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Abstract

The competitiveness of an economy increasingly depends on its ability to innovate. Theory suggests that innovative economies that deliver new differentiated products and services and/or develop more efficient production processes are often more productive, more resilient, more adaptable to change and better able to support higher living standards. However, because knowledge is a public good, without government support, private agents are likely to underinvest in R&D, as it usually leads to higher social returns than private ones. In this context, it is strategically important to use public funds to promote innovative activity in firms to achieve the optimal level of R&D investment. Since 2000, indirect public support through tax credits has become more prominent and is currently the main form of public R&D support for most OECD countries. This paper evaluates the impact of SIFIDE, the Portuguese system of tax incentives to corporate R&D investment, on firms' behaviour. The results show the effectiveness of SIFIDE in promoting investment in R&D, both through the impact of the program on intangible investment and on R&D staff.

Keywords: R&D tax credits, Innovation, BERD, SIFIDE, Propensity score matching, Differences-in-Differences.

JEL Classification: O31; O32; H25; H32; C31

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1. Introduction

The competitiveness of an economy increasingly depends on its ability to innovate, either on the creation of new products and services, or on the development of more efficient production processes. Globalization and the reorganization of international trade in global value chains confer greater value added to the phases of the production process requiring more technology and innovation. The transition towards a digital economy promotes the greater participation of the services sector in international trade and global value chains, which further contributes to this trend.

Given the importance of innovation and technological development, several countries implement policies aimed at promoting research and development (R&D). Public intervention in this area can take several forms such as public investment or financial support to the private sector R&D. Public financial support to the private sector generally consists of direct subsidies and grants or tax incentives³ to firms investing in R&D.

Several factors can justify public support for this type of investment. The most used argument refers to the existence of market failures associated with R&D. Indeed, positive externalities arising from the dissemination of knowledge and the transfer of new technologies imply that firms do not receive the full economic benefits associated with their R&D investments, resulting in a sub-optimal provision of the good from a social point of view (Arrow, 1962; Aghion and Howitt, 1997). Moreover, there is a large uncertainty concerning the return on these investments as they do not always translate into innovation of comparable magnitude. In addition, the intangible nature of R&D investment makes it difficult to be accepted as collateral in the financing of such activities by the private sector.

A problem typically associated with public support for R&D is the difficulty to design policies that encourage firms to undertake R&D projects that benefit society, but at the same time, are not profitable enough for private firms to implement them on their own – otherwise public support would merely replace private investment instead of leading to additional investment (Wallsten, 2000). Ideally, an efficient policy should promote socially desirable projects, that otherwise would not be undertaken by the private sector: either because the social benefit is much higher than the private one or because firms face significant financial constraints that prevent them to

³ According to the European Commission, tax incentives can be grouped into four major segments: i) Tax Credits (deduction from tax collection, depending on R&D expenses); ii) Enhanced Allowance (reduction of the tax base through an overvaluation of R&D expenses); iii) Accelerated Depreciation (reduction of the tax base through an overvaluation of Tangible Fixed Assets depreciation) and iv) Patent Box (reduction of tax payable related to intellectual property income). However, tax credits are the most common instruments. Portuguese government provides a tax credit regime (SIFIDE) and a Patent Box, in addition to various non-tax incentives (SI for Technological R&D, Productive Innovation Voucher, etc.). (https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/gen_info/economic_analysis/tax_papers/country_fiches.pdf)

invest in these projects. However, the difficulty to identify such projects may affect the degree to which public policies can mitigate existent market failures (Lerner, 2013).

Although grants and tax incentives are both designed to fund private expenditure on R&D, the two types of financial support may have different implications on project selection, on the government budget and on firm's behaviour. With grants, which usually take the form of an interest-free or non-reimbursable loan, the evaluation of the project is made by the state agency and the selection depends on its ranking among all national projects and on the budgetary endowment. With tax credits, the evaluation of the project and decision to invest is left to the firm, on the assumption that the market promotes greater efficiency in the allocation of resources. However, given the fact that tax credits are granted as long as eligibility criteria are met, these incentives may lead to a higher degree of budgetary uncertainty. In addition, they may more easily give rise to firms' rent seeking behaviour, whereby the investment is implemented with the main purpose of receiving tax incentives.

While there is no clear conclusion on the most successful approach to foster R&D, direct support through grants, may be more appropriate to encourage projects with a greater gap between private and social benefits. By contrast, tax credits encourage firms to prioritize projects with higher private benefits. As such, they have the advantage of not altering firms' choices, presumably with better information than the State on the quality of their R&D projects.

These difficulties in ensuring the effectiveness of public policies reinforces the importance to conduct policy evaluations. Evaluations should analyse whether incentives lead to additional R&D investment and are not merely replacing private funding (i.e. crowding out). In addition, it is important to consider that investment in R&D is not usually the ultimate goal of the policy, but a vehicle through which companies become more innovative, productive and competitive. Therefore, a more complete assessment should also focus on less immediate, but potentially more important, impact of R&D (e.g. on productivity, firms' profitability, or degree of internationalisation).

The evaluation of public policies is usually complicated by endogeneity issues that arise from the fact that neither the application for public supported programmes nor the approval of such projects occurs by chance, but are dependent upon firm's characteristics that also influence their performance and consequently the outcome of the program. Firms that are more likely to obtain higher returns on investment are also more likely to apply (self-selection) and public support is usually granted to these firms (public selection, in the case of grants). Both mechanisms can introduce bias into the analysis, which makes it difficult to properly distinguish between the impact of the program and the impact of those characteristics that make certain firms more likely to participate.

Several studies have analysed the impact of R&D incentives with results not always consensual. The reasons behind this divergence can be attributed to the inherent characteristics of the program (type of incentive, objectives, country and the effectiveness of monitoring agencies) but also to the methodology used, in particular whether the selection bias is taken into account.

Among the most widely used evaluation methodologies, that attempt to reduce the risk of selection bias, are matching and differences-in-differences methods. Matching methods compare the outcome of firms that have benefited from the policy (treated firms) with that of a control group composed of similar firms, in all relevant characteristics, except the fact that they have not applied for the program. To the extent that this control group has been selected by controlling for the firms' characteristics that determine both the probability of application and the outcome of the programme, it constitutes an appropriate counterfactual for comparison. With the differences in differences method, treated with non-treated firms are compared before and after the implementation of the program. To the extent that these differences result from time-invariant factors, the estimated coefficients for the impact of the program will also be non-biased.

This paper evaluates the impact of SIFIDE, the Portuguese system of tax incentives to corporate R&D investment, on firms' behaviour. This analysis seeks to distinguish between crowding-out and additionality effects. Furthermore, it will also assess the persistence of the impact over different time horizons (contemporary effects, 1 year and 3 years after the completion of the program).

In addition to the more immediate impact of the policy (on intangible investment and R&D staff), the analysis will also assess the impact on variables that may be indirectly affected by incentives, such as the degree of internationalization of firms.

Results will be broken-down by sector, firm size, and according to the firms' previous record with intangible investment and propensity to R&D, in order to identify segments particularly affected by the incentive system. To increase the robustness of the analysis both matching and differences-in-differences methodologies are used, with several matching methods, specification of the variables and models to estimate differences-in-differences coefficients.

2. Corporate R&D Tax Incentive System (SIFIDE)

The Portuguese system of tax incentives to corporate R&D investment (SIFIDE) is an instrument that aims to increase the competitiveness of companies by supporting their research and development effort by deducting these costs from corporate tax collections (tax credit). SIFIDE was created in 1997 and has undergone several revisions. The original system was discontinued between 2004 and 2005, reintroduced in 2006 and replaced in 2011 by SIFIDE II.

The new system incorporated most of the features of the previous one with some changes aimed at increasing its attractiveness to companies.

The tax credit on R&D expenses, in the part that has not been subject of other non-repayable grants, is calculated based on two rates:

1. The base Rate: applicable on the amount of total R&D expenditure in the current year (32.5%).
2. The incremental rate: applicable to the increase in R&D expenditure compared to the average of the previous two years (50% up to a maximum of € 1,500,000.00).

In the case of SMEs that started their activity less than 2 years ago and have not benefited from the Incremental rate, an additional 15pp is added to the Base Rate (i.e. 47.5% of total R&D expenses).

$$\text{Tax credit} = 0,325 * Tot_t + I$$

$$I = 0,5 * [Tot_t - \left(\frac{Tot_{t-1} + Tot_{t-2}}{2}\right)] \text{ up to a limit of €1,500,000 or}$$

$$I = 0,15 * Tot_t \text{ (if micro ou SME with less than 2 years)}$$

Tot = total eligible expenditures

Finally, if the firm has insufficient tax collection to benefit from tax credits, the deduction may be carried forward until the eighth immediate financial year.

Eligible expenditures are defined in Decree-Law No. 162/2014 (see Box 1). These include expenditures related to the company's effort with R&D (e.g. personnel expenses, fixed assets, operating assets and other R&D related activities), the external contracting of R&D activities, the acquisition of output from this effort (e.g. acquisition of patents), and the participation in the capital of R&D entities. Expenditures considered in the application for a programme must be implemented during the year of the tax exercise or during the first six months of the following year⁴.

⁴ Some additional considerations to apply: for firms employing PHDs (level 8) in R&D activities, related costs will be considered at 120%; large firms are not eligible to expenditures related to patent registry; costs with projects related to ecological products are considered at 110%.

Box 1 - SIFIDE II: eligible expenditures according to Decree-Law No. 162/2014:

Acquisitions of tangible fixed assets, with the exception of buildings and land, provided that they are acquired in a new state and in proportion to their allocation to R&D activities;

Expenditure on staff with a minimum educational qualification of level 4 of the National Qualifications Framework, directly involved in R&D activities;

Expenditure with the participation of management in the organization of research and development institutions;

Operating costs, up to a maximum of 55 % of staff expenditures with a minimum of educational qualifications of level 4 of the National Qualifications Framework directly involved in R&D;

Expenditure in contracting R&D activities from public entities or similar with recognised capacity for research and development;

Participation in the capital of R&D institutions and contributions to investment funds, public or private, to finance companies dedicated mainly to research and development;

Costs of registration and maintenance of patents;

Costs with the acquisition of patents that are predominantly intended for research and development;

Expenditure on audits to research and development;

Expenses with demonstration actions related to supported R&D projects.

The eligibility of SIFIDE is extended to all corporate taxpayers residing in Portugal, as well as non-resident firms with a permanent establishment, with a principal activity in agriculture, industry, trade or services. Given the nature of the policy, there is no competition between firms or pre-selection of projects. Firms must meet the following criteria in order to be considered as eligible:

1. Firms' taxable profit are not determined by indirect methods;
2. Firms do not owe taxes or contributions to the State and Social Security or have these payments duly secured.

Firms can apply several times to the programme and with multiple projects, as long as these expenditures were not subject to other forms of financial support.

SIFIDE allows companies to recover a significant part of their costs with research and development activities (up to 82.5% if the company has existed for more than 2 years and has not invested in R&D in the previous two years).

After its reintroduction in 2006, the System was not subject to major structural changes - the methodology used for the calculation of tax credits remained, but the list of eligible expenditures, the base rate, the incremental rate, the incremental value limit, and the carry-forward option (see Table 2.1) suffered some changes. Since its reintroduction, the amount of tax credits granted to

companies has more than doubled (EUR 227 million in 2017, compared to EUR 92 million in 2006).

Table 2.1. Evolution of SIFIDE

| Fiscal year | Legislation | Designation | Base rate | Incremental rate | Incremental Value Limit | Carry forward option |
|-------------|-------------------------|---|-----------|------------------|-------------------------|----------------------|
| 1997 | Decree-Law n° 292/97 | SIFIDE | 8% | 30% | 250.000 € | 3 years |
| 1998 | | | | | | |
| 1999 | | | | | | |
| 2000 | | | | | | |
| 2001 | Decree-Law n° 197/2001 | SIFIDE | 20% | 50% | 500.000 € | 6 years |
| 2002 | | | | | | |
| 2003 | | | | | | |
| 2004 | Decree-Law i n° 23/2004 | SIFIDE was not in force - it was replaced by the Investment Tax Reserve (RFI) | | | | |
| 2005 | | | | | | |
| 2006 | Law n° 40/2005 | SIFIDEI | 32,50% | | 750.000 € | |
| 2007 | | | | | | |
| 2008 | | | | | | |
| 2009 | Law n° 10/2009 | SIFIDEII | 32,50% | | 1.500.000 € | 8 years |
| 2010 | Law n° 3B/2010 | | | | | |
| 2011 | Law n° 55A/2010 | | | | | |
| 2012 | Law n° 4B/2011 | | | | | |
| 2013 | Decree-Law n° 82/2013 | | | | | |
| 2014 | Law n° 83C/2013 & | | | | | |
| 2015 | Decree-Law i n° | | | | | |
| 2016 | 162/2014 | | | | | |
| 2017 | Law n° 42/2016 | | | | | |
| 2018 | Law n° 114/2017 | | | | | |

As mentioned, tax credits, compared to other R&D support policies, may give origin to firms' rent-seeking behaviour (used as a cost optimisation strategy), may introduce budgetary uncertainty (as the loss of tax revenue is more difficult to predict than costs with grants or cash transfers, where resources are committed), and may contribute to the crowding-out of private investment, to the extent that some R&D projects could have been implemented in the absence of public support. Although other forms of support do not exclude many of these problems, they could be minimized given the state evaluation of the project. Furthermore, the fact that the benefits from SIFIDE are relatively uniform among firms, may undermine its efficiency as R&D may be particularly relevant in some sectors or type of firms.

Tax credits, however, have the advantage of conferring to firms the decision to select projects, potentially more knowledgeable of the associated benefits/costs than the state. Furthermore, implementation is relatively simple, administrative cost are low (notwithstanding the mandatory detailed reporting of the project and investment costs under SIFIDE) and provides greater stability to the levels of R&D investments, as they depend less on budgetary endowments or political decisions.

The government is an important source of financing for R&D activities. Between 2004 and 2017, direct public funding of R&D activities in the European Union ranged between 29% and 35% of total expenditure on R&D activities and between 25% and 31% in the OECD (Table 2.2). Portugal compared well above average in a range of 41% to 57% in the same period. In the business sector,

the weight of direct public financing of R&D activities in Portugal was 5,5% in 2018, compared with 4,8% in OECD countries.

Table 2.2. Share of direct public funding of R&D by execution sector

% total R&D expenditure in the respective execution sector

| Country | Execution sector | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|-----------------|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| UE28 | All sectors | 35,2 | 34,4 | 33,6 | 33,3 | 33,8 | 34,9 | 34,8 | 33,3 | 32,8 | 32,5 | 31,9 | 31,1 | 30,2 | 29,3 | |
| OECD | All sectors | 30,5 | 29,7 | 28,9 | 28,5 | 29,4 | 31,4 | 31,3 | 30,0 | 29,3 | 28,3 | 27,3 | 26,9 | 25,7 | 25,2 | 24,9 |
| Portugal | All sectors | 57,5 | 55,2 | 48,6 | 44,6 | 43,7 | 45,5 | 45,1 | 41,8 | 43,1 | 46,4 | 47,1 | 44,3 | 42,6 | 41,0 | 40,6 |
| UE28 | Business Sector | 8,0 | 7,1 | 7,1 | 6,8 | 7,0 | 6,9 | 7,1 | | 6,5 | | 6,1 | 5,9 | 5,3 | 5,1 | |
| OECD | Business Sector | 7,1 | 6,8 | 6,8 | 6,8 | 8,1 | 9,0 | 8,1 | 7,2 | 7,0 | 6,5 | 5,9 | 5,8 | 5,1 | 5,0 | 4,8 |
| Portugal | Business Sector | 4,6 | 4,2 | 3,7 | 3,5 | 3,3 | 5,5 | 4,3 | 4,0 | 6,9 | 9,1 | 9,1 | 5,5 | 3,8 | 4,2 | 5,6 |

Source: Eurostat and OECD

Since 2000 indirect public support through tax credits has become more prominent and is currently the main form of public R&D support for most OECD countries. This particularly true for Portugal as 17.5% of total R&D expenditure in the business sector was financed through tax credits in 2017 (Table 2.3 and figure 2.1).

Table 2.3. Share of public support for business R&D through tax incentives

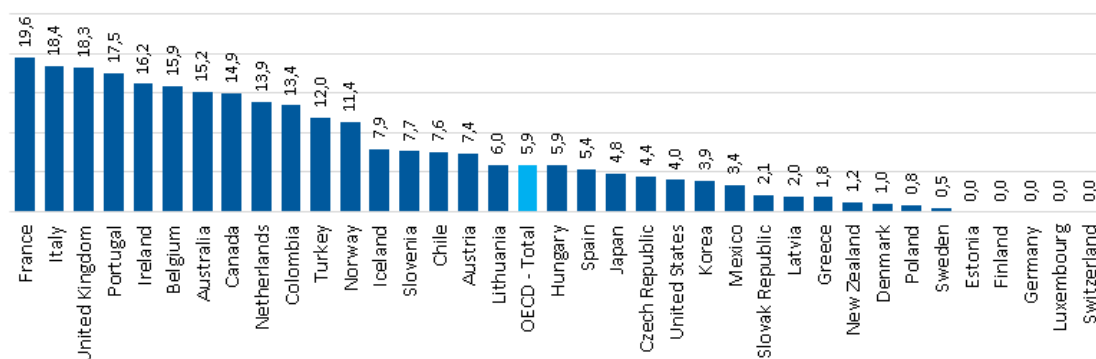
% total R&D expenditure performed by the business sector

| País | Setor de Execução | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|-----------------|------------------------|------|------|------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| UE28 | Business Sector | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| OECD | Business Sector | 3,4 | 3,7 | 3,8 | 4,0 | 4,1 | 4,2 | 4,5 | 4,5 | 5,0 | 5,2 | 5,5 | 5,8 | 5,8 | 5,9 | |
| Portugal | Business Sector | | | | 12,5 | 14,4 | 11,6 | 12,8 | 12,8 | 14,8 | 12,8 | 14,3 | 16,5 | 19,1 | 18,2 | 17,5 |

Source: OECD

Figure 2.1. Weight of public financing to companies' R&D through tax credits

% total R&D expenditure performed by the business sector, 2017



Source: OECD

Note: The figures presented for the United States and Greece refer to 2016.

Tax incentives may differ across countries with respect to the tax base, applied rates or eligibility of expenditure. In particular, the tax base may depend on the volume of R&D expenditure or on an incremental factor (calculated on the basis of the increase in investment over a reference period). Although tax credits started to be mostly based on the volume rate, incremental rates, and hybrid schemes, such as SIFIDE, are increasingly common.

In the international context, SIFIDE is one of the most generous tax incentive systems (table 2.4). For SMEs and large profitable firms, the implied marginal incentive rate in Portugal is 39% (compared with 19% for the OECD average for SMEs and 14% for large companies). For SMEs and large companies with losses the implied marginal incentive rate in Portugal is 31% (compared with 17% for the OECD median for SMEs and 10% for large companies).

Table 2.4. Country comparison of tax credit regimes to R&D investment

| Country | R&D Tax incentive | Implied marginal tax incentive rate for profitable (or at a loss) SMEs |
|----------------|--|--|
| Belgium | Tax withholding; tax credit and subsidy | 0,16 (0,15) |
| Czech Republic | Hybrid tax subsidy | 0,21 (0,15) |
| France | Volume-based tax credit | 0,43 (0,43) |
| Ireland | Volume-based tax credit | 0,29 (0,23) |
| Italy | Incremental tax credit | 0,20 (0,17) |
| Poland | Volume-based tax subsidy | 0,22 (0,18) |
| Portugal | Hybrid tax credit | 0,39 (0,31) |
| Spain | Hybrid tax credit and exemption from contribution to Social Security | 0,33 (0,26) |
| UK | Volume-based tax subsidy | 0,27 (0,27) |

Source: OECD, R&D Tax Incentive Database - OECD R&D Tax Incentive\$ BD (2019 edition) contains time series estimates based on tax credits and subsidies, by company size and profitability scenario. The subsidy rate is defined as 1 minus index B, a measure of revenue before tax required for the representative company to offset \$1 R&D spent.

3. Literature review

3.1 Impact of R&D incentives

Several studies have analysed the effectiveness of R&D incentives, with results not always consensual. This may have to do with the design and diversity of support instruments granted (subsidies, tax credits, etc.), with the different objectives and variables used to measure the impact of public policies (investment in R&D, patent creation, productivity gains, etc.), but also with the diversity of methodologies used, level of data aggregation, different periods analysed, which make the various studies difficult to compare.

Most studies analyse the impact of policies in terms of the input of innovation (R&D effort) or on its more immediate output (new products or production processes and patent creation). By contrast, studies that analyse the less immediate impact of R&D on company performance, such as productivity or degree of internationalization are relatively scarcer in the literature.

A typical concern of these studies is to examine the extent to which public financing replaces or complements private investment on R&D. Ideally, public policies should finance socially beneficial projects, which would not otherwise be carried out. However, it is not always easy for authorities managing R&D incentive programs to identify firms with viable projects, but with financial constraints or other factors that prevent them from implementing them. Thus, there is a risk that the incentives do not contribute to additional investment in research, but only to replace private with public funding (crowding-out).

Most recent empirical studies analysing the impact of R&D incentives conclude for positive effects on private investment in R&D (i.e. complementarity). However, there are also a considerable number of papers which, although rejecting the hypothesis of full crowding-out, do not exclude that of partial crowding-out – i.e. incentives contribute to a greater volume of R&D investment than would otherwise exist, but the additional investment does not exceed the cost incurred with the policy measure – and studies that have mixed results (positive effects for certain countries, industries or size of enterprise) and inconclusive results. In a literature review Zuniga-Vicente et al. (2014) concluded that although studies confirming the hypothesis of additionality prevail, a significant group of studies show some substitution between public and private funding or even inconclusive effects – in 77 studies examined, 60% reported additional effects, 20% crowding-out and 20% obtained inconclusive results. Some authors have concluded that the additional effect (crowding-in) is greater in SME, in business services (Castellacci and Lie, 2015) and in high-tech companies (Czarnitzki and Delanote, 2015).

Among recent studies in European economies, examples of various types of results concerning the impact of public support for R&D can also be found.

Carboni (2011) and Duguet (2004) found some evidence of additionality in studies conducted respectively on Italy and France. Hud and Hussinger (2015) analysed the impact of R&D subsidies in Germany between 2006 and 2010, and concluded that, although the additional effect prevailed for most years analysed, some crowding-out was observed in 2009 due to the greater reluctance of companies to invest during a crisis period.

Aristei et al. (2015), did not find evidence of additionality, concerning the impact of incentives (subsidies or tax credits) to industry between 2007 and 2009 in some European countries (Germany, France, Italy, the United Kingdom and Spain). This analysis, which relied on both parametric and non-parametric methods (propensity score matching), suggested, however, that public funding contributed to avoid a reduction of R&D investment in the context of the international financial crisis. These results are consistent with those of other studies where the hypothesis of full crowding-out was rejected, without however proving an additionality effect on private investment ⁵.

Czarnitzki and Hunermund examine the impact of R&D subsidies under the Eurostars project on firms' growth (measured through employment) and failed to find positive effects for a group of worse quality projects. According to the authors, the results are not attributed to crowding out but to the low quality of many of the projects funded under the program.

If the diversity of results concerning the immediate impact of R&D incentives makes it difficult to reach general conclusions, results are even more disperse when studies analyse other less immediate impacts of incentives (output of research or firm performance). One possible explanation may lie in the fact that these effects take longer to materialize and are therefore more difficult to capture by most empirical studies.

