunity cost of pursing other investments. Furthermore, this increase in assets can be supported in part by one of the criteria of RFAI being the obligation of firms keep

the assets of investment in their inventory for a minimum period of years, as described already in this project.

The second outcome of interest is Labour Productivity, where we reach an ATT of 0,092 in 2018 and in 2019, we see a small decrease to 0,050. These results suggest that there was a slight and modest increase in productivity of firms who enjoyed at least one of the benefits in 2017 in relation to its counterparts, from this result, we can conclude that firms who were treated in 2017, and had a Labour Productivity (LP) of 64 656 on average in 2016, would have an increase of LP of 64 656 * 0,09pp plus 64 656 * 0,05pp due to the benefitting from the incentive. Despite the value of the ATT being higher in the short run we believe that productivity is an outcome that should be studied with a long run focus, as all literature suggest that productivity effects are only significantly observable in the long run.

On employment and wages, we reached another positive result, where the number of workers of firms who benefited from the incentives for investment, immediately saw a remarkable increase in 2018, which stabilized in 2019 (0,620 pp), representing a positive effect of job creation of the program, whereas wages saw a growth in both years of 0,093 pp in 2018, and 0,106 pp in 2019, which goes hand in hand with the increase in Labour Productivity, as better performing employees are usually better paid. This increase is supported by the mandatory criteria of RFAI, where firms must generate new employment throughout a certain period.

On Sales and EBITDA we reached a very positive effect, of 0,753 pp and 0,604 pp respectively in 2019, where the 2018 results can be seen to not be very distant from these, even being slightly higher. As these values are extremely high for an ATT of a simple policy, the significancy of the results should be called into question, nevertheless, if we

observe the economic fabric of the country and the dataset, we see that the vast majority of firms are extremely small, so as explained at the beginning, a small increase in total values of some of these variables translate to a significant increase in percentual points. Nevertheless, we can still point that firms sell more and have better economic results, showing that increases in investment and productivity, translates to a higher competitiveness by firms, which is a goal that governments constantly aspire to reach.

Surprisingly, despite the policy being characterized by tax deductions and credits, the model still saw an increase of 0,668 pp in 2018 and of 0,5984 pp in 2019, this increase in taxes paid can be attributed to the growth in Sales and Ebitda, which in return promote an economic result that makes firms pay more on taxes despite enjoying the benefits of tax deductions. This outcome variable is quite important for the policy, as the deterrents of tax incentives constantly point out the deadweight loss costs in the form of foregone tax revenue that governments have when implementing the policies. Thus, if these policies actually result in increased tax revenues for the government, they can already be considered a moderate success for the policymakers.

Finally on credit we saw increase of 0,224 pp in 2019 and in 2018 of 0,356 pp, thus showing that the investment was accompanied by an increase in credit, as not all firms have the ability and the stock of cash available to invest on large scale. Moreover as Silva et al, 2019 advanced as a possibility, we also believe that this increase in credit was facilitated by the obligation of firms to have its balance sheet in order and easy to audit so that they can obtain the benefit, thus enabling financial actors to more easily grant credit to firms.

Table 11 *Results for manufacturing firms*

	Only Manufacturing Industries Firms					
	2018			2019		
Outcomes of Interest	**ATT**	**S.Dev**	**t**	**ATT**	**S.Dev**	**t**
In Labour Productivity	0.056	0.039	1.415	-0.008	0.043	-0.198
In Wages	0.066	0.027	2.452	0.052	0.027	1.912
In EBITDA	0.481	0.091	5.293	0.510	0.089	5.733
In Employment	0.467	0.068	6.839	0.475	0.070	6.771
In Tangible Fixed Assets	0.534	0.101	5.273	0.539	0.104	5.192
In Volume of Exports	0.064	0.181	0.354	0.307	1.179	1.717
In Intangible Fixed Assets	0.010	0.206	0.050	-0.063	1.198	-0.319
In Taxes	0.407	0.102	3.979	0.444	1.106	4.205
In Sales	0.515	0.087	5.892	0.495	0.090	5.491
In Credit	0.242	0.119	2.041	0.171	0.110	1.557
In Assets	0.368	0.084	4.391	0.362	0.084	4.331

When focusing only on Manufacturing Industries, we confirm the positive effects of the policy, nonetheless the statistic significancy of the results drops drastically, probably due to the sharp decrease in observations in the dataset and the resulting low pscore values in the matching. Nevertheless, the significant increase in Total Assets by 0,360 pp in both years, the increase in Employment and Wages as well as sales, suggest that the majority of the investment by firms goes to assets as well as more and more qualified personnel, of which we expect to see a rise on Labour Productivity in years to come. The low significancy of the results of taxes does not enable us to confirm the robustness of this outcomes of interest by confirming the rise of taxes paid by treated firms as a result of the policies. Therefore, we cannot clearly suggest that the policy does not lose as much tax revenue as expected, even when considering a more asset intensive industry.