Czarnitzki et al. (2011), for example, conclude for the positive impact of public policies on some indicators of product innovation without, however, showing significant effects on firm performance (company profitability, international market shares and competitiveness). Einiö (2014) concludes that subsidised companies in Finland show, on average, increases in R&D investment, sales, employment and (with a 3-year time lag) in productivity. Cin et al. (2017), conclude that R&D incentives had a positive impact on R&D expenditure and productivity in manufacturing companies in Korea. However, Bravo-Biosca et al. (2013), on a study of several OECD countries, show negative effects of tax incentives on productivity and employment growth.

With regard to studies on the Portuguese economy, Mamede and Simões (2019) analyse the effectiveness of SIFIDE in 2006 and 2007 and conclude that for each euro lost in tax collection more than one euro is spend by firms on R&D, thus confirming additionally.

3.2. Methodologies used

According to David et al. (2000) much of the studies carried out until the end of the 1990s were based on linear regressions and did not take into account the problem of endogeneity between the determinants of the application and the impact of the programs, which may give rise to inconsistent estimates of the causal effect ⁶. In particular, the fact that many firms with good projects do not apply for public support tends to underestimate the effectiveness of tax incentives if this bias is not controlled.

⁵ See for example, Almus and Czarnitzki (2003), Czarnitzki and Licht (2006), Gonzalez and Pazó (2005), Cerulli and Poti (2012), also based on matching methods.

⁶ See also Hall and Van Reenen (2000) for a critical review on methodologies to analyze the impact of R&D incentives.

The causal impact of a given phenomenon or treatment would be easily obtained if we could simultaneously compare the performance of the same individual with and without exposure to the treatment. In the impossibility of doing so, the ideal would be to resort to a controlled random experiment. However, given the difficulty in randomly submitting individuals to treatments, these experiences are not always feasible.

To solve the problem, several methods can be used: structural models, sampling methods, instrumental variables, and matching methods (such as the Propensity Score) and differences-in-differences. The latter two are most often used, since it is not always easy to correctly specify the structural model or identify a variable that can constitute an appropriate instrument (i.e. correlated, with the incentive, but not with the impact of the policy).

Assuming that the impact of the policy could be measured by comparing the results of 'treated' companies (subject to the policy) with the results that these companies would have had in the absence of the program, the Average Treated Effect (ATE) would be defined by:

$$\tau_{ATE} = \frac{\sum_{i=0}^n \tau_i}{n} = \frac{\sum_{i=0}^n [y_i(1) - y_i(0)]}{n}$$

being $y_i(1)$ the result of the companies treated after the program and $y_i(0)$ the result of the companies treated in the absence of the program.

Since $y_i(0)$ is non observable, the Propensity Score Matching method (Rosenbaum & Rubin, 1983) makes the comparison by replacing that result with that of a counterfactual composed by firms with a probability of treatment, conditional on a set of relevant observable variables in the pre-treatment period (X_i), similar to the group of treated individuals (T). This probability is calculated using a probit model:

$$P(X_i) = \text{Prob}(T_i = 1 | X_i) = \alpha_0 + \sum_{i=1}^k \beta_i X_i + \varepsilon$$

After determining the control group, the causal impact is obtained by comparing the performance of the two groups after treatment (Average Treated Effect on the Treated - ATT):

$$\tau_{ATT} = \frac{\sum_{i=0}^n \tau_i}{n} = \frac{\sum_{i=0}^n [y_i(1) - y_{Ci}(0)]}{n}$$

being $y_{Ci}(0)$ the result of the control group.

The fact that the model allows controlling for the variables that can influence both the probability of treatment and the results of the program, can eliminate the endogeneity resulting from the selection bias. However, this estimator is only valid in the absence of other factors, non-

observable or omitted, that affect the treatment and the outcome, thus violating the hypothesis of conditional independence.

Although there is no way to test directly for the conditional independence hypothesis, it is more easily satisfied with the use of a greater number of control variables. However, some uncertainty may always persist about how many and which variables should be used.

The Differences-in-Differences (DiD) method seeks to reduce bias by controlling for the effect of non-observable factors invariant in time that may affect the outcome (see for example Card & Krueger, 1994; Angrist & Pischke, 2008). The causal impact of treatment (DiD) is obtained by comparing the performance of participants (T) and non-participants (C) before (0) and after treatment (1), literally through a difference of differences:

$$\text{DiD} = (\bar{Y}_1^T - \bar{Y}_0^T) - (\bar{Y}_1^C - \bar{Y}_0^C)$$

This impact can be estimated using the following equation:

$$Y_{it} = \alpha_0 + \alpha_1 t + \alpha_2 T_i + \alpha_3 t * T_i + \sum \beta_i X_{it} + \varepsilon_{it}$$

being α_3 the parameter of interest, which results from the interception of the treatment variable ($T_i = 1$ if the company was treated, or zero if not) with the time variable (t) that assumes the value of 1 for the period after treatment, and zero otherwise. Thus, α_1 is the coefficient of the common temporal effect between the period before and after treatment, α_2 measures the impact of the intemporal difference between treated and untreated firms and α_3 captures the effect of the treatment.

However, this estimator is only valid in the absence of non-observable factors with effects variable in time. That is, even if comparability between the two groups could be ensured before treatment, the method may be compromised if for example macroeconomic shocks occurred during treatment affect the two groups differently, contributing to overestimating or underestimating the true effects of treatment.

4. Database and descriptive characteristics of companies

This paper uses three different databases: information on SIFIDE applications from 2006 to 2015, obtained from ANI (Agência Nacional de Investigação); data on firms' accounts – Sistema de Contas Integradas das Empresas (SCIE) – and data on firms' staff – Quadros de Pessoal – obtained from INE (Statistics Portugal), from 2004 to 2017. The use of these three databases made it possible to cross information on SIFIDE projects with a wide range of variables on the characteristics of firms and their employees. To ensure greater uniformity of information, some

inconsistencies and outliers were cleared from the database leaving us with 3 537 579 observations of information at the level of the firm⁷.

Between 2006 and 2015, 8230 Projects were financed under SIFIDE for 2,274 companies. During the first year of SIFIDE II, 404 projects were approved. Except for the period between 2009 and 2011, probably a consequence of the international financial crisis, the number of applications and projects approved displays an increasing trend reaching 1093 in 2015 (Table 4.1).

Table 4.1. SIFIDE applications and projects approved

| Year of Application | No. Applications | No. Projects Approved | Rate of Approval (%) |
|----------------------------|-------------------------|------------------------------|-----------------------------|
| 2006 | 424 | 404 | 95 |
| 2007 | 647 | 600 | 93 |
| 2008 | 897 | 804 | 90 |
| 2009 | 1057 | 891 | 84 |
| 2010 | 1001 | 839 | 84 |
| 2011 | 970 | 800 | 82 |
| 2012 | 924 | 864 | 94 |
| 2013 | 1038 | 943 | 91 |
| 2014 | 1057 | 992 | 94 |
| 2015 | 1157 | 1092 | 94 |
| Total | 9172 | 8229 | 90 |

A significant number of companies use SIFIDE to finance various R&D projects. However, companies with only one or two applications are more frequent (650 and 454 with 1 and 2 approved projects, respectively – Graph 4.1). The approval rate of projects is high, with about 90% of projects approved on average (depending on the year of application, the approval rate ranged between 82% and 95%).

Although access to SIFIDE is not limited to any particular sector, the largest number of applications occurred in sectors 3 (Manufacturing - Section C of NACE Rev. 2) and 6 (Business Services – Sections J-N, excl. K of NACE Rev. 2), representing respectively 55% and 29% of the total. This sectoral concentration has remained relatively stable from 2006-2015, with a slight increase in Manufacturing, at the expense of sector 6 (Figure 4.4).

⁷ Observations eliminated included those with negative intangible investment, negative total assets, a ratio of intangible investment over total assets of over 100.

Table 4.2. Projects approved in SIFIDE, sectoral disaggregation (NACE Rev.2 Section)

| Sectors of activity (NACE Rev. 2) | No. Proj. Approved | Structure (%) |
|---|--------------------|---------------|
| 1 - Agriculture, forestry and fisheries (Section A) | 57 | 0,7 |
| 2 -Extractive Industries (Section B) | 29 | 0,4 |
| 3 - Manufacturing (Section C) | 4512 | 54,8 |
| 4 - <i>Utilities</i> and Construction (Sections D-F) | 444 | 5,4 |
| 5 - Wholesale and retail trade, Accommodation and catering (Sections G-I) | 692 | 8,4 |
| 6 - Business services (Sections J-N, excl. K) | 2401 | 29,2 |
| 7 - Other services (Sections P-S) | 95 | 1,2 |
| Total | 8229 | 100 |

Figure 4.1. Number of projects approved, by company and average amount of tax credit

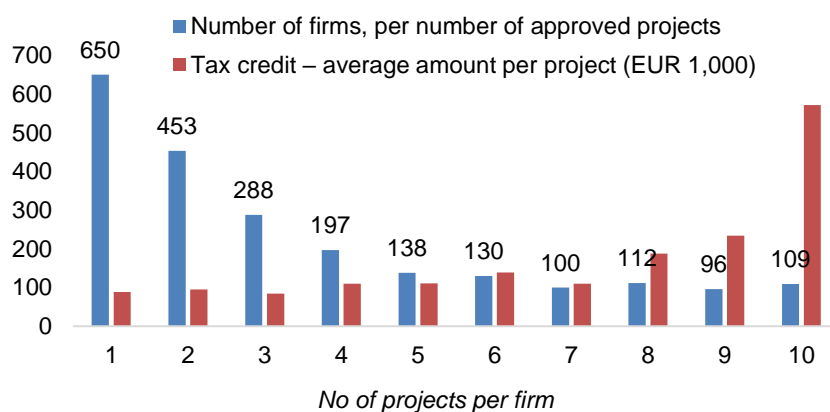
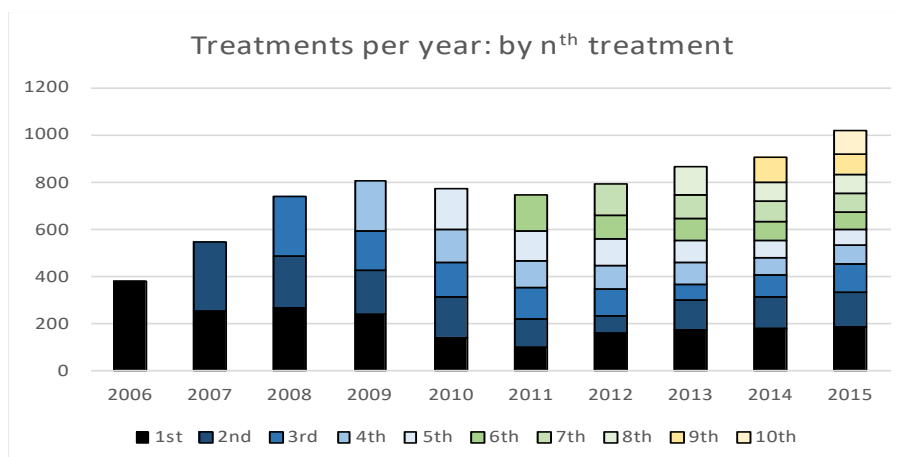


Figure 4.2. Number of projects approved by year and number of firms' programs



The representativeness of the ICT sector in SIFIDE has been decreasing since 2006, from 27% to 12.8% in 2015 (Figure 4.3).

SIFIDE has been progressively more used by firms with less experience in research and less prone to innovate. The number of firms accessing the programme with no investment in intangible assets or R&D projects in the two years before the programme has increased between 2006 and 2015 (Figure 4.4).

Figure 4.3. Representativeness of ICT firms among SIFIDE approved projects

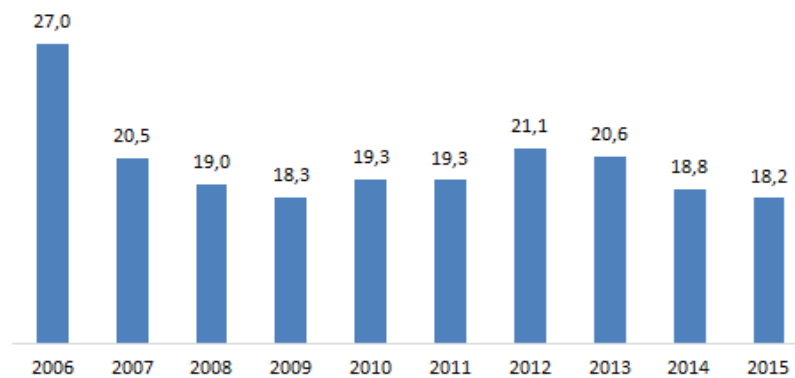
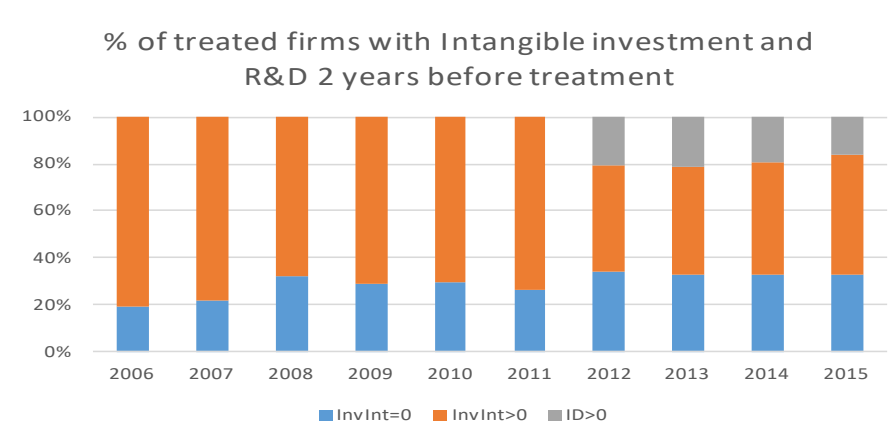


Figure 4.4. Firms displaying positive Intangible Investment and R&D projects⁸ 2 years before the application



About 80% of companies with SIFIDE-supported projects are micro and SMEs (Figure 4.5). Between 2006 and 2015 the share of large companies has decreased, and the number of SMEs projects has tripled between 2006 and 2015.

Most firms with SIFIDE financed programmes are older firms (over 10 years old), although the share of younger firms has increased from around 5% to 20% during the period under analysis.

The size of the projects and tax credits became increasingly smaller, consistent with the large participation of SMEs.

The percentage of treated firms with no positive profits has remained relatively stable over time. Since 2011, there was an increase in the proportion of firms with higher profit margins.

⁸ Variable available from 2010 onwards.

Figure 4.5. Characteristics of treated firms



Most of the costs financed by SIFIDE refer to R&D staff (42,58%) and operating costs (35,3%).

Table 4.3. SIFIDE Expenditures, by type

| Supported expenditures | % of total |
|--|---------------|
| Fixed assets | 13,27 |
| R&D staff | 42,58 |
| R&D managers | 0,03 |
| Operating costs | 35,3 |
| Contracting external R&D | 7,6 |
| Participation in capital of R&D entities | 0,94 |
| Patent registry | 0,15 |
| Patent acquisition | 0,05 |
| Auditing activity | 0,03 |
| Demonstration activities | 0,03 |
| Total | 100,00 |

As shown in Table 4.4, companies with investment projects supported by SIFIDE have, on average, very different characteristics from the remaining companies, with respect to investment (tangible and intangible), turnover, size, quality of human resources and other performance indicators. On average, SIFIDE supported firms invest more, have more qualified staff, export more and are more efficient and profitable than non-supported firms.

Table 4.4. Average characteristics of supported and unsupported companies

| Variables | Treated Companies | Untreated Companies |
|---------------------------------------|-------------------|---------------------|
| Intangible investment (EUR 1,000) | 682,79 | 5,60 |
| Firms with Inv. intangible assets (%) | 0,50 | 0,14 |
| R&D employees | 3,89 | 0,01 |
| Employment | 164,25 | 6,83 |
| Turnover (EUR 1,000) | 41300,00 | 651,30 |
| FBCF (EUR 1,000) | 2276,51 | 33,81 |
| B&S exports (% sales) | 32,18 | 5,43 |
| Labour productivity (EUR 1,000) | 75,26 | 20,07 |
| Graduated Employees (% Employment) | 32,72 | 12,64 |
| Net Results on total assets | 1,60 | -123,28 |
| Operating results | 3483744,00 | 33.813,17 |

5. Methodology for assessing the impact of SIFIDE

As discussed, the impact of a policy is usually difficult to assess given that other factors might interfere with the results. This is particularly challenging when the scope of the policy is universal and firms self-select into the programme, as the criteria determining participation might not be obvious, making it difficult to understand why firms with viable project do not apply. Impact would be easier to assess if specific features of the policy produce incentives that are randomly more attractive to a particular group of firms, as other firms would naturally form a control group. However, aside from some policy changes discussed later, SIFIDE does not seem to have these features as its rules are essentially non-discriminatory.

As such, impact is analysed with the use of Matching (Propensity Score and Mahalanobis) and Difference in Difference methods which can, under some assumptions, produce unbiased results.

The Propensity Score Matching is performed in two distinct steps:

1. Identification of a control group consisting of firms with a similar a priori probability of being treated (propensity score), estimated with a probit model that controls for the variables that are likely to affect simultaneously both the probability of treatment and the outcome of the programme.
2. Comparison of results between the 'treated' firms and those of the control group, after the treatment. We use several matching methods for robustness of results.

The year of the treatment (application) corresponds to the year of the tax exercise, when the investment that qualifies for tax credit is implemented. Under the rules of SIFIDE, R&D expenditures incurred during the year of the tax exercise and during the first six months of the following year are eligible for tax credits under that programme. In this paper, only firms with approved projects are considered as treated and the analysis will focus on the impact of the programmes implemented between 2006 and 2015⁹.

Firms are matched, according to the specified control variables, two years before the treatment. Even though firms should be matched immediately before being subject to any effect of the treatment, we consider that in the year preceding treatment firms might be tempted to postpone investments in anticipation of next year's application, thereby affecting matching conditions.

Given that there are firms that benefit from several programmes, and in order to avoid contaminating the matching process with the effect of previous treatments, we initially restrict the analysis to the impact of the first treatment of firms. In addition, we also analyse the case of firms which were treated only once. This case is particularly interesting to assess whether the impact of the program is persistent, as the period following treatment is also unaffected by posterior programmes – we analyse effects one year and three years after the conclusion of the programme.

⁹ Given that, according to SIFIDE rules, the investment made in R&D precedes the application and the obtaining of tax credit (thus the expectation of tax credit, and not the credit itself, which conditions the behavior of the company and the realization of the investment), it could also be justified to consider as 'treated' companies with unapproved applications since the investment would have been made. However, given that SIFIDE's eligibility criteria are particularly restrictive in terms of the characterization of the investment, it is likely that the non-approval of the credit swells from the fact that the investment made is not classified as an Investment in R&D, which justifies the exclusion of projects not approved for the characterization of the treatment.

The variables used as control as well as the rationale for their inclusion are described in Table 5.1. In general, they measure the firm's investment capacity, propensity to R&D size, quality of human capital (i.e. percentage of graduates among employees), the degree of indebtedness, performance and fixed effects associated with the sector or year of the programme (imposing the condition of coarsened exact matching to the sector and year of application), and are likely to affect both the likelihood of treatment (self-selection) and the results of the program.

Table 5.1. Description of control variables

| Variable | Description | Rationale |
|---------------|---|---|
| DIntInv | Dummy variable =1 if Intangible investment >0, 0 otherwise | Captures persistence in intangible investment |
| DPropID | Dummy variable =1 if R&D>0 in any year analysed, 0 otherwise | Captures firms' propensity to R&D activities |
| Subs | Subsidies | Captures firms' activity and capacity in applying for public subsidies and grants. |
| Staff(log) | No of staff (in logs) | Capture the size of the firm |
| Univ% | Categorical variable measuring the % of staff with a university degree, = 1 if [0, 15]; = 2 if]15, 30], = 3 if > 30. | Determines firm capacity to R&D activities and firm performance |
| Age | Categorical variable measuring the firm age in years, = 1 if [0, 5]; = 2 if]5, 10]; 3 if >10. | Controls for the effect that the firms' age might have on R&D activities and programme applications |
| GFCF(log) | Gross Fixed Capital Formation (in logs) | Determines the firms' investment capacity |
| Turnover(log) | Turnover (in logs) | Captures size in terms of productive capacity |
| FinAut | Capital in % of total assets: categorical variable = 1 if [0, 20]; = 2 if]20, 40], =3 if >40. | Captures the effect of financial autonomy on both R&D investments and programme applications |
| Profit | Net returns in % of total assets. categorical variable = 0 if <=0; 1 if]0, 15]; = 2 if]15, 30], =3 if >30. | Captures the effect of firms' profitability on both R&D investments and programme applications |
| i.NUTS | Dummy for regional classification | Controls for the regional impact |
| i.Sectors | Dummy for sector classification | Controls for the sectoral impact |
| i.Yr | Dummy for Year of application | Controls for temporal impact |

According to the propensity score method, matching takes into account the similarities of the conditional probability of being treated (the advantage of the method lies precisely in condensing into a single variable – the propensity score – all the information relevant to the determination of a control group). In order to obtain results, however, firms can be compared with several methods which differ according to the weight attributed to non-treated observations. In the Nearest Neighbour method each firm is compared only with that with the closest propensity scores. The stratification method compares firms within each block of the distribution of the propensity score. The kernel method uses all firms of the control group and attributes a larger weight to untreated observation more "similar" to the treated ones.

In addition to the propensity score matching, a multivariate matching based on the Mahalanobis distance, was also used, according to which the weight attributed to each observation is based on the matrix of correlation of covariates. The Mahalanobis was estimated using also the propensity score obtained with the probit model as a control variable.

For the difference-in differences method the following equation was estimated in four different specifications: with and without control variables, combined with and without fixed effects:

$$Y_{it} = \alpha_0 + \alpha_1 t + \alpha_2 T_i + \alpha_3 t^* T_i + \beta X_{it} + \varepsilon_{it}$$

The impact on R&D is analysed with respect to the investment in intangible assets (with different specifications of the variable). This variable was selected as, by including in-house R&D, external contracting of R&D and the acquisition of outputs of R&D performed by other entities, it measures more closely the type of investment that SIFIDE aims to incentivise. In addition, we also analyse the impact of SIFIDE in increasing R&D staff (also an expenditure eligible under SIFIDE) and in promoting firms' exports.

Furthermore, we analyse different scenarios according to different profiles of firm's investment in intangible assets and R&D. This allows greater similarity between treated and non-treated firms in the control group and to discriminate the impact of SIFIDE among these groups. As such, the impact of the programme is calculated under four scenarios: a) a general case including all firms; b) a subset of the sample consisting of firms with previous experience of investing in intangible assets (in either of the two years before treatment); c) a subset of firms with propensity to R&D (firms with in-house R&D projects in any period between 2012 and 2015¹⁰); d) the subset of firms with no previous experience on investing in intangible assets (in the two years before treatment).

Scenarios b) and c) analyse the impact of SIFIDE in firms already performing the type investments financed by the project. The later scenario analyses whether SIFIDE can incentivize firms with no previous experience in R&D or in investing in intangible assets to do so.

As shown in Tables A.I both the propensity score and the Mahalanobis ensure balances samples in all the covariate considered. As observed, matching considerably reduces the difference between 'treated' and 'untreated' observations as regards the variables used as control. The distribution of the propensity score is also similar among treated and non-treated variables in all scenarios considered.

Result for the probit model are shown in tables in annex A.II. The model selected 427 treated firms (for firms which have been treated only once) and 728246 observations of non-treated treated firms with balanced propensity scores and which formed the control group. When the case of first treatments (of all firms) was considered, selected firms were 1493 for treated and 755158 observations of non-treated.

6. Results obtained

6.1. On Intangible investment

As shown in tables in annex A.III, SIFIDE has a positive effect on intangible investment in all scenarios considered.

¹⁰ As this variable is only available from 2012 onwards.

Several specifications of the variables were used: as a percentage of the total asset (IntInv), difference in intangible investment from the period of matching, in percentage of total assets in the period of matching (DifInvInt), and difference in logarithms (DInvInt(log)).

As shown in tables 6.1 and A.III.1.1, the results show a significant positive impact of the programme on 'treated' firms in the various specifications of the variables considered. These effects are relatively consistent along several matching methods used (e.g. the coefficient for the effect of the programme on 'Intangible investment on total assets' in the year of application varies between 0,84 and 1 in the general case).

Table 6.1. Impact on intangible investment (in % of total assets)

| Variable | PS (kernel) | | Mahalanobis | | PS (NN) | | PS (Stratification) | |
|---|-------------|------|-------------|------|----------|------|---------------------|------|
| | ATT | t | ATT | t | ATT | t | ATT | t |
| a) General model: all firms | | | | | | | | |
| IntInv | 0,88 *** | 6,16 | 0,95 *** | 6,61 | 0,84 *** | 4,96 | 1,00 *** | 6,86 |
| b) Firms with positive Intangible Investment before treatment | | | | | | | | |
| IntInv | 1,11 *** | 5,04 | 1,30 *** | 5,83 | 1,15 *** | 4,33 | 1,16 *** | 5,25 |
| c) Firms with no intangible investments before treatment | | | | | | | | |
| IntInv | 0,45 *** | 2,90 | 0,39 *** | 2,70 | 0,16 | 0,93 | 0,26 * | 1,78 |
| d) Firms with propensity to R&D | | | | | | | | |
| IntInv | 2,33 *** | 4,55 | 2,38 *** | 4,93 | 2,19 *** | 4,67 | 2,34 *** | 5,07 |

Results are more significant in the scenarios where firms had invested before in intangible assets and even more for firms with a propensity to R&D (coefficients range between 2,19 and 2,38 percent of total assets).

In the case of firms with no prior investment in the two preceding years, the impact is higher in the case where firms were treated only once (Table 6.2, and figure 6.1. AIII.2.1). In all remaining subsamples the impact of the first treatment is lower for firms treated only once.

A particularly important factor in the results presented has to do with the sustainability of the impact of the programme: 'treated' companies that applied to SIFIDE only once remain with higher Levels of R&D investment a few years after the programme is completed (Table 6.2 and AIII.2.2).

Table 6.2. Firms treated only once: persistence of impact

| Variable | PS (kernel) | | Mahalanobis | |
|---|-------------|-------|-------------|-------|
| | ATT | t | ATT | t |
| a) General model: all firms | | | | |
| IntInv | 1,03 *** | 3,70 | 1,07 *** | 4,16 |
| IntInv+1 | 0,8015 *** | 3,22 | 0,78 *** | 3,39 |
| IntInv+3 | 0,33 ** | 2,11 | 0,24 | 1,56 |
| b) Firms with positive Intangible Investment before | | | | |
| IntInv | 1,15 *** | 2,66 | 1,28 *** | 3,14 |
| IntInv+1 | 0,801 * | 1,73 | 1,05 *** | 2,74 |
| IntInv+3 | -0,32 | -1,62 | -0,10 | -0,81 |
| c) Firms with no Intangible Investment before | | | | |
| IntInv | 0,72 *** | 2,11 | 0,65 ** | 2,02 |
| IntInv+1 | 0,4561 * | 1,92 | 0,30 | 1,33 |
| IntInv+3 | 0,37 | 1,31 | 0,35 | 1,25 |
| d) Firms with propensity to R&D | | | | |
| IntInv | 1,44 *** | 2,20 | 1,55 *** | 2,71 |
| IntInv+1 | 2,2845 *** | 2,56 | 2,03 *** | 2,43 |
| IntInv+3 | -0,414 | -1,07 | -0,27 | -1,25 |

When effects were calculated separately for each year (AIII. 1.6.), results show the impact to be higher in the first years of policy implementation. These effects are consistent with results in other studies and may be due to the fact that more active firms are more likely to apply to tax credits from the start of the programme.

6.2. Crowding-in vs crowding out

These results confirming the positive impact of SIFIDE on intangible investment allow us to reject the hypothesis of total crowding-out. However, this does not imply that the higher investment exceeds the amount of the tax credit.

The existence of an additional impact was tested by analysing the impact of SIFIDE using the matching method on a variable that measures privately financed intangible investment – i.e. excluding the amount of tax credit used to finance Intangible investment (total tax credit minus the amount related to staff costs and investment in tangible assets), all variables in percentage of total assets:

$$\text{Additionality} = \text{Intangible investment} - (\text{total tax credit} - \text{credit on staff costs} - \text{credit on tangible investments}).$$

As shown (Table 6.3), the positive and significant coefficients imply that the increase in intangible investment as a result of the programme exceed policy costs directly associated with it, thus confirming additionality.

Table 6.3. Additionality

| | PS (kernel) | | | Mahalanobis | | |
|---------------|-------------|-----|------|-------------|-----|------|
| | ATT | *** | t | ATT | *** | t |
| Addicionality | 0,08 | *** | 4,74 | 0,14 | *** | 5,71 |

6.3. Differences in differences model

The impact of SIFIDE on intangible investment was also analysed with the differences-in-differences method, which estimates the differences between treated and untreated before and after treatment.

The model was estimated separately for each year comparing the results of firms treated that year with those never treated – companies treated in other years are excluded from the analysis in order not to contaminate the results with the effects of later treatments. For each year, four models were estimated, with and without controls and with and without firms' fixed effects. Estimating the model with fixed effects controls for any characteristic of firms that are invariant in time which may not have been considered by the control variables.

Tables A.III.3 show the results for the difference in difference estimations (table 6.4 shows results for the general case). As illustrated, the coefficient of interception between the variables post-treatment and treatment period (t^*TRAT), i.e. the variable of interest, is significant for most years considered, thus confirming the conclusions obtained through the matching methods. As previously, differences in differences results also show higher and more significant effects in the initial years of the programme.

For the years between 2009 and 2011 the coefficients of the models with fixed effects (general case) are not significant. This can be explained by the fact that these are years of greater uncertainty (following the international financial crisis and during the euro area sovereign debt crisis) in which companies are less likely to make investments – this sentiment of risk aversion is better captured by firms' fixed effects than by the control variables. The coefficient of the variable measuring the temporal effect (t) is negative during that period, indicating the negative trend in investment. These results are consistent with Hud and Hussinger (2013) according to which companies would be more reluctant to make investments in times of crisis. As shown in Table 4.1, 2011 was also characterized by a relatively small number of applications to SIFIDE.

Table 6.4. Differences-in-differences models – general case

| IntInv | Simple model | | With control var. | | Fixed effects | | F.E. & Controls | |
|------------|--------------|--------|-------------------|--------|---------------|--------|-----------------|--------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t |
| t | 0,10 *** | 18,52 | -0,01 | -1,38 | -0,14 *** | -30,74 | -0,15 *** | -28,08 |
| TRAT_2006 | 1,47 *** | 10,06 | 1,30 *** | 9,09 | 0,00 | | | |
| tTRAT_2006 | 0,89 *** | 4,97 | 0,79 *** | 4,53 | 1,02 *** | 3,38 | 0,79 *** | 2,86 |
| t | 0,08 *** | 14,09 | -0,04 *** | -5,69 | -0,21 *** | -44,23 | -0,16 *** | -31,32 |
| TRAT_2007 | 1,21 *** | 6,35 | 0,97 *** | 5,27 | | | | |
| tTRAT_2007 | 1,08 *** | 4,62 | 0,96 *** | 4,27 | 0,56 * | 1,86 | 0,66 ** | 2,38 |
| t | 0,02 *** | 4,14 | -0,03 *** | -3,87 | -0,24 *** | -49,60 | -0,16 *** | -30,59 |
| TRAT_2008 | 1,37 *** | 7,26 | 0,88 *** | 4,70 | | | | |
| tTRAT_2008 | 0,16 | 0,71 | 0,57 ** | 2,49 | 0,24 | 0,46 | 0,47 | 1,06 |
| t | -0,10 *** | -20,85 | -0,11 *** | -15,45 | -0,29 *** | -60,49 | -0,18 *** | -35,39 |
| TRAT_2009 | 2,64 *** | 13,44 | 1,94 *** | 9,79 | | | | |
| tTRAT_2009 | 0,59 ** | 2,46 | 0,54 ** | 2,25 | 0,09 | 0,12 | -0,37 | -0,68 |
| t | -0,18 *** | -36,96 | -0,17 *** | -23,30 | -0,29 *** | -64,63 | -0,20 *** | -40,56 |
| TRAT_2010 | 1,51 *** | 6,00 | 0,88 *** | 3,37 | | | | |
| tTRAT_2010 | 1,34 *** | 4,35 | 1,16 *** | 3,62 | 0,79 | 1,15 | 0,52 | 1,46 |
| t | -0,17 *** | -37,41 | -0,12 *** | -15,75 | -0,25 *** | -60,93 | -0,19 *** | -39,24 |
| TRAT_2011 | 2,67 *** | 9,11 | 0,93 *** | 2,89 | | | | |
| tTRAT_2011 | 0,17 | 0,47 | 0,44 | 1,13 | -0,36 | -0,48 | 0,05 | 0,08 |
| t | -0,15 *** | -32,30 | -0,10 *** | -13,53 | -0,21 *** | -52,11 | -0,16 *** | -33,21 |
| TRAT_2012 | 1,63 *** | 7,21 | 0,52 ** | 2,09 | | | | |
| tTRAT_2012 | 1,49 *** | 5,40 | 1,07 *** | 3,55 | 1,19 * | 1,68 | 0,62 | 0,90 |
| t | -0,11 *** | -24,00 | -0,08 *** | -10,02 | -0,18 *** | -43,12 | -0,12 *** | -26,14 |
| TRAT_2013 | 1,25 *** | 5,68 | 1,03 *** | 4,09 | | | | |
| tTRAT_2013 | 1,20 *** | 4,45 | 0,68 ** | 2,26 | 0,88 ** | 2,17 | 0,49 | 1,23 |
| t | -0,10 *** | -22,09 | -0,08 *** | -11,27 | -0,16 *** | -41,70 | -0,10 *** | -22,31 |
| TRAT_2014 | 1,15 *** | 5,37 | 0,77 *** | 3,12 | | | | |
| tTRAT_2014 | 1,25 *** | 4,77 | 0,64 ** | 2,17 | 0,62 | 0,95 | 0,15 | 0,28 |
| t | -0,09 *** | -21,86 | -0,11 *** | -15,51 | -0,17 *** | -42,99 | -0,10 *** | -23,07 |
| TRAT_2015 | 1,55 *** | 7,50 | 0,51 ** | 2,20 | 0,00 | | 0,00 | |
| tTRAT_2015 | 0,67 *** | 2,63 | 0,52 * | 1,83 | 0,21 | 0,28 | -0,04 | -0,09 |

6.4. Results by sectors and firms' size

The sectoral breakdown shows that the effects of the SIFIDE programme are much more significant in the business services sector (Group 6, corresponding to the aggregation of Sections J-N of NACE Rev. 2) than in the manufacturing industry (Group 3, corresponding to Section C of NACE Rev. 2). It should be noted that companies from these two sectors represent about 84% of the projects financed with SIFIDE. Firms in the ICT sector also perform particularly well.

The greater effect of the programme on the business services sector may result from the significant changes that have occurred in terms of digitalisation of the economy and which particularly affects the services sector. These results are also confirmed by several other studies. This is

particularly evident in the impact of SIFIDE on intangible investment as a percentage of assets (2.16 on services and 0.44 on industry in the general case). These differences are even more significant for firms with a propensity to R&D (4.4 to 4.62 for business and 1.05 to 1.36 for industry) – Tables 6.5 and AIII.1.2.

Table 6.5. Impact by sector

| IntInv Sector | PS (kernel) | | Mahalanobis | |
|---|-------------|------|-------------|-------|
| | ATT | t | ATT | t |
| a) General model: all firms | | | | |
| 1 - Agric. for. & fishing | 0,98 | 1,05 | 0,98 | 1,05 |
| 2 - Extr. Industries | -- | -- | -- | -- |
| 3 - Manufacturing Ind. | 0,44 *** | 4,33 | 0,44 *** | 5,39 |
| 4 - Utilities & constr. | 0,80 | 1,42 | 0,87 | 1,63 |
| 5 - Trade & accom. | 0,42 | 1,62 | 0,38 | 1,63 |
| 6 - Business services | 2,16 *** | 4,66 | 2,16 *** | 4,8 |
| 7 - Other services | 2,18 * | 1,76 | 2,10 * | 1,84 |
| ICT_SECTOR | 2,09 *** | 3,4 | 2,36 *** | 4,11 |
| b) Firms with positive Intangible Investment before treatment | | | | |
| 3 - Manuf. Ind. | 0,64 *** | 3,33 | 1,02 *** | 2,13 |
| 6-B. Services | 2,59 *** | 3,40 | 2,82 *** | 3,93 |
| c) Firms with no Intangible Investment before treatment | | | | |
| 3 - Manuf. Ind. | 0,04 | 0,59 | 0,05 | 0,078 |
| 6-B. Services | 1,27 ** | 2,22 | 1,24 ** | 2,39 |
| d) Firms with propensity to R&D | | | | |
| 3 - Manuf. Ind. | 1,05 *** | 2,58 | 1,36 *** | 4,31 |
| 6-B. Services | 4,62 *** | 3,41 | 4,40 *** | 3,26 |

Concerning firms' size, the most significant impacts of SIFIDE on intangible investment are observed in micro and small enterprises in all scenarios considered – Tables 6.6 and AIII.1.3.

For large firms, only those with propensity to R&D show significant results from SIFIDE, although lower than smaller firms.

Table 6.6. Impact by firm size

| InvInt Size | PS (kernel) | | Mahalanobis | |
|---|-------------|-------|-------------|-------|
| | ATT | t | ATT | t |
| a) General model: all firms | | | | |
| Micro | 1,97 *** | 2,42 | 2,37 *** | 3,32 |
| Small | 0,90 *** | 4,60 | 0,92 *** | 3,80 |
| Medium | 0,44 ** | 2,54 | 0,52 *** | 3,77 |
| Large | 0,18 | 1,32 | 0,26 * | 1,65 |
| b) Firms with positive Intangible Investment before treatment | | | | |
| Micro | 2,55 *** | 2,7 | 2,36 *** | 2,68 |
| Small | 1,67 *** | 3,80 | 1,63 *** | 3,17 |
| Medium | 0,72 *** | 2,38 | 0,76 *** | 3,04 |
| Large | 0,39 | 1,67 | 0,20 | 0,84 |
| c) Firms with no Intangible Investment before treatment | | | | |
| Micro | 2,41 *** | 2,47 | 2,28 ** | 2,37 |
| Small | 0,35 ** | 2,01 | 0,24 | 1,48 |
| Medium | -0,03 | -0,69 | -0,06 | -1,51 |
| Large | 0,00 | -0,12 | -0,24 *** | -4,04 |
| d) Firms with propensity to R&D | | | | |
| Micro | 4,51 *** | 2,93 | 4,09 *** | 2,72 |
| Small | 3,60 *** | 2,92 | 3,28 *** | 2,69 |
| Medium | 1,04 *** | 2,52 | 1,32 *** | 3,45 |
| Large | 0,56 *** | 2,57 | 0,34 | 1,65 |

6.5. Results of R&D staff and total export

Results also show the effectiveness of SIFIDE in incentivising the hiring of staff in R&D activities for most scenarios considered. Effects were measured in terms of the number of staff in R&D activities (StaffID) and in terms of this difference from the pre-treatment period (DStaffID).

Even though treated firms have more staff dedicated to R&D activities, only firms with previous intangible investment and propensity to R&D have higher more R&D staff as a result of the programme – tables 6.7 and AIII.

Table 6.7. Impact on R&D staff

| Variable | PS (kernel) | | Mahalanobis | |
|---|-------------|------|-------------|------|
| | ATT | t | ATT | t |
| a) General model: all firms | | | | |
| StaffID | 1,24 *** | 6,03 | 1,23 *** | 5,78 |
| DStaffID | 1,16 *** | 2,86 | 0,92 *** | 3,2 |
| b) Firms with positive Intangible Investment before treatment | | | | |
| StaffID | 1,29 *** | 5,10 | 1,22 *** | 4,10 |
| DStaffID | 0,84 *** | 2,30 | 1,08 *** | 4,32 |
| c) Firms with no Intangible Investment before treatment | | | | |
| StaffID | 0,85 *** | 5,20 | 0,86 *** | 5,47 |
| DStaffID | 0,29 | 0,68 | 0,30 | 0,8 |
| d) Firms with propensity to R&D | | | | |
| StaffID | 1,59 *** | 3,60 | 1,96 *** | 4,40 |
| DStaffID | 1,24 *** | 3,14 | 1,55 *** | 3,36 |

Firms which benefit from SIFIDE also have higher export volumes (in % of total sales). Firms with propensity to R&D seem to have increase exports as a consequence of SIFIDE – tables 6.8 and AIII.

Table 6.8. Impact on Exports

| Variable | PS (kernel) | | Mahalanobis | |
|---|-------------|------|-------------|------|
| | ATT | t | ATT | t |
| a) General model: all firms | | | | |
| ExpTot | 9,24 *** | 5,96 | 11,37 *** | 7,99 |
| DExpTot | 2,40 *** | 2,79 | 2,09 *** | 2,59 |
| b) Firms with positive Intangible Investment before treatment | | | | |
| ExpTot | 11,97 *** | 4,99 | 12,44 *** | 5,67 |
| DExpTot | 2,37 | 1,66 | 2,69 ** | 2,13 |
| c) Firms with no Intangible Investment before treatment | | | | |
| ExpTot | 7,89 *** | 3,36 | 9,43 *** | 4,31 |
| DExpTot | 1,49 | 1,06 | 1,19 | 0,97 |
| d) Firms with propensity to R&D | | | | |
| ExpTot | 21,45 *** | 5,68 | 21,32 *** | 6,14 |
| DExpTot | 4,37 * | 1,72 | 4,94 * | 1,92 |

6.6. Policy changes in SIFIDE

Policy changes are particularly important for policy evaluation as incentives to firms are likely to change in that period. These changes are particularly interesting when they affect firms differently.

There are two moments in SIFIDE when that seems to be the case: in 2009 when the limit for the incremental rate was increased from 750 000 euros to 1 500 000 euros¹¹, which benefits firms with large projects, and in 2014, when the carry forward option was increased from 6 to 8 years, which benefits firms with negative or no profits.

These effects were evaluated by re-estimating the differences in differences with additional dummies for these groups of firms on the variable of interest (t^*TRAT).

However, results do not show a very significant impact from those changes. Large firms did neither increase their applications in 2014 nor their investments as a result of a change, and even though non-profitable firms continued to show significant effects, they were no higher than those before the policy change. This may be due to the fact that previous limits were not binding and therefore incentives were not affected by policy changes. In fact very few projects have an overall tax credit of 750 thousand euros. In what concerns non-profitable firms, the previous possibility of carrying over the tax credit for 6 years was already a sufficient incentive for applying to SIFIDE and the extension to two more years added little in that regard.

Figure 6.1. Intangible investment (firms treated only once): all years and from 2006 to 2008



¹¹ Even though the base rate was also increase in that period, its impact is likely to be the same for all firms.

7. Conclusions

The capacity for innovation has been considered one of the main determinants of competitiveness and growth. The recent trend towards the digitisation of the economy allows anticipating an enormous potential, still to be explored, associated with these new technologies, in various areas of economic activity, especially in the services sector.

Despite these advantages, uncertainty, financing difficulties and the fact that the social return associated with innovation generally exceeds the private one limits the ability of firms to invest in R&D in the magnitude of the socially desirable. Thus, to address this market failure, several countries have been providing public support for this type of investment, with tax credit being the most common form.

The difficulty in providing effective incentives, which do not give rise to adverse behaviour by firms or to a mere replacement of private investment with public funding, reinforces the need to evaluate the efficacy of these policies.

This paper evaluates the impact of SIFIDE – a system of tax incentives for corporate R&D – with matching and differences-in-differences methods that allow minimizing the possible bias resulting from endogeneity between self-selection for the program and its impact. The relative consistency of the results obtained with various methods gives greater robustness to the analysis.

The results show the effectiveness of SIFIDE in promoting investment in R&D, both through the impact of the program on intangible investment and on R&D staff. An equally important factor concerns the persistence of the results. Indeed, the positive impact of the programme seems to remain for a few years after its completion, even in firms subject to a single approved project. It was also possible to conclude that SIFIDE encouraged additional private investment in an amount greater than the amount of the tax credit (crowding-in effect), after deducting for the parts related to costs with R&D staff and fixed tangible investments. This makes it possible to justify the relative generosity of SIFIDE when compared to tax credit rates in other European countries.

The breakdown of results by size or sector shows the higher impact of the programme on micro and small enterprises, in the services sector or in the ICT (information and communication technologies) sector. These results, largely consistent with those of studies on other countries, suggest that it may be advantageous to redesign the policy in order to differentiate support according to these characteristics of the company – contrary to the practice of most OECD countries, SIFIDE incentives do not differ much according to sector or the size of firms. However, the fact that R&D investment by large firms might result in higher technology spill-overs should also be considered.

It was also possible to note that SIFIDE is less effective at encouraging R&D in companies that did not register any intangible investment in the period prior to the programme, even though these companies can potentially benefit from a higher tax credit. This may justify some revision of the methodology for calculating the tax credit, concerning the value of the incremental rate.

Although there is less empirical evidence on the impact of R&D incentives on firms' performance, we also analysed the impact of the programme in promoting exports. Although treated firms

showed a greater percentage of exports in total sales, evidence that this can be attributed to SIFIDE is more inconclusive.

Finally, we have also analysed whether recent policy changes with SIFIDE altered incentives for firms more likely to benefit from them: a) the increase in the limit applied to the incremental rate, more likely to benefit large firms and b) the extension of the carry forward option of the tax credit, more likely to affect firms with insufficient tax collections to benefit from SIFIDE. However, no significant changes in results were observed, which seems to suggest that limits under previous rules were mostly non-binding and questions the usefulness of these policy changes.