The outcomes that are not confirmed by this analysis other than taxes are the ones related with Credit and Tangible Fixed Assets, as they are not statistically significant.

Table 12 *Results for small and medium enterprises*

	Only SMEs					
	2018			2019		
Outcomes of Interest	**ATT**	**S.Dev**	**t**	**ATT**	**S.Dev**	**t**
ln Labour Productivity	0.035	0.026	1.313	0.059	0.027	2.191
ln Wages	0.081	0.020	3.943	0.095	0.019	4.938
ln EBITDA	0.606	0.050	12.147	0.626	0.051	12.208
ln Employment	0.651	0.037	17.734	0.636	0.037	17.142
ln Tangible Fixed Assets	0.940	0.066	14.288	0.886	0.063	13.674
ln Volume of Exports	0.522	0.121	4.566	0.576	0.128	4.511
ln Intangible Fixed Assets	-0.408	0.143	-2.860	-0.330	0.143	-2.373
ln Taxes	0.617	0.055	11.191	0.589	0.057	10.333
ln Sales	0.778	0.048	16.063	0.796	0.049	16.123
ln Credit	0.311	0.067	4.633	0.301	0.067	4.476
ln Assets	0.498	0.047	10.685	0.509	0.047	10.874

Finally, when we only consider SMEs the results go in line with the info previously obtained, thus giving extra robustness to the first set of results. Nevertheless, this was already expected as the fabric of the economy is characterized by micro and small firms as described in this paper already.

Of this set of results we want to focus the noteworthy growth in number of employees, higher than 0,600 pp in both yeas, which is again a proxy for the growth of the firm in both medium and long run, thus indicating a possible sustainable growth of micro and small firms, one of the goals of the incentives. This set of results explanation for high results goes back to the magnitude that small changes in outcomes of interest can have.

On the full set results, we want to comment that they do not seem to be reliable despite their significancy at times, as the positive effect of the policy would be felt along multiple variables. Furthermore, despite the past literature agreeing on a somewhat positive effect of tax incentives they do never reach such a positive large scope. A justification for such would be that the variables for control in the pscore matching only explain treatment at a smaller level, and/or our method probably does not control for environment or economic unobservable factors, such as macroeconomic trends in the period studied as explained

previously. Nevertheless, this was already expected in order to conform with the robustness necessities and the more universal criteria of the incentives.

7. **Conclusion:**

In the past few decades, tax incentives have become a pillar of tax systems and public policy all around the world, be it in developed, developing, peripheric or central countries. Portugal, as a country in the economic tail of Europe in terms of productivity and investment, makes use of incentives to promote growth, competitiveness, better economic performance and decentralization of the country.

The fiscal code in Portugal has seen a tremendous and constant growth in tax incentives, therefore it has become imperative that the existence of these benefits is properly justified and evaluated. One type of incentives of the many present in the Portuguese fiscal code are those that are substantiated by the need to promote investment. Of the many, the two analysed and studied in this project are RFAI and DLRR, which take form as tax deductions for firms who benefit from the incentives. Despite the value and importance of these incentives when compared to others, they have not received the attention and evaluation needed, the literature has up until now focused on incentives for investment in Research and Development, maybe due to its importance as a driver for sustainable growth.

This said and given that the evaluation of these two incentives has never been carried out for the Portuguese economy, this project sought to evaluate the impacts of RFAI and DLRR on the productivity, performance and economic results of firms in the Portuguese economy. To this end, a counterfactual analysis was carried out using the Propensity Score Matching method. Due to this methodology, it was possible to evaluate the impact of incentives without the effect of other factors, on the variables of interest, such as apparent labor productivity, investment (through tangible and intangible assets), export ratio, sales and even employment and wages among others.

The results of this study suggest that the average impact of the treatment (benefit from at least one of the incentives in the year of 2017) is an important positive one, both in the short and well as medium run (t+1 and t+2), with ATT with positive values in pp terms across most of the outcomes of interest, even when we only consider firms from the manufacturing sector or only SMEs. From the variables of interest those with the biggest impact are the increase in tangible assets of 0,98 pp in 2018 and 0,85 pp in 2019 which is accompanied by an increase credit by those same firms, thus reflecting the success of the policies in stimulating investment. An outcome of interest for us and for the literature is the slight increase in labour productivity, outcome to which we only expect to see the true treatment effect in the long run. A final variable of interest is the significant increases in employment, suggesting that treated firms do improve their business competitiveness and scale, hence pointing to firms having the tools for sustainable growth.