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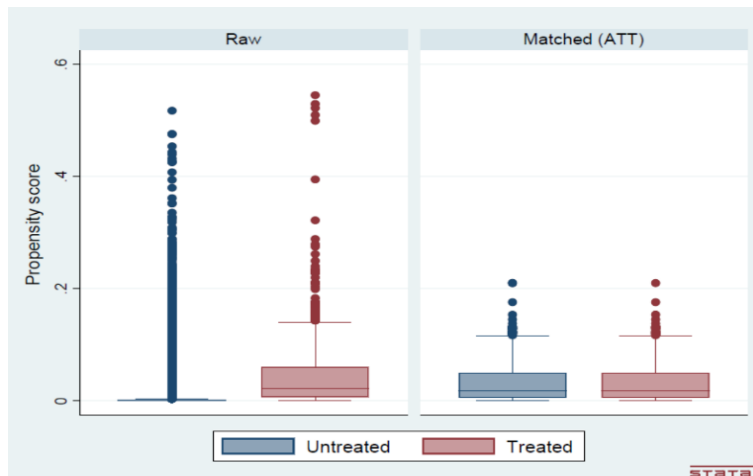
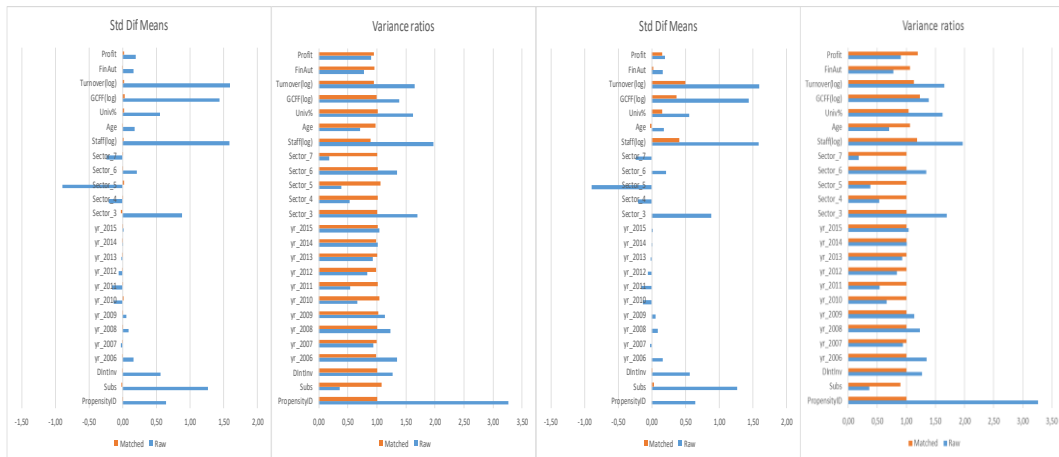
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– ANNEXES –

Tables A.I – Matching quality: 1st treatments (TRAT)

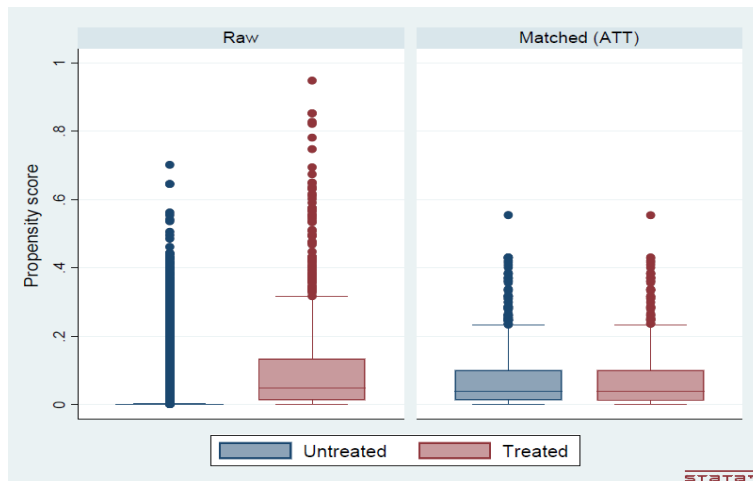
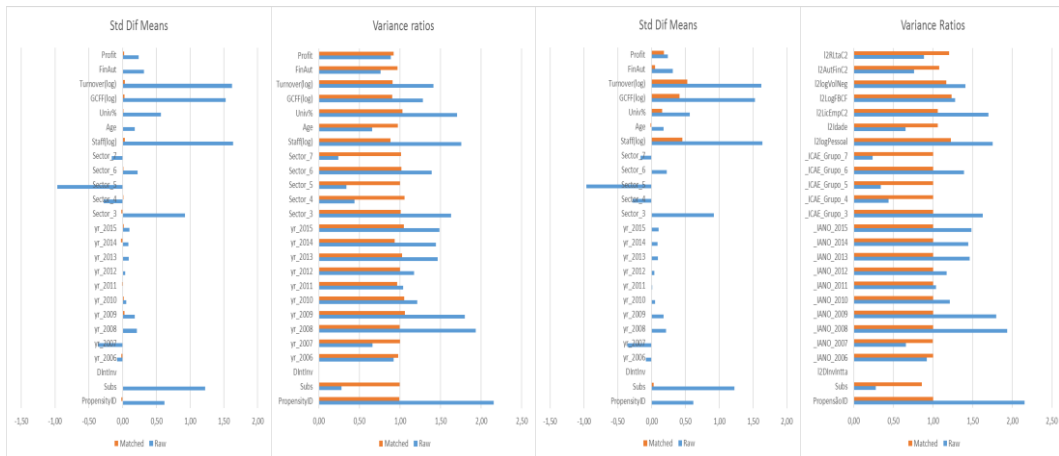
a) General model – Matching with all firms

| | Propensity score | | | | Mahalanobis | | | |
|---------------|------------------|---------|-----------------|---------|--------------|---------|-----------------|---------|
| | StdDif Means | | Ratio Variances | | StdDif Means | | Ratio Variances | |
| | Raw | Matched | Raw | Matched | Raw | Matched | Raw | Matched |
| PropensityID | 0,65 | 0,01 | 3,26 | 1,01 | 0,65 | 0,00 | 3,26 | 1,00 |
| Subs | 1,27 | -0,02 | 0,36 | 1,08 | 1,27 | 0,03 | 0,36 | 0,90 |
| DIntInv | 0,56 | -0,01 | 1,27 | 1,00 | 0,56 | 0,00 | 1,27 | 1,00 |
| yr_2006 | 0,16 | -0,01 | 1,35 | 0,98 | 0,16 | 0,00 | 1,35 | 1,00 |
| yr_2007 | -0,03 | 0,00 | 0,94 | 1,00 | -0,03 | 0,00 | 0,94 | 1,00 |
| yr_2008 | 0,09 | 0,00 | 1,24 | 1,00 | 0,09 | 0,00 | 1,24 | 1,00 |
| yr_2009 | 0,05 | 0,01 | 1,14 | 1,02 | 0,05 | 0,00 | 1,14 | 1,00 |
| yr_2010 | -0,13 | 0,01 | 0,66 | 1,04 | -0,13 | 0,00 | 0,66 | 1,00 |
| yr_2011 | -0,16 | 0,00 | 0,54 | 1,02 | -0,16 | 0,00 | 0,54 | 1,00 |
| yr_2012 | -0,06 | -0,01 | 0,84 | 0,98 | -0,06 | 0,00 | 0,84 | 1,00 |
| yr_2013 | -0,02 | 0,00 | 0,93 | 1,00 | -0,02 | 0,00 | 0,93 | 1,00 |
| yr_2014 | 0,00 | 0,00 | 1,01 | 0,99 | 0,00 | 0,00 | 1,01 | 1,00 |
| yr_2015 | 0,01 | 0,00 | 1,04 | 1,01 | 0,01 | 0,00 | 1,04 | 1,00 |
| Sector_3 | 0,88 | -0,03 | 1,69 | 1,01 | 0,88 | 0,00 | 1,69 | 1,00 |
| Sector_4 | -0,21 | 0,00 | 0,53 | 1,01 | -0,21 | 0,00 | 0,53 | 1,00 |
| Sector_5 | -0,90 | 0,02 | 0,38 | 1,06 | -0,90 | 0,00 | 0,38 | 1,00 |
| Sector_6 | 0,21 | 0,01 | 1,34 | 1,01 | 0,21 | 0,00 | 1,34 | 1,00 |
| Sector_7 | -0,24 | 0,00 | 0,18 | 1,00 | -0,24 | 0,00 | 0,18 | 1,00 |
| Staff(log) | 1,58 | 0,02 | 1,97 | 0,89 | 1,58 | 0,41 | 1,97 | 1,18 |
| Age | 0,18 | 0,00 | 0,70 | 0,98 | 0,18 | -0,03 | 0,70 | 1,06 |
| Univ% | 0,55 | 0,02 | 1,62 | 1,02 | 0,55 | 0,15 | 1,62 | 1,04 |
| GCFF(log) | 1,43 | 0,03 | 1,38 | 0,99 | 1,43 | 0,36 | 1,38 | 1,23 |
| Turnover(log) | 1,60 | 0,03 | 1,65 | 0,95 | 1,60 | 0,50 | 1,65 | 1,13 |
| FinAut | 0,16 | -0,01 | 0,78 | 0,96 | 0,16 | 0,02 | 0,78 | 1,06 |
| Profit | 0,20 | 0,02 | 0,90 | 0,95 | 0,20 | 0,15 | 0,90 | 1,20 |



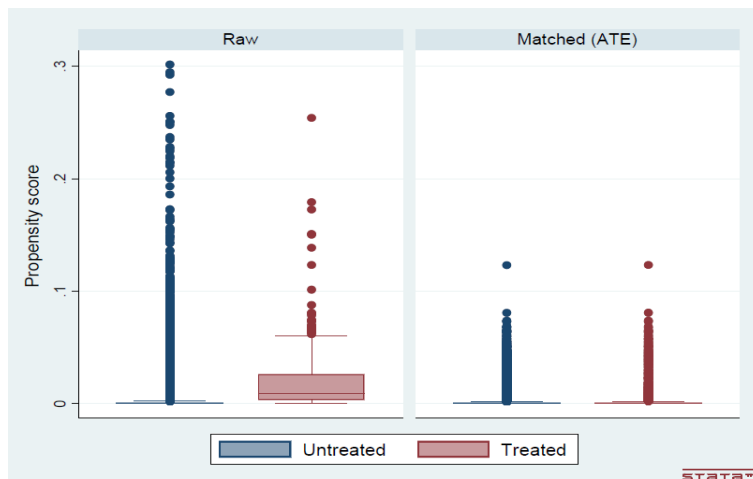
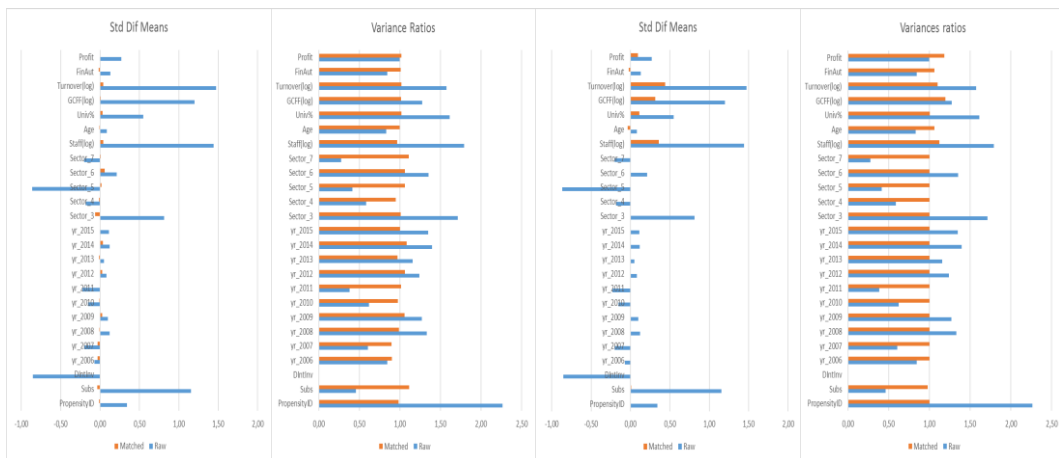
b) Firms with positive intangible Investment in the pre-treatment period

| | Propensity score | | | | Mahalanobis | | | |
|---------------|------------------|---------|-----------------|---------|--------------|---------|-----------------|---------|
| | StdDif Means | | Ratio Variances | | StdDif Means | | Ratio Variances | |
| | Raw | Matched | Raw | Matched | Raw | Matched | Raw | Matched |
| PropensityID | 0,62 | -0,02 | 2,16 | 0,99 | 0,62 | 0,00 | 2,16 | 1,00 |
| Subs | 1,22 | 0,00 | 0,28 | 0,99 | 1,22 | 0,03 | 0,28 | 0,86 |
| DIntInv | | | | | | | | |
| yr_2006 | -0,08 | -0,02 | 0,92 | 0,98 | -0,08 | 0,00 | 0,92 | 1,00 |
| yr_2007 | -0,36 | 0,00 | 0,66 | 1,00 | -0,36 | 0,00 | 0,66 | 1,00 |
| yr_2008 | 0,21 | 0,00 | 1,94 | 1,00 | 0,21 | 0,00 | 1,94 | 1,00 |
| yr_2009 | 0,18 | 0,03 | 1,80 | 1,06 | 0,18 | 0,00 | 1,80 | 1,00 |
| yr_2010 | 0,05 | 0,02 | 1,21 | 1,05 | 0,05 | 0,00 | 1,21 | 1,00 |
| yr_2011 | 0,01 | -0,01 | 1,04 | 0,97 | 0,01 | 0,00 | 1,04 | 1,00 |
| yr_2012 | 0,04 | 0,00 | 1,17 | 1,00 | 0,04 | 0,00 | 1,17 | 1,00 |
| yr_2013 | 0,09 | 0,01 | 1,46 | 1,03 | 0,09 | 0,00 | 1,46 | 1,00 |
| yr_2014 | 0,09 | -0,02 | 1,44 | 0,93 | 0,09 | 0,00 | 1,44 | 1,00 |
| yr_2015 | 0,10 | 0,02 | 1,49 | 1,05 | 0,10 | 0,00 | 1,49 | 1,00 |
| Sector_3 | 0,92 | -0,02 | 1,63 | 1,01 | 0,92 | 0,00 | 1,63 | 1,00 |
| Sector_4 | -0,28 | 0,01 | 0,44 | 1,05 | -0,28 | 0,00 | 0,44 | 1,00 |
| Sector_5 | -0,97 | 0,00 | 0,34 | 1,00 | -0,97 | 0,00 | 0,34 | 1,00 |
| Sector_6 | 0,22 | 0,01 | 1,39 | 1,02 | 0,22 | 0,00 | 1,39 | 1,00 |
| Sector_7 | -0,16 | 0,00 | 0,24 | 1,01 | -0,16 | 0,00 | 0,24 | 1,00 |
| Staff(log) | 1,64 | 0,03 | 1,76 | 0,88 | 1,64 | 0,45 | 1,76 | 1,22 |
| Age | 0,18 | 0,00 | 0,65 | 0,97 | 0,18 | -0,02 | 0,65 | 1,06 |
| Univ% | 0,57 | 0,01 | 1,70 | 1,03 | 0,57 | 0,16 | 1,70 | 1,06 |
| GCFE(log) | 1,53 | 0,03 | 1,28 | 0,90 | 1,53 | 0,41 | 1,28 | 1,24 |
| Turnover(log) | 1,62 | 0,03 | 1,41 | 0,91 | 1,62 | 0,53 | 1,41 | 1,17 |
| FinAut | 0,31 | 0,00 | 0,76 | 0,97 | 0,31 | 0,05 | 0,76 | 1,08 |
| Profit | 0,24 | 0,02 | 0,89 | 0,92 | 0,24 | 0,18 | 0,89 | 1,20 |



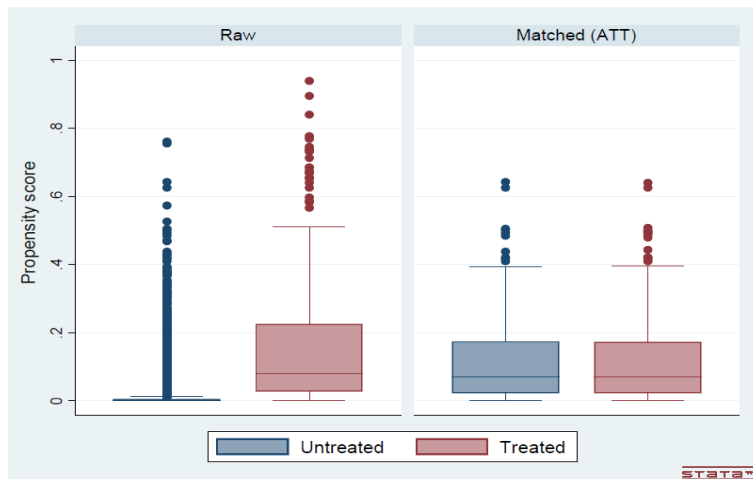
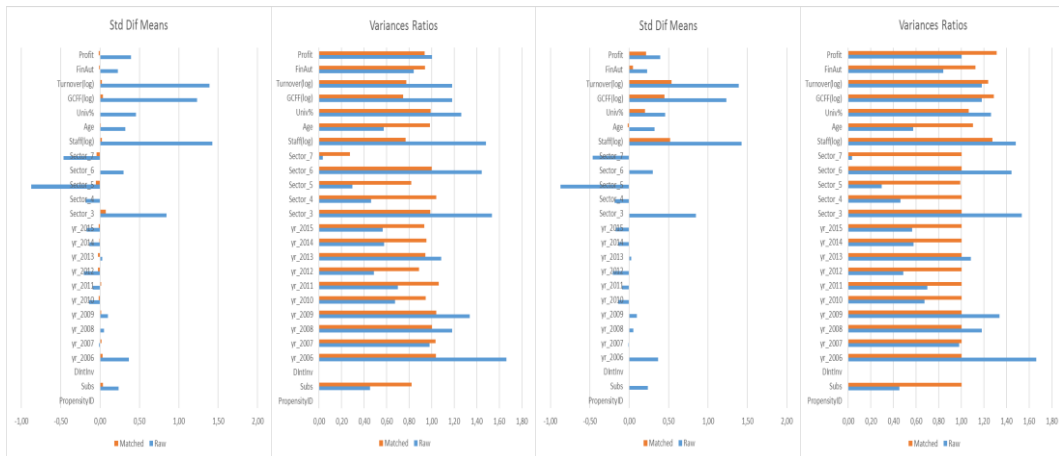
c) Firms without Intangible Investment in the two years before treatment

| | Propensity score | | | | Mahalanobis | | | |
|---------------|------------------|---------|-----------------|---------|--------------|---------|-----------------|---------|
| | StdDif Means | | Ratio Variances | | StdDif Means | | Ratio Variances | |
| | Raw | Matched | Raw | Matched | Raw | Matched | Raw | Matched |
| Subs | 1,15 | -0,04 | 0,46 | 1,12 | 1,15 | 0,01 | 0,46 | 0,98 |
| DIntInv | -0,85 | 0,00 | 0,00 | | -0,85 | 0,00 | 0,00 | |
| yr_2006 | -0,07 | -0,03 | 0,85 | 0,90 | -0,07 | 0,00 | 0,85 | 1,00 |
| yr_2007 | -0,20 | -0,03 | 0,60 | 0,90 | -0,20 | 0,00 | 0,60 | 1,00 |
| yr_2008 | 0,12 | -0,01 | 1,33 | 0,99 | 0,12 | 0,00 | 1,33 | 1,00 |
| yr_2009 | 0,10 | 0,03 | 1,27 | 1,06 | 0,10 | 0,00 | 1,27 | 1,00 |
| yr_2010 | -0,15 | -0,01 | 0,62 | 0,97 | -0,15 | 0,00 | 0,62 | 1,00 |
| yr_2011 | -0,23 | 0,00 | 0,38 | 1,01 | -0,23 | 0,00 | 0,38 | 1,00 |
| yr_2012 | 0,08 | 0,03 | 1,24 | 1,06 | 0,08 | 0,00 | 1,24 | 1,00 |
| yr_2013 | 0,05 | -0,01 | 1,16 | 0,97 | 0,05 | 0,00 | 1,16 | 1,00 |
| yr_2014 | 0,12 | 0,03 | 1,40 | 1,08 | 0,12 | 0,00 | 1,40 | 1,00 |
| yr_2015 | 0,11 | 0,00 | 1,35 | 1,00 | 0,11 | 0,00 | 1,35 | 1,00 |
| Sector_3 | 0,81 | -0,06 | 1,71 | 1,01 | 0,81 | 0,00 | 1,71 | 1,00 |
| Sector_4 | -0,19 | -0,01 | 0,59 | 0,95 | -0,19 | 0,00 | 0,59 | 1,00 |
| Sector_5 | -0,86 | 0,02 | 0,41 | 1,06 | -0,86 | 0,00 | 0,41 | 1,00 |
| Sector_6 | 0,21 | 0,06 | 1,35 | 1,06 | 0,21 | 0,00 | 1,35 | 1,00 |
| Sector_7 | -0,20 | 0,01 | 0,28 | 1,11 | -0,20 | 0,00 | 0,28 | 1,00 |
| Staff(log) | 1,44 | 0,04 | 1,79 | 0,97 | 1,44 | 0,36 | 1,79 | 1,12 |
| Age | 0,08 | -0,01 | 0,83 | 1,00 | 0,08 | -0,03 | 0,83 | 1,06 |
| Univ% | 0,55 | 0,03 | 1,61 | 1,02 | 0,55 | 0,11 | 1,61 | 1,01 |
| GCFF(log) | 1,20 | 0,01 | 1,28 | 1,01 | 1,20 | 0,31 | 1,28 | 1,20 |
| Turnover(log) | 1,47 | 0,04 | 1,58 | 1,02 | 1,47 | 0,44 | 1,58 | 1,10 |
| FinAut | 0,13 | -0,02 | 0,84 | 1,01 | 0,13 | -0,02 | 0,84 | 1,06 |
| Profit | 0,27 | 0,01 | 1,00 | 1,02 | 0,27 | 0,10 | 1,00 | 1,18 |



d) Firms with propensity to R&D

| | Propensity score | | | | Mahalanobis | | | |
|---------------|------------------|---------|-----------------|---------|--------------|---------|-----------------|---------|
| | StdDif Means | | Ratio Variances | | StdDif Means | | Ratio Variances | |
| | Raw | Matched | Raw | Matched | Raw | Matched | Raw | Matched |
| PropensityID | | | | | | | | |
| Subs | 0,24 | 0,04 | 0,45 | 0,82 | 0,24 | 0,00 | 0,45 | 1,00 |
| DIntInv | | | | | | | | |
| yr_2006 | 0,36 | 0,03 | 1,66 | 1,04 | 0,36 | 0,00 | 1,66 | 1,00 |
| yr_2007 | -0,01 | 0,02 | 0,98 | 1,03 | -0,01 | 0,00 | 0,98 | 1,00 |
| yr_2008 | 0,05 | 0,00 | 1,18 | 1,00 | 0,05 | 0,00 | 1,18 | 1,00 |
| yr_2009 | 0,10 | 0,02 | 1,34 | 1,04 | 0,10 | 0,00 | 1,34 | 1,00 |
| yr_2010 | -0,14 | -0,02 | 0,68 | 0,95 | -0,14 | 0,00 | 0,68 | 1,00 |
| yr_2011 | -0,09 | 0,01 | 0,70 | 1,06 | -0,09 | 0,00 | 0,70 | 1,00 |
| yr_2012 | -0,21 | -0,03 | 0,49 | 0,89 | -0,21 | 0,00 | 0,49 | 1,00 |
| yr_2013 | 0,03 | -0,03 | 1,08 | 0,94 | 0,03 | 0,00 | 1,08 | 1,00 |
| yr_2014 | -0,14 | -0,01 | 0,58 | 0,95 | -0,14 | 0,00 | 0,58 | 1,00 |
| yr_2015 | -0,17 | -0,02 | 0,57 | 0,94 | -0,17 | 0,00 | 0,57 | 1,00 |
| Sector_3 | 0,84 | 0,07 | 1,54 | 0,99 | 0,84 | 0,00 | 1,54 | 1,00 |
| Sector_4 | -0,19 | 0,01 | 0,46 | 1,04 | -0,19 | 0,00 | 0,46 | 1,00 |
| Sector_5 | -0,87 | -0,06 | 0,30 | 0,82 | -0,87 | 0,00 | 0,30 | 0,99 |
| Sector_6 | 0,30 | 0,00 | 1,45 | 1,00 | 0,30 | 0,00 | 1,45 | 1,00 |
| Sector_7 | -0,46 | -0,04 | 0,03 | 0,28 | -0,46 | 0,00 | 0,03 | 1,00 |
| Staff(log) | 1,43 | 0,02 | 1,48 | 0,77 | 1,43 | 0,52 | 1,48 | 1,27 |
| Age | 0,32 | 0,01 | 0,57 | 0,99 | 0,32 | -0,02 | 0,57 | 1,10 |
| Univ% | 0,46 | 0,00 | 1,26 | 0,99 | 0,46 | 0,20 | 1,26 | 1,07 |
| GCFF(log) | 1,23 | 0,04 | 1,18 | 0,75 | 1,23 | 0,45 | 1,18 | 1,29 |
| Turnover(log) | 1,39 | 0,02 | 1,18 | 0,77 | 1,39 | 0,54 | 1,18 | 1,24 |
| FinAut | 0,23 | -0,01 | 0,84 | 0,94 | 0,23 | 0,05 | 0,84 | 1,13 |
| Profit | 0,39 | -0,02 | 1,00 | 0,94 | 0,39 | 0,22 | 1,00 | 1,31 |



II – Firms treated only once

a) General model – Matching with all firms

| | Propensity score | | | | Mahalanobis | | | |
|---------------|------------------|---------|-----------------|---------|--------------|---------|-----------------|---------|
| | StdDif Means | | Ratio Variances | | StdDif Means | | Ratio Variances | |
| | Raw | Matched | Raw | Matched | Raw | Matched | Raw | Matched |
| PropensityID | 0,51 | 0,06 | 2,88 | 1,07 | 0,51 | 0,00 | 2,88 | 1,00 |
| Subs | 1,10 | -0,02 | 0,51 | 1,05 | 1,10 | 0,10 | 0,51 | 0,81 |
| DintInv | 0,42 | 0,02 | 1,27 | 1,01 | 0,42 | 0,08 | 1,27 | 1,02 |
| Yr_2006 | -0,22 | -0,01 | 0,55 | 0,96 | -0,22 | 0,00 | 0,55 | 1,00 |
| yr_2007 | -0,25 | -0,01 | 0,52 | 0,95 | -0,25 | 0,00 | 0,52 | 1,00 |
| yr_2008 | 0,01 | 0,01 | 1,02 | 1,04 | 0,01 | 0,00 | 1,02 | 1,00 |
| yr_2009 | -0,05 | 0,01 | 0,87 | 1,03 | -0,05 | 0,00 | 0,87 | 1,00 |
| yr_2010 | -0,25 | 0,00 | 0,40 | 0,98 | -0,25 | 0,00 | 0,40 | 1,00 |
| yr_2011 | -0,07 | 0,03 | 0,78 | 1,13 | -0,07 | 0,00 | 0,78 | 1,00 |
| yr_2012 | -0,01 | -0,01 | 0,97 | 0,98 | -0,01 | 0,00 | 0,97 | 1,00 |
| yr_2013 | -0,01 | 0,03 | 0,97 | 1,12 | -0,01 | 0,00 | 0,97 | 1,00 |
| yr_2014 | 0,06 | -0,02 | 1,21 | 0,96 | 0,06 | 0,00 | 1,21 | 1,00 |
| yr_2015 | 0,59 | -0,02 | 2,78 | 0,98 | 0,59 | 0,00 | 2,78 | 1,00 |
| Sector_3 | 0,73 | -0,04 | 1,72 | 1,00 | 0,73 | 0,03 | 1,72 | 1,00 |
| Sector_4 | -0,17 | -0,01 | 0,62 | 0,97 | -0,17 | 0,00 | 0,62 | 1,01 |
| Sector_5 | -0,82 | 0,03 | 0,46 | 1,07 | -0,82 | -0,05 | 0,46 | 0,89 |
| Sector_6 | 0,23 | 0,03 | 1,39 | 1,03 | 0,23 | 0,02 | 1,39 | 1,02 |
| Sector_7 | -0,19 | 0,00 | 0,31 | 0,99 | -0,19 | 0,00 | 0,31 | 1,00 |
| _INUTS_simp_2 | -0,11 | 0,01 | 0,31 | 1,16 | -0,11 | 0,00 | 0,31 | 1,00 |
| Staff(log) | 1,34 | 0,01 | 1,74 | 0,92 | 1,34 | 0,33 | 1,74 | 0,96 |
| Age | -0,01 | -0,01 | 0,93 | 1,00 | -0,01 | -0,09 | 0,93 | 1,19 |
| Univ% | 0,62 | 0,02 | 1,69 | 1,04 | 0,62 | 0,10 | 1,69 | 1,06 |
| GCFF(log) | 1,24 | 0,01 | 1,23 | 1,00 | 1,24 | 0,29 | 1,23 | 0,93 |
| Turnover(log) | 1,39 | 0,02 | 1,51 | 0,99 | 1,39 | 0,40 | 1,51 | 0,88 |
| FinAut | 0,06 | -0,02 | 0,82 | 0,97 | 0,06 | -0,02 | 0,82 | 1,04 |
| Profit | 0,14 | -0,02 | 0,92 | 0,94 | 0,14 | 0,11 | 0,92 | 1,22 |
| ps | 0,88 | 0,00 | 44,08 | 1,21 | 0,88 | 0,12 | 44,08 | 0,97 |

b) Firms with positive intangible investment before treatment

| | Propensity score | | | | Mahalanobis | | | |
|---------------|------------------|---------|-----------------|---------|--------------|---------|-----------------|---------|
| | StdDif Means | | Ratio Variances | | StdDif Means | | Ratio Variances | |
| | Raw | Matched | Raw | Matched | Raw | Matched | Raw | Matched |
| PropensityID | 0,45 | 0,09 | 1,95 | 1,07 | 0,45 | 0,02 | 1,95 | 1,02 |
| Subs | 1,10 | -0,02 | 0,39 | 1,07 | 1,10 | 0,09 | 0,39 | 0,77 |
| DintInv | | | | | | | | |
| Yr_2006 | -0,51 | -0,02 | 0,43 | 0,94 | -0,51 | 0,00 | 0,43 | 1,02 |
| yr_2007 | -0,61 | -0,02 | 0,38 | 0,95 | -0,61 | 0,00 | 0,38 | 0,99 |
| yr_2008 | 0,20 | 0,01 | 1,90 | 1,04 | 0,20 | 0,00 | 1,90 | 1,01 |
| yr_2009 | 0,13 | -0,05 | 1,56 | 0,90 | 0,13 | 0,00 | 1,56 | 1,01 |
| yr_2010 | -0,07 | 0,01 | 0,75 | 1,05 | -0,07 | 0,00 | 0,75 | 1,01 |
| yr_2011 | 0,16 | 0,00 | 1,96 | 1,01 | 0,16 | 0,00 | 1,96 | 1,01 |
| yr_2012 | 0,11 | 0,01 | 1,52 | 1,04 | 0,11 | 0,00 | 1,52 | 1,01 |
| yr_2013 | 0,13 | 0,02 | 1,71 | 1,07 | 0,13 | 0,00 | 1,71 | 1,01 |
| yr_2014 | 0,16 | 0,00 | 1,87 | 1,00 | 0,16 | 0,00 | 1,87 | 1,01 |
| yr_2015 | 0,67 | 0,03 | 4,65 | 1,04 | 0,67 | 0,00 | 4,65 | 1,01 |
| Sector_3 | 0,80 | -0,03 | 1,68 | 1,01 | 0,80 | 0,06 | 1,68 | 1,00 |
| Sector_4 | -0,24 | -0,04 | 0,52 | 0,88 | -0,24 | 0,02 | 0,52 | 1,08 |
| Sector_5 | -0,85 | -0,02 | 0,44 | 0,95 | -0,85 | -0,10 | 0,44 | 0,79 |
| Sector_6 | 0,22 | 0,08 | 1,40 | 1,09 | 0,22 | 0,03 | 1,40 | 1,04 |
| Sector_7 | -0,12 | 0,01 | 0,38 | 1,19 | -0,12 | 0,00 | 0,38 | 1,01 |
| Staff(log) | 1,37 | -0,01 | 1,63 | 0,86 | 1,37 | 0,32 | 1,63 | 1,04 |
| Age | -0,01 | 0,01 | 0,89 | 0,97 | -0,01 | -0,08 | 0,89 | 1,17 |
| Univ% | 0,67 | 0,01 | 1,77 | 1,03 | 0,67 | 0,12 | 1,77 | 1,10 |
| GCFF(log) | 1,34 | -0,03 | 1,16 | 0,92 | 1,34 | 0,28 | 1,16 | 0,97 |
| Turnover(log) | 1,43 | -0,01 | 1,29 | 0,95 | 1,43 | 0,38 | 1,29 | 0,88 |
| FinAut | 0,17 | 0,05 | 0,84 | 1,02 | 0,17 | -0,02 | 0,84 | 1,06 |
| Profit | 0,15 | 0,05 | 0,87 | 0,97 | 0,15 | 0,13 | 0,87 | 1,17 |
| ps | 0,98 | 0,03 | 28,18 | 1,58 | 0,98 | 0,15 | 28,18 | 0,95 |

c) Firms with no Intangible investment before treatment

| | Propensity score | | | | Mahalanobis | | | |
|---------------|------------------|---------|-----------------|---------|--------------|---------|-----------------|---------|
| | StdDif Means | | Ratio Variances | | StdDif Means | | Ratio Variances | |
| | Raw | Matched | Raw | Matched | Raw | Matched | Raw | Matched |
| PropensityID | 0,29 | 0,01 | 2,07 | 1,03 | 0,29 | 0,00 | 2,07 | 1,01 |
| Subs | 1,01 | -0,04 | 0,59 | 1,10 | 1,01 | 0,08 | 0,59 | 0,88 |
| DintInv | -0,86 | 0,00 | 0,00 | | -0,86 | -0,08 | 0,00 | 0,00 |
| Yr_2006 | -0,38 | -0,01 | 0,26 | 0,93 | -0,38 | 0,00 | 0,26 | 1,01 |
| yr_2007 | -0,34 | 0,00 | 0,37 | 1,01 | -0,34 | 0,00 | 0,37 | 1,01 |
| yr_2008 | -0,07 | 0,02 | 0,84 | 1,07 | -0,07 | 0,00 | 0,84 | 1,01 |
| yr_2009 | -0,02 | 0,01 | 0,96 | 1,04 | -0,02 | 0,00 | 0,96 | 1,01 |
| yr_2010 | -0,23 | 0,01 | 0,45 | 1,05 | -0,23 | 0,00 | 0,45 | 1,01 |
| yr_2011 | -0,19 | 0,00 | 0,48 | 1,03 | -0,19 | 0,00 | 0,48 | 1,01 |
| yr_2012 | 0,07 | 0,01 | 1,22 | 1,04 | 0,07 | 0,00 | 1,22 | 1,01 |
| yr_2013 | -0,01 | -0,01 | 0,96 | 0,97 | -0,01 | 0,00 | 0,96 | 1,01 |
| yr_2014 | 0,16 | -0,03 | 1,55 | 0,95 | 0,16 | 0,00 | 1,55 | 1,01 |
| yr_2015 | 0,67 | 0,00 | 2,95 | 1,00 | 0,67 | 0,00 | 2,95 | 1,01 |
| Sector_3 | 0,63 | 0,01 | 1,72 | 1,01 | 0,63 | 0,01 | 1,72 | 1,01 |
| Sector_4 | -0,18 | -0,01 | 0,59 | 0,95 | -0,18 | 0,00 | 0,59 | 1,01 |
| Sector_5 | -0,79 | 0,03 | 0,48 | 1,08 | -0,79 | -0,01 | 0,48 | 0,98 |
| Sector_6 | 0,28 | 0,02 | 1,46 | 1,02 | 0,28 | 0,00 | 1,46 | 1,01 |
| Sector_7 | -0,16 | -0,01 | 0,40 | 0,94 | -0,16 | 0,00 | 0,40 | 1,01 |
| Staff(log) | 1,22 | 0,03 | 1,63 | 0,83 | 1,22 | 0,32 | 1,63 | 0,91 |
| Age | -0,12 | 0,01 | 1,08 | 0,98 | -0,12 | -0,09 | 1,08 | 1,12 |
| Univ% | 0,61 | 0,03 | 1,69 | 1,01 | 0,61 | 0,09 | 1,69 | 1,02 |
| GCFE(log) | 1,06 | 0,01 | 1,12 | 0,88 | 1,06 | 0,29 | 1,12 | 0,96 |
| Turnover(log) | 1,21 | 0,02 | 1,69 | 1,03 | 1,21 | 0,36 | 1,69 | 0,96 |
| FinAut | 0,05 | -0,01 | 0,85 | 0,96 | 0,05 | -0,04 | 0,85 | 1,04 |
| Profit | 0,28 | 0,00 | 1,07 | 1,04 | 0,28 | 0,09 | 1,07 | 1,23 |
| ps | 0,86 | 0,05 | 38,64 | 1,77 | 0,86 | 0,10 | 38,64 | 0,98 |

d) Firms with propensity to R&D

| | Propensity score | | | | Mahalanobis | | | |
|---------------|------------------|---------|-----------------|---------|--------------|---------|-----------------|---------|
| | StdDif Means | | Ratio Variances | | StdDif Means | | Ratio Variances | |
| | Raw | Matched | Raw | Matched | Raw | Matched | Raw | Matched |
| PropensityID | | | | | | | | |
| Subs | 0,30 | -0,01 | 0,33 | 1,12 | 0,30 | -0,02 | 0,33 | 1,21 |
| DintInv | | | | | | | | |
| Yr_2006 | -0,27 | 0,02 | 0,49 | 1,09 | -0,27 | 0,00 | 0,49 | 1,03 |
| yr_2007 | -0,34 | 0,01 | 0,43 | 1,08 | -0,34 | 0,00 | 0,43 | 1,01 |
| yr_2008 | -0,01 | 0,03 | 0,98 | 1,11 | -0,01 | 0,00 | 0,98 | 1,02 |
| yr_2009 | 0,03 | 0,08 | 1,12 | 1,30 | 0,03 | 0,00 | 1,12 | 1,02 |
| yr_2010 | -0,32 | -0,03 | 0,31 | 0,87 | -0,32 | 0,00 | 0,31 | 1,01 |
| yr_2011 | 0,17 | 0,03 | 1,65 | 1,07 | 0,17 | 0,00 | 1,65 | 1,02 |
| yr_2012 | -0,06 | 0,00 | 0,85 | 1,01 | -0,06 | 0,00 | 0,85 | 1,02 |
| yr_2013 | 0,24 | -0,08 | 1,81 | 0,90 | 0,24 | 0,00 | 1,81 | 1,02 |
| yr_2014 | -0,02 | 0,02 | 0,95 | 1,10 | -0,02 | 0,00 | 0,95 | 1,02 |
| yr_2015 | 0,44 | -0,04 | 2,24 | 0,96 | 0,44 | 0,00 | 2,24 | 1,02 |
| Sector_3 | 0,83 | -0,01 | 1,56 | 1,02 | 0,83 | 0,18 | 1,56 | 0,99 |
| Sector_4 | -0,10 | -0,04 | 0,69 | 0,81 | -0,10 | 0,00 | 0,69 | 1,02 |
| Sector_5 | -0,80 | -0,01 | 0,37 | 1,00 | -0,80 | -0,32 | 0,37 | 0,52 |
| Sector_6 | 0,20 | 0,03 | 1,33 | 1,05 | 0,20 | 0,12 | 1,33 | 1,17 |
| Sector_7 | -0,38 | 0,01 | 0,17 | 1,24 | -0,38 | 0,00 | 0,17 | 1,02 |
| Staff(log) | 1,24 | 0,17 | 1,02 | 0,87 | 1,24 | 0,45 | 1,02 | 0,92 |
| Age | 0,16 | 0,01 | 0,70 | 1,00 | 0,16 | -0,10 | 0,70 | 1,26 |
| Univ% | 0,58 | -0,10 | 1,38 | 1,12 | 0,58 | 0,30 | 1,38 | 1,22 |
| GCFE(log) | 0,99 | 0,09 | 0,92 | 0,71 | 0,99 | 0,37 | 0,92 | 0,89 |
| Turnover(log) | 1,23 | 0,10 | 0,83 | 0,91 | 1,23 | 0,42 | 0,83 | 0,87 |
| FinAut | 0,01 | -0,01 | 0,94 | 1,07 | 0,01 | -0,02 | 0,94 | 1,17 |
| Profit | 0,15 | 0,05 | 0,94 | 1,19 | 0,15 | 0,12 | 0,94 | 1,38 |
| ps | 0,99 | -0,02 | 16,81 | 0,90 | 0,99 | 0,25 | 16,81 | 1,00 |

Tables A.II. Probit models

General case – Firms treated only once

| | | |
|-------------------|----------------|------------|
| Probit regression | Number of obs | 832479 |
| | LR chi2(23) | 1794.98 |
| | Prob > chi2 | 0.0000 |
| | Pseudo R2 | 0.2451 |
| | Log likelihood | -2764.0889 |

| TRT1 | Coef. | z | P>z |
|---------------|-----------|--------|------|
| PropensityID | 0,23 *** | 5,68 | 0,00 |
| Subs | 0,14 *** | 3,84 | 0,00 |
| DIntInv | 0,35 *** | 8,04 | 0,00 |
| Yr_2006 | -0,14 * | -1,73 | 0,08 |
| yr_2007 | -0,18 ** | -2,27 | 0,02 |
| yr_2008 | 0,00 | 0,03 | 0,97 |
| yr_2009 | -0,07 | -0,90 | 0,37 |
| yr_2010 | -0,34 *** | -3,64 | 0,00 |
| yr_2011 | -0,17 ** | -2,08 | 0,04 |
| yr_2012 | -0,06 | -0,77 | 0,44 |
| yr_2013 | -0,08 | -1,09 | 0,27 |
| yr_2015 | 0,34 *** | 5,52 | 0,00 |
| Sector_3 | 0,22 * | 1,63 | 0,10 |
| Sector_4 | -0,19 | -1,29 | 0,20 |
| Sector_5 | -0,46 *** | -3,36 | 0,00 |
| Sector_6 | -0,04 | -0,29 | 0,77 |
| Sector_7 | -0,63 *** | -3,56 | 0,00 |
| Staff(log) | 0,08 *** | 3,95 | 0,00 |
| Age | 0,29 *** | 11,84 | 0,00 |
| Univ% | 0,05 *** | 4,74 | 0,00 |
| GCFF(log) | 0,14 *** | 8,01 | 0,00 |
| Turnover(log) | -0,01 | -0,35 | 0,73 |
| FinAut | 0,06 *** | 3,08 | 0,00 |
| Profit | -6,53 *** | -28,29 | 0,00 |

The final number of blocks is 12

The region of common support is [1.414e-06, .17807266]

| Inferior limit of ps score | TRT1=0 | TRT1=1 | Total |
|-------------------------------|--------|--------|--------|
| 1,41E-06 | 460680 | 13 | 460693 |
| 0,0000977 | 74157 | 9 | 74166 |
| 0,0001953 | 63401 | 10 | 63411 |
| 0,0003906 | 51766 | 27 | 51793 |
| 0,0007813 | 37834 | 42 | 37876 |
| 0,0015625 | 25825 | 49 | 25874 |
| 0,003125 | 1563 | 88 | 1651 |
| 0,00625 | 8153 | 80 | 8233 |
| 0,0125 | 3426 | 60 | 3486 |
| 0,025 | 1166 | 36 | 1202 |
| 0,05 | 252 | 12 | 264 |
| 0,1 | 26 | 1 | 27 |
| Total | 728249 | 427 | 728676 |

First treatment – firms treated several times

| | |
|----------------|----------|
| Number of obs | 833551 |
| LR chi2(23) | 7525,46 |
| Prob > chi2 | 0,00 |
| Pseudo R2 | 0,34 |
| Log likelihood | -7209,94 |

| TRAT | Coef. | z | P>z |
|---------------|-----------|--------|------|
| PropensityID | 0,37 | 17,98 | 0,32 |
| DintInv | 0,14 *** | 6,32 | 0,00 |
| Subs | 0,55 *** | 17,49 | 0,00 |
| Yr_2006 | 0,55 *** | 9,83 | 0,00 |
| yr_2007 | 0,38 *** | 6,70 | 0,00 |
| yr_2008 | 0,46 *** | 8,14 | 0,00 |
| yr_2009 | 0,38 *** | 6,66 | 0,00 |
| yr_2010 | 0,13 ** | 2,10 | 0,04 |
| yr_2011 | 0,22 *** | 3,60 | 0,00 |
| yr_2012 | 0,22 *** | 3,64 | 0,00 |
| yr_2013 | 0,26 *** | 4,37 | 0,00 |
| yr_2015 | 0,24 *** | 4,01 | 0,00 |
| Sector_3 | 0,30 ** | 2,37 | 0,02 |
| Sector_4 | -0,27 ** | -2,03 | 0,04 |
| Sector_5 | -0,58 *** | -4,45 | 0,00 |
| Sector_6 | -0,05 | -0,42 | 0,67 |
| Sector_7 | -0,77 *** | -4,92 | 0,00 |
| Staff(log) | 0,12 *** | 9,04 | 0,00 |
| Univ% | 0,39 *** | 23,61 | 0,00 |
| GCFE(log) | 0,06 *** | 9,06 | 0,00 |
| Turnover(log) | 0,18 *** | 15,43 | 0,00 |
| FinAut | 0,05 *** | 3,53 | 0,00 |
| Profit | 0,09 *** | 6,98 | 0,00 |
| _cons | -7,90 *** | -42,12 | 0,00 |

| Inferior limit of ps | | | |
|----------------------|--------|--------|--------|
| score | TRT1=0 | TRT1=1 | Total |
| 0,0000 | 430167 | 18 | 430185 |
| 0,0001 | 61632 | 13 | 61645 |
| 0,0002 | 56858 | 17 | 56875 |
| 0,0004 | 51922 | 23 | 51945 |
| 0,0008 | 44966 | 44 | 45010 |
| 0,0016 | 36956 | 81 | 37037 |
| 0,0031 | 27822 | 126 | 27948 |
| 0,0063 | 19707 | 180 | 19887 |
| 0,0125 | 8393 | 116 | 8509 |
| 0,0188 | 4629 | 101 | 4730 |
| 0,0250 | 4957 | 136 | 5093 |
| 0,0375 | 2495 | 103 | 2598 |
| 0,0500 | 2367 | 166 | 2533 |
| 0,0750 | 1060 | 101 | 1161 |
| 0,1000 | 1050 | 166 | 1216 |
| 0,2000 | 170 | 86 | 256 |
| 0,4000 | 7 | 16 | 23 |
| TOTAL | 755158 | 1493 | 756651 |

Tables AIII. – Results

1. First Treatments – all firms

1.1. Impact on intangible investment – overall

| Variable | Propensity score (Kernel) | | | | Mahalanobis (Kernel) | | | | Propensity score (NN) | | | | Propensity score (Stratification) | | | |
|---|---------------------------|--------|----------|------|----------------------|--------|----------|------|-----------------------|------|----------|------|-----------------------------------|--------|----------|-------|
| | T | NT | ATT | t | T | NT | ATT | t | T | NT | ATT | t | T | NT | ATT | t |
| a) General model: all firms | | | | | | | | | | | | | | | | |
| IntInv | 1368 | 830066 | 0,88 *** | 6,16 | 1475 | 207105 | 0,95 *** | 6,61 | 1406 | 1386 | 0,84 *** | 4,96 | 1406 | 516878 | 1,00 *** | 6,86 |
| DifIntInv | 1368 | 830066 | 1,98 *** | 3,24 | 1475 | 207105 | 1,99 *** | 3,42 | 1406 | 1386 | 2,77 *** | 3,77 | 1406 | 516878 | 2,73 *** | 3,91 |
| DlnvInt(log) | 510 | 44274 | 0,45 *** | 3,70 | 544 | 16594 | 0,46 *** | 4,08 | 1406 | 344 | 0,84 *** | 6,20 | 1406 | 516878 | 0,75 | |
| b) Firms with positive Intangible Investment before treatment | | | | | | | | | | | | | | | | |
| IntInv | 727 | 222304 | 1,11 *** | 5,04 | 787 | 62155 | 1,30 *** | 5,83 | 800 | 733 | 1,15 *** | 4,33 | 793 | 153844 | 1,16 *** | 5,25 |
| DifIntInv | 727 | 222304 | 1,46 *** | 3,09 | 787 | 62155 | 1,78 *** | 3,61 | 800 | 733 | 1,20 * | 1,79 | 793 | 153844 | 1,66 *** | 3,29 |
| DlnvInt(log) | 510 | 44274 | 0,45 *** | 3,70 | 544 | 16594 | 0,45 *** | 4,08 | 800 | 396 | 0,51 *** | 3,38 | 793 | 153844 | 0,62 *** | 6,64 |
| c) Firms with no intangible investments before treatment | | | | | | | | | | | | | | | | |
| IntInv | 499 | 602473 | 0,45 *** | 2,90 | 477 | 89892 | 0,39 *** | 2,70 | 486 | 483 | 0,16 | 0,93 | 486 | 517559 | 0,26 * | 1,78 |
| d) Firms with propensity to R&D | | | | | | | | | | | | | | | | |
| IntInv | 281 | 27887 | 2,33 *** | 4,55 | 299 | 10263 | 2,38 *** | 4,93 | 306 | 296 | 2,19 *** | 4,67 | 304 | 23485 | 2,34 *** | 5,07 |
| DifIntInv | 281 | 27887 | 2,65 ** | 2,01 | 299 | 10263 | 3,19 *** | 2,84 | 306 | 296 | 3,77 *** | 3,30 | 304 | 23485 | -0,62 | -0,15 |
| DlnvInt(log) | 239 | 14200 | 0,75 *** | 3,88 | 248 | 5455 | 0,60 *** | 3,80 | 306 | 176 | 0,53 *** | 2,63 | 304 | 23485 | 0,75 *** | 5,62 |