These positive results when compared with the literature reflect an optimistic and positive evaluation of the incentives here studied. Despite going in line with some of the results in the literature such as increase in investment and even credit such as Bronzini et al. (2008), the values are high across the board, and the significance must be called into question. Nevertheless, we can still see parallels between our project and others such as Santi (2021), where in their sector of study, investment sees a significant and notable increase whereas labour productivity shows a smaller or insignificant increase, thereby giving robustness to our findings as labour productivity is commonly assumed to either be on a downwards trajectory in the economy as a whole or the effect of the policy on it can only be visible in the long term. These parallels continue to the significant growth in employment such as Chirinko et al. (2016), as well as the growth in credit like Silva et al. (2019).

Overall, our project results suggest an all-around positive effect on economic and productive performance of firms, be it SMEs or even just manufacturing firms.

Policy Implications:

The implications of this project mainly focus on the analysis of the benefits and outcomes that result from the policy when compared with the potential costs that the policy has for the government, because at a first stage governments suffer from a loss in tax revenue when firms benefit from the policy. Nevertheless, our results show that this loss may be smaller than expected, not because firms do not engage with the government and apply for benefits, but because the evaluation results show an increase in taxes paid by firms that benefitted from the incentives, therefore due to the rise in sales, investment and wages paid, firms can end up paying more taxes than if the policy was not in play. By looking at 2017, we see that the average value of the incentive was €61 892 for RFAI and €18 302 for DLRR, and the average tax paid by them was €36 395, thus if the result for increase in taxes paid is of 0,7 pp in 2018 and 0,6 in 2019, some of tax loss is recouped by the increase in case of firms benefitting from the incentive, as the increase in tax revenues for the government would be €36 395*0,668pp plus €36 395*0,584pp, which would equal €473 by firm. This result shows at a first glance that the sustainability of the program as governments may not be guaranteed and the program may incur in prohibited and unsustainable losses such as the ones described in Caiumi (2011) and Bronzini et al. (2008), nevertheless the benefits might support and counterweight these losses in the long run.

As our results point towards a global positive effect, the benefits of the program should not be overstated, as the stimulation of investment, employment and wages and sales all point towards a positive effect of the policy, which creates competitiveness, growth and

better economic performance. When analysing the results in the first proxy for investment, increase in assets, we see that while in 2016, firms treated in 2017, had total assets in the value of €4 626 083, our results point to a significant increase in assets of 0,5pp in both years, thus, the increase in assets would be of close to €46 261 by treated firm, continuing therefore to offset the tax revenue foregone by the government. In fact, when only studying SMEs we realize that this positive outcomes are of extreme importance and significancy for a sustainable growth of the entrepreneurial fabric in Portugal, so characterized by these micro, small and medium enterprises which are rarely competitive at a national and multinational level.

Giving a final comment on the large number of incentives in Portugal, past literature has found a positive effect of SIFIDE on R&D Investment, and now RFAI and DLRR are found to positively affect a number of outcomes, therefore it is our recommendation for the government to review its fiscal code and reduce the number of incentives to trim inefficiencies, ambiguities and complexity of the current code and focus on some of the incentives which are found to be extremely positive for the outcomes of interest and necessities of the government, and which do not incur in pitfall losses.

Limitations and Suggestions for Future Research:

This project has two major limitations seen at a first glance. Firstly, we do not distinguish between the effects of RFAI and DLRR in order to have a dataset more populous to increase the significancy of the results, nevertheless future studies should try to disentangle the effects of each, as despite the similitude in the incentives, their quantitative statistics are different. DLRR is used by a notable higher number of firms, but its incentives are smaller, while RFAI has a higher value per firm, but a smaller number of beneficiary firms, thus showing that their scope is different and can result in

different effects. Although when grouped, the effects are positive, it is necessary to improve their independent evaluation, given the differences in their beneficiaries and range. For example, it would be interesting to further assess the factors that contribute to the companies receiving these incentives.

The second major limitation is that this work would have benefited from the inclusion of information regarding the amount of incentives received by firms instead of just a dummy variable, since the impacts may be different depending on the amount received, this information could enable us to know if the policy has led to additional private investments (crowding-in) or their replacement (crowding-out), thus improving on Caiumi (2011).

As in the majority of evaluation of public policies, future research on these incentives could benefit from evaluating their effects over a longer period, as there are factors that may hinder the immediate impact of these policies on the outcomes of interest, nevertheless, post 2019 came the covid pandemic, which might negatively affect the evaluation of the incentives, as its negative shocks cannot be singled out with the use of a counterfactual analysis such as Propensity Score Matching.

Furthermore, in future literature, we suggest the opportunity to evaluate the difference in the treatment effects between firms that only benefitted from one of the incentives and firms that benefitted from both. With this analysis we could understand what the most effective combination to stimulate firm's level of investment is, as well as the cumulative effect of DLRR and RFAI, and would give the literature the opportunity to understand and evaluate whether the government should limit the number of similar incentives that a firm could enjoy.

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