Additionality

| | Propensity score (Kernel) | | | | Mahalanobis (Kernel) | | | |
|--------------|---------------------------|-------|----------|------|----------------------|-------|----------|------|
| | T | NT | ATT | t | T | NT | ATT | t |
| Adicionality | 739 | 85018 | 0,08 *** | 4,74 | 694 | 68680 | 0,14 *** | 5,71 |

1.2. Impact on intangible investment, by sector

| Sector | Propensity score (Kernel) | | | | Mahalanobis (Kernel) | | | |
|---|---------------------------|--------|----------|------|----------------------|--------|----------|-------|
| | T | NT | ATT | t | T | NT | ATT | t |
| a) General model: all firms | | | | | | | | |
| 1 - Agric. for. & fishing | 8 | 5130 | 0,98 | 1,05 | 8 | 3542 | 0,98 | 1,05 |
| 2 - Extr. Industries | -- | | | | -- | | | |
| 3 - Manufacturing Ind. | 783 | 146439 | 0,44 *** | 4,33 | 837 | 92452 | 0,44 *** | 5,39 |
| 4 - Utilities & constr. | 81 | 99169 | 0,80 | 1,42 | 87 | 47922 | 0,87 | 1,63 |
| 5 - Trade & accom. | 148 | 395864 | 0,42 | 1,62 | 160 | 71721 | 0,38 | 1,63 |
| 6 - Business services | 349 | 140103 | 2,16 *** | 4,66 | 371 | 106812 | 2,16 *** | 4,8 |
| 7 - Other services | 11 | 17038 | 2,18 * | 1,76 | 12 | 3602 | 2,10 * | 1,84 |
| b) Firms with positive Intangible Investment before treatment | | | | | | | | |
| 3 - Manuf. Ind. | 435 | 40419 | 0,64 *** | 3,33 | 106 | 20528 | 1,02 *** | 2,13 |
| 6-B. Services | 187 | 35951 | 2,59 *** | 3,40 | 195 | 13616 | 2,82 *** | 3,93 |
| c) Firms with no Intangible Investment before treatment | | | | | | | | |
| 3 - Manuf. Ind. | 241 | 104889 | 0,04 | 0,59 | 259 | 44881 | 0,05 | 0,078 |
| 6-B. Services | 113 | 44641 | 1,27 ** | 2,22 | 125 | 14661 | 1,24 ** | 2,39 |
| d) Firms with propensity to R&D | | | | | | | | |
| 3 - Manuf. Ind. | 163 | 5546 | 1,05 *** | 2,58 | 175 | 4368 | 1,36 *** | 4,31 |
| 6-B. Services | 88 | 5023 | 4,62 *** | 3,41 | 90 | 2586 | 4,40 *** | 3,26 |

| Sector ICT | Propensity score (Kernel) | | | | | Mahalanobis (Kernel) | | | | |
|------------|---------------------------|-------|----------|------|--|----------------------|-------|----------|------|--|
| | T | NT | ATT | t | | T | NT | ATT | t | |
| IntInv | 232 | 18690 | 2,09 *** | 3,4 | | 252 | 15096 | 2,36 *** | 4,11 | |
| StaffID | 78 | 3975 | 2,19 ** | 2,17 | | 83 | 5899 | 1,51 | 1,31 | |

1.3. Impact on intangible investment, by firm size

| Size | Propensity score (Kernel) | | | | | Mahalanobis (Kernel) | | | | |
|---|---------------------------|--------|----------|-------|--|----------------------|--------|-----------|-------|--|
| | T | NT | ATT | t | | T | NT | ATT | t | |
| a) General model: all firms | | | | | | | | | | |
| Micro | 144 | 509818 | 1,97 *** | 2,42 | | 151 | 35685 | 2,37 *** | 3,32 | |
| Small | 529 | 162027 | 0,90 *** | 4,60 | | 572 | 105160 | 0,92 *** | 3,80 | |
| Medium | 520 | 26831 | 0,44 ** | 2,54 | | 559 | 20809 | 0,52 *** | 3,77 | |
| Large | 189 | 3623 | 0,18 | 1,32 | | 204 | 3161 | 0,26 * | 1,65 | |
| b) Firms with positive Intangible Investment before treatment | | | | | | | | | | |
| Micro | 62 | 73387 | 2,55 *** | 2,7 | | 67 | 10070 | 2,36 *** | 2,68 | |
| Small | 249 | 41510 | 1,67 *** | 3,80 | | 267 | 27854 | 1,63 *** | 3,17 | |
| Medium | 299 | 8866 | 0,72 *** | 2,38 | | 324 | 7787 | 0,76 *** | 3,04 | |
| Large | 131 | 1591 | 0,39 | 1,67 | | 137 | 1411 | 0,20 | 0,84 | |
| c) Firms with no Intangible Investment before treatment | | | | | | | | | | |
| Micro | 55 | 185906 | 2,41 *** | 2,47 | | 59 | 13899 | 2,28 ** | 2,37 | |
| Small | 197 | 28259 | 0,35 ** | 2,01 | | 211 | 56621 | 0,24 | 1,48 | |
| Medium | 155 | 12681 | -0,03 | -0,69 | | 165 | 13401 | -0,06 | -1,51 | |
| Large | 42 | 1761 | 0,00 | -0,12 | | 44 | 1659 | -0,24 *** | -4,04 | |
| d) Firms with propensity to R&D | | | | | | | | | | |
| Micro | 33 | 10384 | 4,51 *** | 2,93 | | 34 | 1633 | 4,09 *** | 2,72 | |
| Small | 98 | 6834 | 3,60 *** | 2,92 | | 105 | 3345 | 3,28 *** | 2,69 | |
| Medium | 111 | 1764 | 1,04 *** | 2,52 | | 122 | 1372 | 1,32 *** | 3,45 | |
| Large | 42 | 153 | 0,56 *** | 2,57 | | 44 | 204 | 0,34 | 1,65 | |

1.4. Impact on other R&D staff

| Variable | Propensity score (Kernel) | | | | | Mahalanobis (Kernel) | | | | |
|---|---------------------------|--------|----------|------|--|----------------------|-------|----------|------|--|
| | T | NT | ATT | t | | T | NT | ATT | t | |
| a) General model: all firms | | | | | | | | | | |
| StaffID | 494 | 265101 | 1,24 *** | 6,03 | | 529 | 81061 | 1,23 *** | 5,78 | |
| DStaffID | 338 | 172815 | 1,16 *** | 2,86 | | 355 | 58472 | 0,92 *** | 3,2 | |
| b) Firms with positive Intangible Investment before treatment | | | | | | | | | | |
| StaffID | 204 | 26833 | 1,29 *** | 5,10 | | 219 | 12361 | 1,22 *** | 4,10 | |
| DStaffID | 137 | 25837 | 0,84 *** | 2,30 | | 147 | 8324 | 1,08 *** | 4,32 | |
| c) Firms with no Intangible Investment before treatment | | | | | | | | | | |
| StaffID | 214 | 231753 | 0,85 *** | 5,20 | | 225 | 49513 | 0,86 *** | 5,47 | |
| DStaffID | 146 | 124514 | 0,2912 | 0,68 | | 155 | 43332 | 0,3025 | 0,8 | |
| d) Firms with propensity to R&D | | | | | | | | | | |
| StaffID | 78 | 6534 | 1,59 *** | 3,60 | | 83 | 3083 | 1,96 *** | 4,40 | |
| DStaffID | 52 | 5219 | 1,24 *** | 3,14 | | 55 | 1805 | 1,55 *** | 3,36 | |

1.5. Impact on exports

| Variable | Propensity score (Kernel) | | | | Mahalanobis (Kernel) | | | |
|---|---------------------------|--------|------------|------|----------------------|-------|-----------|------|
| | T | NT | ATT | t | T | NT | ATT | t |
| a) General model: all firms | | | | | | | | |
| ExpTot | 586 | 345876 | 9,24 *** | 5,96 | 624 | 89515 | 11,37 *** | 7,99 |
| DExpTot | 438 | 201503 | 2,40 *** | 2,79 | 467 | 67408 | 2,09 *** | 2,59 |
| b) Firms with positive Intangible Investment before treatment | | | | | | | | |
| ExpTot | 255 | 32594 | 11,97 *** | 4,99 | 272 | 13819 | 12,44 *** | 5,67 |
| DExpTot | 178 | 29997 | 2,37 | 1,66 | 190 | 10892 | 2,69 ** | 2,13 |
| c) Firms with no Intangible Investment before treatment | | | | | | | | |
| ExpTot | 237 | 27268 | 7,8874 *** | 3,36 | 253 | 57513 | 9,426 *** | 4,31 |
| DExpTot | 200 | 214243 | 1,4863 | 1,06 | 212 | 45658 | 1,1874 | 0,97 |
| d) Firms with propensity to R&D | | | | | | | | |
| ExpTot | 98 | 12848 | 21,45 *** | 5,68 | 106 | 3844 | 21,32 *** | 6,14 |
| DExpTot | 64 | 6255 | 4,37 * | 1,72 | 69 | 2579 | 4,94 * | 1,92 |

1.6. Impact on Intangible investment, by year

| Year of treatm. | Propensity score (Kernel) | | | | Mahalanobis (Kernel) | | | | |
|---|---------------------------|--------|----------|-------|----------------------|-------|----------|-------|--|
| | T | NT | ATT | t | T | NT | ATT | t | |
| a) General model: all firms | | | | | | | | | |
| 2006 | 273 | 110258 | 1,66 *** | 4,17 | 286 | 69648 | 1,83 *** | 4,68 | |
| 2007 | 188 | 121761 | 0,99 | 1,58 | 202 | 50937 | 1,36 *** | 2,81 | |
| 2008 | 183 | 85456 | 0,86 ** | 2,06 | 195 | 16987 | 0,71 ** | 2,27 | |
| 2009 | 162 | 81976 | 0,65 | 1,25 | 175 | 27592 | 0,71 | 1,46 | |
| 2010 | 89 | 82915 | 0,80 | 1,31 | 94 | 9460 | 0,82 | 1,43 | |
| 2011 | 57 | 60895 | 0,23 | 0,70 | 62 | 8428 | 0,18 | 0,59 | |
| 2012 | 102 | 29216 | 0,48 ** | 2,11 | 112 | 8919 | 0,29 | 1,33 | |
| 2013 | 106 | 62530 | 1,10 * | 1,90 | 111 | 17819 | 1,05 * | 1,75 | |
| 2014 | 108 | 48755 | 0,34 * | 1,95 | 115 | 18382 | 0,28 * | 1,72 | |
| 2015 | 120 | 66808 | 0,34 | 1,05 | 129 | 19871 | 0,47 * | 1,76 | |
| b) Firms with positive Intangible Investment before treatment | | | | | | | | | |
| 2006 | 198 | 66805 | 2,28 *** | 4,10 | 205 | 30508 | 2,45 *** | 4,75 | |
| 2007 | 131 | 73585 | 1,91 *** | 2,72 | 140 | 28636 | 1,76 *** | 2,63 | |
| 2008 | 86 | 11683 | 0,90 | 1,30 | 91 | 3045 | 1,20 * | 1,81 | |
| 2009 | 73 | 11785 | 0,25 | 0,48 | 81 | 3968 | 0,49 | 1,00 | |
| 2010 | 51 | 11950 | 0,68 | 0,87 | 53 | 1675 | 0,66 | 0,87 | |
| 2011 | 28 | 2732 | -0,11 | -0,20 | 29 | 1524 | 0,06 | 0,13 | |
| 2012 | 41 | 3442 | 0,11 | 0,23 | 42 | 1605 | 0,27 | 0,71 | |
| 2013 | 44 | 5212 | 1,58 | 1,42 | 47 | 2465 | 1,54 | 1,48 | |
| 2014 | 42 | 7497 | 0,23 | 0,75 | 44 | 1965 | 0,21 | 0,72 | |
| 2015 | 52 | 8225 | 0,29 | 0,89 | 56 | 3985 | 0,42 | 1,41 | |
| c) Firms with no Intangible Investment before treatment | | | | | | | | | |
| 2006 | 49 | 43437 | 0,19 | 0,42 | 53 | 8435 | 0,19 | 0,47 | |
| 2007 | 37 | 44623 | 0,10 | 0,98 | 40 | 26872 | 0,02 | 0,23 | |
| 2008 | 64 | 73669 | 0,21 | 0,96 | 69 | 10587 | 0,19 | 0,91 | |
| 2009 | 60 | 41547 | 0,32 | 0,80 | 65 | 9132 | 0,20 | 0,53 | |
| 2010 | 28 | 1526 | 1,43 | 1,11 | 29 | 3213 | 1,33 | 1,07 | |
| 2011 | 13 | 969 | 0,62 | 0,72 | 14 | 700 | 0,72 | 0,93 | |
| 2012 | 53 | 43625 | 0,28 | 0,89 | 57 | 7097 | 0,23 | 0,77 | |
| 2013 | 44 | 58630 | 0,90 | 1,41 | 46 | 6569 | 0,79 | 1,24 | |
| 2014 | 53 | 54631 | 0,24 | 1,32 | 53 | 14971 | 0,19 | 1,03 | |
| 2015 | 53 | 56144 | 0,77 | 1,37 | 56 | 13964 | 0,68 | 1,27 | |
| d) Firms with propensity to R&D | | | | | | | | | |
| 2006 | 85 | 4125 | 3,86 *** | 3,49 | 89 | 2822 | 3,99 *** | 3,78 | |
| 2007 | 49 | 4871 | 3,97 *** | 2,36 | 49 | 2127 | 4,09 *** | 4,46 | |
| 2008 | 24 | 1712 | 2,22 | 1,65 | 25 | 938 | 2,32 * | 1,81 | |
| 2009 | 28 | 1882 | 0,94 | 0,84 | 31 | 824 | 0,92 | 0,78 | |
| 2010 | 22 | 3073 | 1,76 | 1,02 | 23 | 425 | 1,87 | 1,13 | |
| 2011 | 13 | 553 | -0,63 | -1,26 | 14 | 484 | -0,43 | -0,85 | |
| 2012 | 14 | 2133 | 1,25 | 1,52 | 13 | 364 | 0,39 | 0,37 | |
| 2013 | 26 | 1284 | 0,27 | 0,34 | 28 | 838 | 0,84 | 1,03 | |
| 2014 | 11 | 371 | 1,09 * | 1,69 | 11 | 363 | 0,43 | 0,64 | |
| 2015 | 15 | 1854 | 0,21 | 0,44 | 16 | 519 | 0,04 | 0,08 | |

2. Firms treated only once

2.1. Impact on intangible investment

| Variable | Propensity score (Kernel) | | | | | Mahalanobis (Kernel) | | | | |
|---|---------------------------|--------|------|-----|------|----------------------|--------|------|-----|------|
| | T | NT | ATT | | t | T | NT | ATT | | t |
| a) General model: all firms | | | | | | | | | | |
| IntInv | 399 | 678473 | 1,03 | *** | 3,70 | 417 | 349418 | 1,07 | *** | 4,16 |
| DifIntInv | 399 | 668352 | 1,97 | ** | 2,29 | 417 | 352392 | 1,77 | ** | 2,24 |
| DIntInv(log) | 117 | 31718 | 0,72 | *** | 2,65 | 124 | 24257 | 0,63 | *** | 2,53 |
| b) Firms with positive Intangible Investment before treatment | | | | | | | | | | |
| IntInv | 184 | 101241 | 1,15 | *** | 2,66 | 193 | 104302 | 1,28 | *** | 3,14 |
| DifIntInv | 184 | 101241 | 1,07 | | 1,03 | 193 | 104302 | 0,90 | | 0,93 |
| DIntInv(log) | 117 | 35523 | 0,56 | ** | 2,06 | 124 | 23262 | 0,62 | *** | 2,50 |
| c) Firms with no Intangible Investment before treatment | | | | | | | | | | |
| IntInv | 152 | 499503 | 0,72 | *** | 2,11 | 161 | 157273 | 0,65 | ** | 2,02 |
| d) Firms with propensity to R&D | | | | | | | | | | |
| IntInv | 55 | 21676 | 1,44 | *** | 2,20 | 59 | 15301 | 1,55 | *** | 2,71 |
| DifIntInv | 55 | 21676 | 0,47 | | 0,29 | 59 | 15301 | 1,50 | | 0,45 |
| DIntInv(log) | 49 | 9572 | 0,38 | *** | 2,65 | 50 | 6606 | 1,12 | *** | 3,06 |

2.2. Lagged effects, 1 and 3 years after treatment

| Variable | Propensity score (Kernel) | | | | | Mahalanobis (Kernel) | | | | |
|---|---------------------------|--------|--------|-----|-------|----------------------|--------|-------|-----|-------|
| | T | NT | ATT | | t | T | NT | ATT | | t |
| a) General model: all firms | | | | | | | | | | |
| IntInv1 | 364 | 515486 | 0,8015 | *** | 3,22 | 389 | 271369 | 0,78 | *** | 3,39 |
| IntInv3 | 226 | 230837 | 0,33 | ** | 2,11 | 234 | 177911 | 0,24 | | 1,56 |
| b) Firms with positive Intangible Investment before treatment | | | | | | | | | | |
| IntInv1 | 170 | 130986 | 0,801 | * | 1,73 | 178 | 71997 | 1,05 | *** | 2,74 |
| IntInv3 | 102 | 30551 | -0,32 | | -1,62 | 106 | 43441 | -0,10 | | -0,81 |
| c) Firms with no Intangible Investment before treatment | | | | | | | | | | |
| IntInv1 | 142 | 293850 | 0,4561 | * | 1,92 | 149 | 131475 | 0,30 | | 1,33 |
| IntInv3 | 88 | 88230 | 0,37 | | 1,31 | 87 | 41253 | 0,35 | | 1,25 |
| d) Firms with propensity to R&D | | | | | | | | | | |
| IntInv1 | 52 | 11338 | 2,2845 | *** | 2,56 | 56 | 11193 | 2,03 | *** | 2,43 |
| IntInv3 | 33 | 9269 | -0,414 | | -1,07 | 36 | 6243 | -0,27 | | -1,25 |

3. Differences in Differences

a) General model

| Invntta | ANO 2006 | | | | | | ANO 2007 | | | | | | ANO 2008 | | | | | | | | | | | | | |
|---------------|----------|-------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|----------|-------|-----------|--------|-----------|--------|-----------|--------|----------|-------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | | | | |
| t | 0,10 *** | 18,52 | -0,01 | -1,38 | -0,14 *** | -30,74 | -0,15 *** | -28,08 | 0,08 *** | 14,09 | -0,04 *** | -5,69 | -0,21 *** | -44,23 | -0,16 *** | -31,32 | 0,02 *** | 4,14 | -0,03 *** | -3,87 | -0,24 *** | -49,60 | -0,16 *** | -30,59 | | |
| TRAT_yr | 1,47 *** | 10,06 | 1,30 *** | 9,09 | 0,00 | 0,00 | 0,00 | 0,00 | 1,21 *** | 6,35 | 0,97 *** | 5,27 | 1,37 *** | 7,26 | 1,37 *** | 7,26 | 0,88 *** | 4,70 | 0,88 *** | 4,70 | 0,88 *** | 4,70 | 0,88 *** | 4,70 | | |
| tTRAT_yr | 0,89 *** | 4,97 | 0,79 *** | 4,53 | 1,02 *** | 3,38 | 0,79 *** | 2,86 | 1,08 *** | 4,62 | 0,96 *** | 4,27 | 0,56 * | 1,86 | 0,66 ** | 2,38 | 0,16 | 0,71 | 0,57 ** | 2,49 | 0,24 | 0,46 | 0,47 | 1,06 | | |
| Sector_2 | | | 0,16 *** | 2,43 | | | | | 0,20 ** | 3,24 | 0,29 *** | 12,07 | | | 0,20 *** | 3,39 | | | 0,20 *** | 3,39 | | | 0,20 *** | 3,39 | | |
| Sector_3 | | | 0,25 *** | 9,81 | | | | | 0,26 *** | 11,06 | 0,26 *** | 11,06 | | | 0,26 *** | 11,06 | | | 0,26 *** | 11,06 | | | 0,26 *** | 11,06 | | |
| Sector_4 | | | 0,23 *** | 9,17 | | | | | 0,62 *** | 27,21 | 0,46 *** | 19,34 | | | 0,65 *** | 30,07 | | | 0,65 *** | 30,07 | | | 0,65 *** | 30,07 | | |
| Sector_5 | | | 0,42 *** | 16,34 | | | | | 0,22 *** | 8,67 | 0,22 *** | 8,67 | | | 0,49 *** | 21,55 | | | 0,49 *** | 21,55 | | | 0,49 *** | 21,55 | | |
| Sector_6 | | | 0,17 *** | 6,24 | | | | | 0,06 *** | 2,50 | 0,06 *** | 2,50 | | | 0,23 *** | 9,77 | | | 0,23 *** | 9,77 | | | 0,23 *** | 9,77 | | |
| Sector_7 | | | 0,05 *** | 9,24 | | | 0,09 *** | 6,92 | 0,06 *** | 13,34 | 0,06 *** | 13,34 | | | 0,07 *** | 14,76 | | | 0,07 *** | 14,76 | | | 0,07 *** | 14,76 | | |
| Staff(log) | | | 0,00 *** | 25,27 | | | 0,00 *** | -0,52 | 0,00 *** | 28,88 | 0,00 *** | 28,88 | | | 0,01 *** | 31,81 | | | 0,01 *** | 31,81 | | | 0,01 *** | 31,81 | | |
| Univ% | | | -0,30 *** | -53,98 | | | | | -0,31 *** | -62,68 | -0,31 *** | -62,68 | | | -0,30 *** | -65,55 | | | -0,30 *** | -65,55 | | | -0,30 *** | -65,55 | | |
| Age | | | 0,24 *** | 107,66 | | | | | 0,24 *** | 117,91 | 0,24 *** | 117,91 | | | 0,24 *** | 127,60 | | | 0,24 *** | 127,60 | | | 0,24 *** | 127,60 | | |
| GFCF | | | -0,23 *** | -63,37 | | | -0,09 *** | -8,41 | -0,25 *** | -71,48 | -0,25 *** | -71,48 | | | -0,13 *** | -13,08 | | | -0,13 *** | -13,08 | | | -0,13 *** | -13,08 | | |
| Turnover(log) | | | 0,00 *** | 2,46 | | | 0,00 *** | -2,51 | 0,00 *** | -2,51 | 0,00 *** | -2,51 | | | 0,00 * | -1,79 | | | 0,00 * | -1,79 | | | 0,00 * | -1,79 | | |
| FinAut | | | 0,00 *** | -4,90 | | | 0,00 *** | -2,08 | 0,00 *** | -6,00 | 0,00 *** | -6,00 | | | 0,00 * | -1,97 | | | 0,00 *** | -6,01 | | | 0,00 *** | -6,01 | | |
| Profit | | | 0,31 *** | 77,86 | 1,42 *** | 31,14 | 0,43 *** | 191,58 | 1,32 *** | 10,92 | 0,34 *** | 100,18 | 1,57 *** | 36,50 | 0,46 *** | 241,16 | 1,79 *** | 15,65 | 0,36 *** | 119,14 | 1,54 *** | 37,55 | 0,45 | 274,41 | 2,25 *** | 21,75 |
| _cons | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Number of obs | 1001338 | | 573 274 | | 1001338 | | 673573 | | 1256815 | | 697777 | | 1256815 | | 849240 | | 1505542 | | 810448 | | 1505542 | | 1019454 | | | |
| F | 326,38 | | 1262,69 | | 476,72 | | 154,53 | | 180,29 | | 1565,17 | | 978,71 | | 166,83 | | 67,67 | | 1813,45 | | 1229,87 | | 167,59 | | | |
| Prob > F | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | | |
| R-squared | 0,001 | | 0,034 | | 0,0014 | | 0,0024 | | 0,0004 | | 0,0347 | | 0,0024 | | 0,0027 | | 0,0001 | | 0,0346 | | 0,0025 | | 0,0027 | | | |
| Adj R-squared | 0,001 | | 0,034 | | | | 0,0004 | | 0,0004 | | 0,0346 | | | | | | 0,0001 | | 0,0345 | | | | 0,0001 | | | |
| Root MSE | 2,7928 | | 2,636 | | | | | | 2,9544 | | 2,7701 | | | | | | 3,023 | | 2,8689 | | | | | | | |

| Invntta | ANO 2009 | | | | | | ANO 2010 | | | | | | ANO 2011 | | | | | | | | | | | | | |
|---------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|----------|-------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | | | | |
| t | -0,10 *** | -20,85 | -0,11 *** | -15,45 | -0,29 *** | -60,49 | -0,18 *** | -35,39 | -0,18 *** | -36,96 | -0,17 *** | -23,30 | -0,29 *** | -64,63 | -0,20 *** | -40,56 | -0,17 *** | -37,41 | -0,12 *** | -15,75 | -0,25 *** | -60,93 | -0,19 *** | -39,24 | | |
| TRAT_yr | 2,64 *** | 13,44 | 1,94 *** | 9,79 | 0,54 ** | 2,25 | 0,09 | 0,12 | 0,37 *** | 154,78 | 1,51 *** | 6,00 | 0,88 *** | 3,37 | 2,67 *** | 9,11 | 1,81 *** | 7,26 | 0,93 *** | 2,89 | 2,67 *** | 9,11 | 1,81 *** | 7,26 | | |
| tTRAT_yr | 0,59 ** | 2,46 | 0,21 *** | 3,84 | 0,09 | 0,12 | -0,37 | -0,68 | 1,34 *** | 4,35 | 1,16 *** | 3,62 | 0,79 | 1,15 | 0,52 | 1,46 | 0,17 | 0,47 | 0,44 | 1,13 | 0,17 | 0,47 | -0,36 | -0,48 | | |
| Sector_2 | | | 0,30 *** | 14,65 | | | | | 0,22 *** | 4,22 | 0,31 *** | 15,98 | | | 0,23 *** | 4,67 | | | 0,23 *** | 4,67 | | | 0,23 *** | 4,67 | | |
| Sector_3 | | | 0,30 *** | 14,65 | | | | | 0,31 *** | 15,98 | 0,31 *** | 15,98 | | | 0,32 *** | 17,50 | | | 0,32 *** | 17,50 | | | 0,32 *** | 17,50 | | |
| Sector_4 | | | 0,28 *** | 13,45 | | | | | 0,28 *** | 14,47 | 0,28 *** | 14,47 | | | 0,29 *** | 15,82 | | | 0,29 *** | 15,82 | | | 0,29 *** | 15,82 | | |
| Sector_5 | | | 0,63 *** | 31,99 | | | | | 0,62 *** | 33,79 | 0,62 *** | 33,79 | | | 0,62 *** | 36,09 | | | 0,62 *** | 36,09 | | | 0,62 *** | 36,09 | | |
| Sector_6 | | | 0,50 *** | 24,00 | | | | | 0,51 *** | 26,44 | 0,51 *** | 26,44 | | | 0,53 *** | 29,05 | | | 0,53 *** | 29,05 | | | 0,53 *** | 29,05 | | |
| Sector_7 | | | 0,23 *** | 10,70 | | | | | 0,24 *** | 11,61 | 0,24 *** | 11,61 | | | 0,25 *** | 12,83 | | | 0,25 *** | 12,83 | | | 0,25 *** | 12,83 | | |
| Staff(log) | | | 0,07 *** | 16,77 | | | 0,06 ** | 6,15 | 0,07 *** | 17,24 | 0,07 *** | 17,24 | | | 0,05 *** | 5,10 | | | 0,07 *** | 18,07 | | | 0,07 *** | 18,07 | | |
| Univ% | | | 0,01 *** | 34,94 | | | 0,00 ** | -2,14 | 0,01 *** | 37,10 | 0,01 *** | 37,10 | | | 0,00 *** | -2,59 | | | 0,01 *** | 38,68 | | | 0,01 *** | 38,68 | | |
| Age | | | -0,25 *** | -67,68 | | | | | -0,27 *** | -68,99 | -0,27 *** | -68,99 | | | -0,26 *** | -68,18 | | | -0,26 *** | -68,18 | | | -0,26 *** | -68,18 | | |
| GFCF | | | 0,23 *** | 131,53 | | | | | 0,23 *** | 136,56 | 0,23 *** | 136,56 | | | 0,23 *** | 140,07 | | | 0,23 *** | 140,07 | | | 0,23 *** | 140,07 | | |
| Turnover(log) | | | -0,25 *** | -79,01 | | | -0,18 *** | -21,81 | -0,25 *** | -80,48 | -0,25 *** | -80,48 | | | -0,17 *** | -22,66 | | | -0,17 *** | -22,66 | | | -0,17 *** | -22,66 | | |
| FinAut | | | 0,00 * | 1,80 | | | 0,00 * | -1,98 | 0,00 | 1,20 | 0,00 | 1,20 | | | 0,00 *** | -2,70 | | | 0,00 | 0,39 | | | 0,00 | 0,39 | | |
| Profit | | | 0,00 *** | -6,40 | | | 0,00 *** | -0,65 | 0,00 *** | -6,19 | 0,00 *** | -6,19 | | | 0,00 *** | -0,39 | | | 0,00 *** | -6,23 | | | 0,00 *** | -6,23 | | |
| _cons | | | 0,37 *** | 140,87 | 1,48 *** | 38,93 | 0,43 *** | 311,32 | 2,49 *** | 25,54 | 0,37 *** | 154,78 | 1,39 *** | 38,65 | 0,40 *** | 352,26 | 2,38 *** | 26,90 | 0,34 *** | 159,84 | 1,32 *** | 38,36 | 0,36 *** | 409,13 | 2,30 *** | 28,27 |
| Number of obs | 1762778 | | 914909 | | 1762778 | | 1176566 | | 2009908 | | 1004697 | | 2009908 | | 1328592 | | 2244253 | | 1083139 | | 2244253 | | 1468934 | | | |
| F | 378,45 | | 1976,46 | | 1829,00 | | 217,95 | | 544,83 | | 2102,01 | | 2088,88 | | 267,10 | | 553,77 | | 2192,47 | | 1856,70 | | 250,91 | | | |
| Prob > F | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | | |
| R-squared | 0,00006 | | 0,0334 | | 0,0031 | | 0,0031 | | 0,0008 | | 0,0324 | | 0,0029 | | 0,0031 | | 0,0007 | | 0,0314 | | 0,0019 | | 0,0026 | | | |
| Adj R-squared | 0,0006 | | 0,0334 | | | | 0,0008 | | 0,0008 | | 0,0324 | | | | 0,0007 | | 0,0007 | | 0,0314 | | | | 0,0007 | | | |
| Root MSE | 2,985 | | 2,8444 | | | | | | 2,9116 | | 2,8389 | | | | 2,8529 | | 2,8188 | | | | | | | | | |

| Invntta | ANO 2012 | | | | | | ANO 2013 | | | | | | ANO 2014 | | | | | | | | | | | |
|----------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | | |
| t | -0,15 *** | -32,30 | -0,10 *** | -13,53 | -0,21 *** | -52,11 | -0,16 *** | -33,21 | -0,11 *** | -24,00 | -0,08 *** | -10,02 | -0,18 *** | -43,12 | -0,12 *** | -26,14 | -0,10 *** | -22,09 | -0,08 *** | -11,27 | -0,16 *** | -41,70 | -0,10 *** | -22,31 |
| TRAT_yr | 1,63 *** | 7,21 | 0,52 ** | 2,09 | 1,19 * | 1,68 | 0,62 | 0,90 | 1,25 *** | 5,68 | 1,03 *** | 4,09 | 0,88 ** | 2,17 | 1,15 *** | 5,37 | 1,15 *** | 5,37 | 0,77 *** | 3,12 | 1,25 *** | 4,77 | 1,25 *** | 4,77 |
| tTRAT_yr | 1,49 *** | 5,40 | 1,07 *** | 3,55 | | | 0,62 | 0,90 | 1,20 *** | 4,45 | 0,68 ** | 2,26 | 0,88 ** | 2,17 | 0,49 | 1,23 | 0,64 ** | 2,17 | 0,64 ** | 2,17 | 0,64 ** | 2,17 | 0,64 ** | 2,17 |
| Sector_2 | | | 0,24 *** | 5,06 | | | | | 0,25 *** | 5,47 | 0,25 *** | 5,47 | | | 0,26 *** | 5,67 | | | 0,26 *** | 5,67 | | | 0,26 *** | 5,67 |
| Sector_3 | | | 0,33 *** | 19,18 | | | | | 0,35 *** | 21,13 | 0,35 *** | 21,13 | | | 0,35 *** | 22,42 | | | 0,35 *** | 22,42 | | | 0,35 *** | 22,42 |
| Sector_4 | | | 0,38 *** | 17,46 | | | | | 0,33 *** | 19,38 | 0,33 *** | 19,38 | | | 0,33 *** | 20,54 | | | 0,33 *** | 20,54 | | | 0,33 *** | 20,54 |
| Sector_5 | | | 0,63 *** | 38,71 | | | | | 0,65 *** | 41,68 | 0,65 *** | 41,68 | | | 0,65 *** | 44,01 | | | 0,65 *** | 44,01 | | | 0,65 *** | 44,01 |
| Sector_6 | | | 0,55 *** | 31,70 | | | | | 0,57 *** | 34,46 | 0,57 *** | 34,46 | | | 0,58 *** | 36,85 | | | 0,58 *** | 36,85 | | | 0,58 *** | 36,85 |
| Sector_7 | | | 0,27 *** | 14,97 | | | | | 0,30 *** | 17,45 | 0,30 *** | 17,45 | | | 0,31 *** | 1 | | | | | | | | |

b) With positive intangible investment before treatment

| Invntta | Year 2006 | | | | 2007 | | | | 2008 | | | | | | | | | | | | | | | |
|---------------|-----------|-------|-----------|--------|-----------|--------|-----------|--------|----------|-------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | | | | | | | | | | |
| t | 0,25 *** | 37,82 | 0,04 *** | 4,82 | -0,25 *** | -39,68 | -0,26 *** | -35,12 | 0,36 *** | 48,08 | 0,04 *** | 4,39 | -0,41 *** | -45,53 | -0,31 *** | -32,01 | 0,52 *** | 56,90 | 0,13 *** | 9,75 | -0,82 *** | -46,25 | -0,54 *** | -27,98 |
| TRAT_yr | 1,93 *** | 10,92 | 1,72 *** | 10,15 | | | | | 1,69 *** | 6,74 | 1,33 *** | 5,65 | | | | | 1,69 *** | 5,52 | 0,97 *** | 3,32 | | | | |
| tTRAT_yr | 1,15 *** | 5,24 | 1,10 *** | 5,28 | 1,36 *** | 3,41 | 1,05 *** | 2,84 | 1,43 *** | 4,59 | 1,39 *** | 4,78 | 0,76 * | 1,80 | 0,89 ** | 2,33 | 0,00 | 0,00 | 0,90 ** | 2,48 | 0,85 | 0,89 | 1,45 * | 1,79 |
| Sector_2 | 0,31 *** | 73,92 | 0,16 ** | 2,22 | | | | | 0,37 *** | 91,88 | 0,23 *** | 3,15 | | | | | | | 0,26 *** | 3,42 | | | | |
| Sector_3 | | | 0,27 *** | 9,22 | | | | | | | 0,34 *** | 11,18 | | | | | | | 0,39 *** | 12,76 | | | | |
| Sector_4 | | | 0,27 *** | 9,02 | | | | | | | 0,33 *** | 10,86 | | | | | | | 0,38 *** | 12,41 | | | | |
| Sector_5 | | | 0,63 *** | 22,14 | | | | | | | 0,73 *** | 24,80 | | | | | | | 0,80 *** | 27,02 | | | | |
| Sector_6 | | | 0,46 *** | 15,35 | | | | | | | 0,55 *** | 17,90 | | | | | | | 0,62 *** | 19,99 | | | | |
| Sector_7 | | | 0,18 ** | 5,78 | | | | | | | 0,25 ** | 7,67 | | | | | | | 0,27 ** | 8,39 | | | | |
| Staff(log) | | | 0,05 *** | 8,20 | | | 0,14 *** | 7,45 | | | 0,06 *** | 11,04 | | | 0,12 *** | 6,24 | | | 0,07 *** | 11,54 | | | 0,10 *** | 5,31 |
| Univ% | | | 0,00 *** | 23,63 | | | 0,00 *** | -2,61 | | | 0,01 *** | 26,33 | | | 0,00 *** | -3,07 | | | 0,01 *** | 27,63 | | | 0,00 *** | -3,51 |
| Age | | | -0,31 *** | -50,06 | | | | | | | -0,33 *** | -54,11 | | | | | | | -0,31 *** | -52,22 | | | | |
| GFCF | | | 0,26 *** | 104,23 | | | | | | | 0,28 *** | 110,70 | | | | | | | 0,30 *** | 116,54 | | | | |
| Turnover(log) | | | -0,25 *** | -62,18 | | | -0,11 *** | -8,68 | | | -0,29 *** | -68,57 | | | -0,20 *** | -13,81 | | | -0,30 *** | -71,91 | | | -0,27 *** | -19,16 |
| FinAut | | | 0,00 *** | 2,72 | | | 0,00 *** | -0,42 | | | 0,00 *** | 2,86 | | | 0,00 *** | -0,39 | | | 0,00 *** | 2,63 | | | 0,00 *** | -0,46 |
| Profit | | | 0,00 *** | -4,69 | | | 0,00 * | -1,84 | | | 0,00 *** | -5,45 | | | 0,00 * | -1,79 | | | 0,00 *** | -5,29 | | | 0,00 *** | 0,18 |
| _cons | | | 1,43 *** | 28,15 | 0,51 *** | 198,35 | 1,61 *** | 10,66 | | | 1,61 *** | 30,70 | 0,59 | 233,07 | 2,76 *** | 16,17 | 0,41 *** | 107,67 | 1,57 *** | 29,64 | 0,64 *** | 209,43 | 3,72 *** | 22,16 |
| Number of obs | 841,156 | | 495,46 | | 841156 | | 558745 | | 930,49 | | 536,968 | | 930490 | | 612434 | | 1,015,800 | | 575,038 | | 1015800 | | 664190 | |
| F | 718,78 | | 1207,19 | | 791,08 | | 220,64 | | 894,38 | | 1402,59 | | 1036,95 | | 167,31 | | 1116,73 | | 1549,57 | | 1369,73 | | 143,69 | |
| Prob > F | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | |
| R-squared | 0,00026 | | 0,0375 | | 0,0034 | | 0,0051 | | 0,00029 | | 0,0401 | | 0,0054 | | 0,0058 | | 0,0033 | | 0,0413 | | 0,008 | | 0,0072 | |
| Adj R-squared | 0,00026 | | 0,0375 | | 0,0034 | | 0,0051 | | 0,00029 | | 0,0401 | | 0,0054 | | 0,0058 | | 0,0033 | | 0,0413 | | 0,008 | | 0,0072 | |
| Root MSE | 2,9419 | | 2,7164 | | | | | | 3,2829 | | 2,9719 | | | | | | 3,4812 | | 3,1378 | | | | | |

| Invntta | 2009 | | | | 2010 | | | | 2011 | | | | | | | | | | | | | | | |
|---------------|---------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | | | | | | | | | | |
| t | 0,17 | 18,13 | -0,07 *** | -5,20 | -0,93 *** | -53,05 | -0,57 *** | -30,58 | -0,05 *** | -5,27 | -0,18 *** | -12,44 | -0,83 *** | -50,39 | -0,52 *** | -29,62 | -0,08 *** | -8,17 | -0,10 *** | -6,74 | -0,65 *** | -41,40 | -0,46 *** | -26,19 |
| TRAT_yr | 4,45 | 13,68 | 3,53 *** | 11,29 | | | | | 2,12 *** | 5,19 | 1,13 *** | 2,62 | | | 4,45 *** | 8,66 | | | 1,04 *** | 1,99 | | | | |
| tTRAT_yr | 0,24 | 0,60 | -0,03 *** | -0,09 | -0,14 | -0,10 | -1,61 * | -1,75 | 2,14 *** | 4,13 | 1,49 *** | 2,95 | 1,37 | 1,06 | 0,81 | 1,54 | 0,68 | 1,06 | 1,11 *** | 1,65 | -0,71 | -0,54 | 0,20 | 0,35 |
| Sector_2 | | | 0,27 *** | 3,62 | | | | | | | 0,28 *** | 3,75 | | | | | | | 0,30 *** | 4,10 | | | | |
| Sector_3 | | | 0,40 *** | 13,32 | | | | | | | 0,42 *** | 14,12 | | | | | | | 0,44 *** | 15,26 | | | | |
| Sector_4 | | | 0,39 *** | 13,05 | | | | | | | 0,41 *** | 13,73 | | | | | | | 0,43 *** | 14,88 | | | | |
| Sector_5 | | | 0,81 *** | 28,18 | | | | | | | 0,83 *** | 29,25 | | | | | | | 0,85 *** | 30,80 | | | | |
| Sector_6 | | | 0,66 *** | 21,79 | | | | | | | 0,69 *** | 23,28 | | | | | | | 0,73 *** | 25,12 | | | | |
| Sector_7 | | | 0,29 *** | 9,15 | | | | | | | 0,30 *** | 9,62 | | | | | | | 0,32 *** | 10,56 | | | | |
| Staff(log) | | | 0,07 *** | 12,71 | | | 0,08 *** | 4,61 | | | 0,08 *** | 12,92 | | | 0,07 *** | 4,10 | | | 0,08 *** | 13,45 | | | 0,07 *** | 3,97 |
| Univ% | | | 0,01 *** | 30,24 | | | 0,00 *** | -3,65 | | | 0,01 *** | 32,13 | | | 0,00 *** | -3,92 | | | 0,01 *** | 33,17 | | | 0,00 *** | -4,20 |
| Age | | | -0,31 *** | -55,94 | | | | | | | -0,31 *** | -56,89 | | | | | | | -0,29 *** | -54,52 | | | | |
| GFCF | | | 0,30 *** | 119,47 | | | | | | | 0,31 *** | 122,49 | | | | | | | 0,31 *** | 124,12 | | | | |
| Turnover(log) | | | -0,30 *** | -73,17 | | | -0,32 *** | -22,31 | | | -0,31 *** | -73,86 | | | -0,33 *** | -23,83 | | | -0,31 *** | -75,08 | | | -0,33 *** | -24,93 |
| FinAut | | | 0,00 *** | 2,63 | | | 0,00 *** | -0,50 | | | 0,00 *** | 2,30 | | | 0,00 *** | -0,95 | | | 0,00 *** | 2,21 | | | 0,00 *** | -2,00 |
| Profit | | | 0,00 *** | -5,49 | | | 0,00 *** | 0,17 | | | 0,00 *** | -5,19 | | | 0,00 *** | 1,05 | | | 0,00 *** | -5,29 | | | 0,00 *** | 1,32 |
| _cons | 0,47 | 127,76 | 1,56 *** | 29,90 | 0,64 *** | 235,84 | 4,31 *** | 25,75 | 0,50 *** | 140,39 | 1,49 *** | 29,00 | 0,61 *** | 264,50 | 4,40 *** | 27,55 | 0,50 *** | 144,92 | 1,41 *** | 27,89 | 0,56 *** | 308,80 | 4,46 *** | 28,80 |
| Number of obs | 1100803 | | 608394 | | 1100803 | | 709339 | | 1179080 | | 636682 | | 1179080 | | 751996 | | 1245300 | | 659134 | | 1245300 | | 786433 | |
| F | 306,04 | | 1618,71 | | 1407,46 | | 183,44 | | 76,13 | | 1666,32 | | 1269,76 | | 180,47 | | 104,73 | | 1700,61 | | 857,47 | | 164,96 | |
| Prob > F | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | |
| R-squared | 0,0008 | | 0,0408 | | 0,0088 | | 0,0081 | | 0,0002 | | 0,0402 | | 0,0064 | | 0,0069 | | 0,0003 | | 0,0396 | | 0,0032 | | 0,0058 | |
| Adj R-squared | 0,0008 | | 0,0408 | | 0,0088 | | 0,0081 | | 0,0002 | | 0,0402 | | 0,0064 | | 0,0069 | | 0,0003 | | 0,0396 | | 0,0032 | | 0,0058 | |
| Root MSE | 3,5493 | | 3,1993 | | | | | | 3,5787 | | 3,2537 | | | | | | 3,539 | | 3,282 | | | | | |

| Invntta | 2012 | | | | 2013 | | | | 2014 | | | | | | | | | | | | | | | |
|------------|-----------|-------|-----------|-------|-----------|--------|-----------|--------|----------|------|----------|-------|---------|--------|----------|--------|---------|-------|----------|-------|-----------|--------|-----------|--------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | | | | | | | | | | |
| t | -0,04 *** | -4,23 | -0,09 *** | -5,56 | -0,55 *** | -31,74 | -0,39 *** | -19,36 | 0,01 | 1,06 | -0,01 | -0,54 | -0,44 * | -24,92 | -0,25 * | -12,90 | -0,01 | -0,96 | -0,01 | -0,96 | -0,39 *** | -24,14 | -0,19 *** | -10,70 |
| TRAT_yr | 2,08 *** | 4,72 | 0,60 | 1,32 | | | | | 1,01 | 2,31 | 0,84 * | 1,89 | | | 1,49 *** | 3,54 | | | 0,78 * | 1,69 | | | | |
| tTRAT_yr | 2,80 *** | 5,01 | 1,14 ** | 2,02 | 2,46 * | 2,00 | 1,02 | 1,02 | 1,72 *** | 3,23 | 1,25 ** | 2,34 | 1,11 | 1,66 | 0,64 | 1,03 | 1,46 ** | 2,83 | 0,67 | 1,20 | 0,39 | 0,33 | 0,00 | 0,00 |
| Sector_2 | | | 0,32 *** | 4,39 | | | | | | | 0,35 *** | 4,76 | | | | | | | 0,35 *** | 4,86 | | | | |
| Sector_3 | | | 0,46 *** | 15,23 | | | | | | | 0,49 *** | 17,67 | | | | | | | 0,50 *** | 18,45 | | | | |
| Sector_4 | | | 0,45 *** | 15,02 | | | | | | | 0,49 *** | 17,57 | | | | | | | 0,50 *** | 18,32 | | | | |
| Sector_5 | | | 0,87 *** | 32,45 | | | | | | | 0,91 *** | 34,51 | | | | | | | 0,93 *** | 35,83 | | | | |
| Sector_6 | | | 0,76 *** | 26,87 | | | | | | | 0,81 *** | 28,91 | | | | | | | 0,83 *** | 30,44 | | | | |
| Sector_7 | | | 0,37 *** | 12,30 | | | | | | | 0,43 *** | 14,49 | | | | | | | 0,45 *** | 15,79 | | | | |
| Staff(log) | | | 0,08 *** | 13,92 | | | 0,06 *** | 3,91 | | | 0,08 *** | 14,57 | | | 0,06 *** | 4,12 | | | 0,09 *** | 15,56 | | | 0,06 *** | 4,03 |
| Univ% | | | 0,01 *** | 35,27 | | | 0,00 *** | -3,91 | | | 0,01 *** | 38,46 | | | 0,00 *** | -3,88 | | | 0,01 *** | 40,12 | | | 0,00 *** | -3,80 |
| Age | | | -0,27 *** | -5 | | | | | | | | | | | | | | | | | | | | |

c) With no intangible investment before treatment

| InvIntta | ANO 2006 | | | | | | ANO 2007 | | | | | | ANO 2008 | | | | | | | | | | | |
|---------------|----------|-------|-----------|--------|-----------|--------|-----------|--------|----------|--------|-----------|--------|-----------|--------|-----------|--------|----------|--------|---------|--------|-----------|--------|-----------|--------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | | | | | | |
| t | 0,10 *** | 18,57 | -0,01 | -1,36 | -0,14 *** | -30,74 | -0,15 *** | -28,05 | 0,08 *** | 14,12 | -0,04 *** | -5,67 | -0,21 *** | -44,23 | -0,16 *** | -31,31 | 0,02 *** | 4,14 | -0,03 | -3,84 | -0,24 *** | -49,60 | -0,16 *** | -30,56 |
| TRAT_yr | -0,31 | -0,86 | -0,33 | -0,95 | | | | | -0,34 | -0,79 | -0,26 | -0,63 | | | | | -0,36 | -1,10 | -0,48 | -1,46 | | | | |
| tTRAT_yr | 0,45 | 1,02 | 0,47 | 1,11 | 0,68 *** | 2,18 | 0,70 *** | 2,20 | 0,14 | 0,26 | 0,06 | 0,11 | 0,42 *** | 5,38 | 0,39 *** | 5,01 | 0,42 | 1,02 | 0,51 | 1,26 | 0,66 *** | 4,51 | 0,61 *** | 3,98 |
| Sector_2 | | | 0,16 ** | 2,45 | | | | | | | 0,20 *** | 3,29 | | | | | | | 0,20 | 3,45 | | | | |
| Sector_3 | | | 0,25 *** | 9,88 | | | | | | | 0,29 *** | 12,14 | | | | | | | 0,31 | 13,74 | | | | |
| Sector_4 | | | 0,23 *** | 9,08 | | | | | | | 0,26 *** | 10,94 | | | | | | | 0,28 | 12,58 | | | | |
| Sector_5 | | | 0,58 *** | 23,64 | | | | | | | 0,62 *** | 27,18 | | | | | | | 0,65 | 30,06 | | | | |
| Sector_6 | | | 0,41 *** | 15,96 | | | | | | | 0,46 *** | 19,07 | | | | | | | 0,49 | 21,51 | | | | |
| Sector_7 | | | 0,17 *** | 6,36 | | | | | | | 0,22 *** | 8,72 | | | | | | | 0,23 | 9,83 | | | | |
| Staff(log) | | | 0,05 *** | 9,46 | | | 0,09 *** | 6,77 | | | 0,06 *** | 13,36 | | | 0,09 *** | 7,01 | | | 0,07 | 14,76 | | | 0,08 *** | 6,88 |
| Univ% | | | 0,00 *** | 24,51 | | | 0,00 | -0,56 | | | 0,00 *** | 28,42 | | | 0,00 | -1,17 | | | 0,00 | 31,40 | | | 0,00 | -1,64 |
| Age | | | -0,30 *** | -54,12 | | | | | | | -0,31 *** | -62,73 | | | | | | | -0,30 | -65,56 | | | | |
| GFCF | | | 0,23 *** | 107,26 | | | | | | | 0,24 *** | 117,67 | | | | | | | 0,24 | 127,47 | | | | |
| Turnover(log) | | | -0,23 *** | -62,75 | | | -0,08 *** | -8,37 | | | -0,25 *** | -71,15 | | | -0,13 *** | -3,62 | | | -0,25 | -76,20 | | | -0,16 *** | -18,68 |
| FinAut | | | 0,00 *** | 2,52 | | | 0,00 *** | -2,63 | | | 0,00 *** | 2,55 | | | 0,00 * | -1,81 | | | 0,00 | 1,86 | | | 0,00 * | -1,99 |
| Profit | | | 1,00 *** | -4,93 | | | 0,00 ** | -2,09 | | | 0,00 *** | -6,03 | | | 0,00 * | -1,97 | | | 0,00 | -6,01 | | | 0,00 | -0,14 |
| _cons | 0,31 *** | 78,09 | 0,40 *** | 30,79 | 0,43 *** | 191,57 | 1,31 *** | 10,92 | 0,34 *** | 100,33 | 1,56 *** | 36,33 | 0,46 *** | 240,99 | 1,79 *** | 15,63 | 0,36 *** | 119,28 | 1,53 | 37,43 | 0,45 *** | 275,42 | 2,25 *** | 21,85 |
| Number of obs | 1000425 | | 572 413 | | 100425 | | 672703 | | 1256219 | | 696707 | | 1256219 | | 848.663 | | 1505020 | | 809955 | | 1505020 | | 1018952 | |
| F | 115,46 | | 1210,47 | | 473,96 | | 154,25 | | 66,75 | | 1537,20 | | 981,70 | | 167,50 | | 6,17 | | 1795,06 | | 1234,00 | | 168,58 | |
| Prob > F | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0003 | | 0,0000 | | 0,0000 | | 0,0000 | |
| R-squared | 0,0003 | | 0,0327 | | 0,0014 | | 0,0024 | | 0,0002 | | 0,0341 | | 0,0024 | | 0,0027 | | 0 | | 0,0342 | | 0,0094 | | 0 | |
| Adj R-squared | 0,0003 | | 0,0327 | | | | | | 0,0002 | | 0,0341 | | | | 0 | | 0 | | 0,0342 | | | | 0 | |
| Root MSE | 2,7847 | | 2,6238 | | | | | | 2,9499 | | 2,7632 | | | | 3,0195 | | 2,8635 | | | | | | | |

| InvIntta | ANO 2009 | | | | | | ANO 2010 | | | | | | ANO 2011 | | | | | | | | | | | |
|---------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | | | | |
| t | -0,10 *** | -20,90 | -0,11 *** | -15,42 | -0,29 *** | -60,49 | -0,18 *** | -35,39 | -0,18 *** | -36,99 | -0,17 *** | -23,31 | -0,29 *** | -64,63 | -0,20 *** | -40,56 | -0,17 *** | -37,43 | -0,12 *** | -15,75 | -0,25 *** | -60,93 | -0,19 *** | -39,24 |
| TRAT_yr | -0,37 | -1,06 | -0,45 | -1,34 | | | | | -0,37 | -0,82 | -0,43 | -0,95 | | | | | -0,34 | -0,60 | -0,48 | -0,72 | | | | |
| tTRAT_yr | 0,62 | 1,42 | 0,63 | 1,48 | 0,79 *** | 2,27 | 0,71 * | 1,95 | 1,19 ** | 2,15 | 1,27 *** | 2,25 | 1,28 *** | 2,49 | 1,28 ** | 2,32 | 0,64 | 0,92 | 0,65 | 0,81 | 0,72 *** | 2,87 | 0,78 ** | 2,48 |
| Sector_2 | | | 0,21 *** | 3,83 | | | | | | | 0,22 *** | 4,20 | | | | | | | 0,23 *** | 4,66 | | | | |
| Sector_3 | | | 0,31 *** | 14,82 | | | | | | | 0,31 *** | 16,00 | | | | | | | 0,32 *** | 17,53 | | | | |
| Sector_4 | | | 0,28 *** | 13,45 | | | | | | | 0,28 *** | 14,41 | | | | | | | 0,29 *** | 15,81 | | | | |
| Sector_5 | | | 0,63 *** | 31,97 | | | | | | | 0,62 *** | 33,77 | | | | | | | 0,62 *** | 36,08 | | | | |
| Sector_6 | | | 0,50 *** | 23,91 | | | | | | | 0,51 *** | 26,38 | | | | | | | 0,53 *** | 29,02 | | | | |
| Sector_7 | | | 0,24 *** | 10,85 | | | | | | | 0,24 *** | 11,62 | | | | | | | 0,25 *** | 12,85 | | | | |
| Staff(log) | | | 0,07 *** | 16,53 | | | 0,06 *** | 6,15 | | | 0,07 *** | 17,31 | | | 0,05 *** | 5,13 | | | 0,07 *** | 18,07 | | | 0,04 *** | 4,79 |
| Univ% | | | 0,00 *** | 34,04 | | | 0,00 ** | -2,11 | | | 0,01 *** | 36,89 | | | 0,00 *** | -2,56 | | | 0,01 *** | 38,54 | | | 0,00 *** | -3,13 |
| Age | | | -0,29 *** | -67,60 | | | | | | | -0,27 *** | -68,98 | | | | | | | -0,26 *** | -68,14 | | | | |
| GFCF | | | 0,23 *** | 131,47 | | | | | | | 0,23 *** | 136,43 | | | | | | | 0,22 *** | 139,99 | | | | |
| Turnover(log) | | | -0,24 *** | -78,29 | | | -0,18 *** | -21,87 | | | -0,24 *** | -80,33 | | | -0,17 *** | -22,68 | | | -0,23 *** | -82,64 | | | -0,17 *** | -23,73 |
| FinAut | | | 0,00 * | 1,79 | | | 0,00 ** | -2,07 | | | 0,00 | 1,18 | | | 0,00 *** | -2,72 | | | 0,00 | 0,40 | | | 0,00 *** | -3,89 |
| Profit | | | 0,00 *** | -6,41 | | | 0,00 | -0,66 | | | 0,00 *** | -6,20 | | | 0,00 | -0,39 | | | 0,00 *** | -6,23 | | | 0,00 | 0,02 |
| _cons | 0,37 *** | 141,23 | 1,45 *** | 38,31 | 0,43 *** | 313,15 | 2,49 *** | 25,63 | 0,37 *** | 154,92 | 1,39 *** | 38,56 | 0,40 *** | 352,94 | 2,38 *** | 26,91 | 0,34 *** | 159,93 | 1,32 *** | 38,28 | 0,36 *** | 409,81 | 2,30 *** | 28,27 |
| Number of obs | 1762302 | | 914473 | | 1762302 | | 1176124 | | 2009632 | | 100454 | | 2009632 | | 1328339 | | 2244036 | | 1082955 | | 2244036 | | 1468745 | |
| F | 146,06 | | 1930,33 | | 1830,72 | | 218,43 | | 457,80 | | 2087,02 | | 2090,47 | | 267,63 | | 467,23 | | 2184,28 | | 1858,14 | | 251,36 | |
| Prob > F | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | | 0,0000 | |
| R-squared | 0,0002 | | 0,0327 | | 0,0031 | | 0,0031 | | 0,0007 | | 0,0322 | | 0,0029 | | 0,0031 | | 0,0006 | | 0,0313 | | 0,0019 | | 0,0026 | |
| Adj R-squared | 0,0002 | | 0,0327 | | | | | | 0,0007 | | 0,0322 | | | | 0,0006 | | 0,0006 | | 0,0313 | | | | 0,0026 | |
| Root MSE | 2,9609 | | 2,8342 | | | | | | 2,9088 | | 2,8341 | | | | 2,8513 | | 2,818 | | | | | | | |

| InvIntta | ANO 2012 | | | | | | ANO 2013 | | | | | | ANO 2014 | | | | | | | | | | | |
|---------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | | | | |
| t | -0,15 *** | -32,35 | -0,10 *** | -13,53 | -0,21 *** | -52,11 | -0,16 *** | -33,22 | -0,11 *** | -24,01 | -0,08 *** | -10,01 | -0,18 *** | -43,12 | -0,12 *** | -26,13 | -0,10 *** | -22,11 | -0,08 *** | -11,25 | -0,16 *** | -41,70 | -0,10 *** | -22,30 |
| TRAT_yr | -0,32 | -0,97 | -0,56 | -1,57 | | | | | -0,31 | -0,87 | -0,49 | -1,20 | | | | | -0,30 | -0,90 | -0,52 | -1,36 | | | | |
| tTRAT_yr | 1,05 *** | 2,56 | 0,92 ** | 2,10 | 1,10 *** | 3,58 | 0,95 *** | 3,48 | 1,16 *** | 2,68 | 1,06 ** | 2,14 | 1,21 *** | 2,58 | 1,17 ** | 2,18 | 1,45 *** | 3,57 | 1,43 *** | 3,11 | 1,49 *** | 2,96 | 1,29 *** | 2,49 |
| Sector_2 | | | 0,24 *** | 5,08 | | | | | | | 0,25 *** | 5,47 | | | | | | | 0,26 *** | 5,67 | | | | |
| Sector_3 | | | 0,33 *** | 19,25 | | | | | | | 0,35 *** | 21,14 | | | | | | | 0,35 *** | 22,42 | | | | |
| Sector_4 | | | 0,30 *** | 17,46 | | | | | | | 0,32 *** | 19,36 | | | | | | | 0,32 *** | 20,50 | | | | |
| Sector_5 | | | 0,63 *** | 38,70 | | | | | | | 0,64 *** | 41,66 | | | | | | | 0,65 *** | 43,96 | | | | |
| Sector_6 | | | 0,55 *** | 31,66 | | | | | | | 0,57 *** | 34,42 | | | | | | | 0,58 *** | 36,81 | | | | |
| Sector_7 | | | 0,27 *** | 15,00 | | | | | | | 0,30 *** | 17,49 | | | | | | | 0,31 *** | 19,07 | | | | |
| Staff(log) | | | 0,07 *** | 18,73 | | | 0,04 *** | 4,66 | | | 0,07 *** | 19,98 | | | 0,04 *** | 5,12 | | | 0,08 *** | 21,84 | | | 0,04 *** | 5,61 |
| Univ% | | | 0,01 *** | 40,95 | | | 0,00 *** | -3,49 | | | 0,01 *** | 44,52 | | | 0,00 *** | -3,64 | | | 0,01 *** | 46,74 | | | 0,00 *** | -4,11 |
| Age | | | -0,24 *** | -67,74 | | | | | | | -0,24 *** | -68,19 | | | | | | | -0,23 *** | -68,55 | | | | |
| GFCF | | | 0,22 *** | 144,43 | | | | | | | 0,22 *** | 149,75 | | | | | | | 0,22 *** | 153,99 | | | | |
| Turnover(log) | | | -0,23 *** | -84,83 | | | -0,15 *** | -23,36 | | | -0,23 *** | -88,70 | | | -0,14 *** | -22,68 | | | -0,24 *** | -91,66 | | | -0,13 *** | -22,88 |
| FinAut | | | 0,00 | -0,24 | | | 0,00 *** | -4,81 | | | 0,00 | -0,56 | | | 0,00 *** | -5,22 | | | 0,00 | -1,17 | | | | |

d) With propensity to R&D

| Invntta | Year 2006 | | | | | | 2007 | | | | | | 2008 | | | | | | | | | | | |
|---------------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|-----------|--------|----------|--------|-----------|--------|-----------|--------|-----------|--------|----------|------|-----------|-------|------------|-------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | | | | | | |
| t | 0,37 *** | 11,08 | 0,11 *** | 2,82 | -0,10 *** | -3,46 | -0,13 *** | -4,14 | 0,45 *** | 12,57 | 0,17 *** | 4,14 | -0,23 *** | -6,05 | -0,18 *** | -4,39 | 0,54 *** | 14,44 | 0,24 *** | 5,50 | -0,45 *** | -8,65 | -0,303 *** | -5,71 |
| TRAT_yr | 3,25 *** | 9,75 | 2,78 *** | 8,71 | | | | | 3,20 *** | 6,28 | 2,31 *** | 4,70 | | | 2,78 *** | 4,03 | 0,47 | 0,74 | | | | | | |
| tTRAT_yr | 1,55 *** | 3,77 | 1,24 *** | 3,19 | 1,70 ** | 2,20 | 1,01 | 1,52 | 1,79 *** | 2,88 | 1,25 ** | 2,12 | 1,33 | 1,35 | 2,07 ** | 2,31 | -0,84 | -0,98 | 1,15 | 1,44 | -0,11 | -0,01 | 1,9431 * | 1,75 |
| Sector_2 | | | 0,19 | 0,68 | | | | | 0,58 ** | 2,03 | | | | | 0,67 ** | 2,36 | | | | | | | | |
| Sector_3 | | | 0,35 *** | 3,22 | | | | | 0,50 *** | 4,57 | | | | | 0,64 *** | 6,01 | | | | | | | | |
| Sector_4 | | | 0,45 *** | 3,99 | | | | | 0,59 *** | 5,20 | | | | | 0,69 *** | 6,22 | | | | | | | | |
| Sector_5 | | | 0,80 *** | 7,74 | | | | | 0,96 *** | 9,24 | | | | | 1,08 *** | 10,74 | | | | | | | | |
| Sector_6 | | | 0,87 *** | 7,82 | | | | | 1,10 *** | 9,88 | | | | | 1,24 *** | 11,74 | | | | | | | | |
| Sector_7 | | | -0,14 | -1,19 | | | | | -0,03 | -0,30 | | | | | -0,04 | -0,36 | | | | | | | | |
| Staff(log) | | | -0,01 | -0,26 | | | 0,29 *** | 4,11 | 0,02 | 0,64 | | | | | 0,28 *** | 4,04 | | | | | | | 0,21 *** | 3,20 |
| Univ% | | | 0,01 *** | 9,66 | | | 0,00 | -0,38 | 0,01 *** | 10,12 | | | | | -0,20 | 0,18 | | | | | | | 0,00 | 0,02 |
| Age | | | -0,27 *** | -9,96 | | | | | -0,27 *** | -10,52 | | | | | -0,28 *** | -11,70 | | | | | | | | |
| GFCF | | | 0,39 *** | 32,85 | | | | | 0,44 *** | 36,69 | | | | | 0,47 *** | 40,41 | | | | | | | | |
| Turnover(log) | | | -0,31 *** | -17,06 | | | -0,14 *** | -2,86 | -0,36 *** | -19,58 | | | -0,20 *** | -4,73 | | | -0,40 *** | -22,20 | | | | | -1,92 *** | -5,01 |
| FinAut | | | 0,00 | 1,28 | | | 0,00 | -1,61 | 0,00 ** | 2,42 | | | 0,00 | -1,35 | | | 0,00 *** | 2,77 | | | | | 0,00 | -0,99 |
| Profit | | | 0,00 | -0,14 | | | 0,00 ** | -2,32 | 0,00 | -0,31 | | | 0,00 | -0,76 | | | 0,00 | -0,30 | | | | | 3E-06 | 0,3 |
| _cons | 0,38 *** | 16,78 | 0,82 *** | 3,78 | 0,62 *** | 45,77 | 2,01 *** | 3,33 | 0,49 *** | 22,78 | 0,77 *** | 3,58 | 0,74 *** | 53,00 | 2,68 *** | 5,27 | 0,56 *** | 28,45 | 0,83 *** | 4,01 | 0,83 *** | 58,55 | 2,754 *** | 5,94 |
| Number of obs | 46453 | 32 397 | 46453 | 35473 | 46453 | 35473 | 54562 | 37410 | 54562 | 41377 | 63132 | 42709 | 63132 | 47693 | | | | | | | | | | |
| F | 213,44 | 139,06 | 8,13 | 6,16 | 137,73 | 147,05 | 18,91 | 7,51 | 170,78 | 37,42 | 8,73 | 0,0000 | 0,0000 | 0,0000 | | | | | | | | | | |
| Prob > F | 0,0000 | 0,0000 | 0,0003 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | | | | | | | | | | |
| R-squared | 0,0136 | 0,0643 | 0,0048 | 0,0016 | 0,0075 | 0,0588 | | | 0,0038 | 0,0588 | | | 0,0038 | 0,0598 | | | | | | | | | | |
| Adj R-squared | 0,0135 | 0,0638 | f.e. | f.e. | 0,0075 | 0,0588 | | | f.e. | f.e. | | | 0,0038 | 0,0598 | | | | | | | | | | |
| Root MSE | 3,5626 | 3,2814 | | | 3,9806 | 3,5823 | | | | | | | 4,1918 | 3,7497 | | | | | | | | | | |

| Invntta | 2009 | | | | | | 2010 | | | | | | 2011 | | | | | | | | | | | |
|---------------|----------|--------|-----------|--------|--------|--------|-----------|--------|-----------|--------|----------|--------|------------|--------|-----------|--------|-----------|-------|----------|-------|-----------|--------|-----------|-------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | | | | | | |
| t | 0,34 *** | 9,33 | 0,12 *** | 2,78 | -0,53 | -11,42 | -0,33 *** | -6,51 | 0,37 *** | 9,92 | 0,24 *** | 5,09 | -0,48 *** | -10,29 | 0,23 *** | -4,22 | 0,47 *** | 10,95 | 0,43 *** | 8,15 | -0,48 *** | -9,32 | -0,32 *** | -5,62 |
| TRAT_yr | 9,35 *** | 15,08 | 7,13 | 12,07 | | | | | 4,39 *** | 5,41 | 1,94 *** | 2,95 | | | 1,97 * | 1,99 | 8,22 *** | 8,39 | 1,97 * | 1,99 | | | | |
| tTRAT_yr | -1,16 | -1,50 | -1,49 ** | -2,05 | -1,97 | -0,65 | -4,42 ** | -2,11 | 2,01 * | 1,93 | 2,50 *** | 2,50 | 2,32 | 0,75 | 1,39 | 1,26 | -3,51 *** | -2,68 | -0,24 | -0,20 | -3,18 | -1,38 | -0,71 | -0,73 |
| Sector_2 | | | 0,68 ** | 2,45 | | | | | 0,81 ** | 2,90 | | | | | 0,92 *** | 3,32 | | | | | | | | |
| Sector_3 | | | 0,76 ** | 2,32 | | | | | 0,85 *** | 8,43 | | | | | 0,98 *** | 10,04 | | | | | | | | |
| Sector_4 | | | 0,83 *** | 7,61 | | | | | 0,95 *** | 8,93 | | | | | 1,06 *** | 10,22 | | | | | | | | |
| Sector_5 | | | 1,21 *** | 12,35 | | | | | 1,32 *** | 13,95 | | | | | 1,43 *** | 15,61 | | | | | | | | |
| Sector_6 | | | 1,48 *** | 14,16 | | | | | 1,71 *** | 16,90 | | | | | 1,91 *** | 19,53 | | | | | | | | |
| Sector_7 | | | 0,04 | 0,38 | | | | | 0,14 | 1,33 | | | | | 0,23 ** | 2,33 | | | | | | | | |
| Staff(log) | | | 0,06 ** | 2,38 | | | 0,16 *** | 2,69 | 0,05 ** | 2,11 | | | 0,1325 ** | 2,18 | 0,05 ** | 2,08 | | | | | | | 0,11 * | 1,93 |
| Univ% | | | 0,01 *** | 14,89 | | | 0,00 | -0,18 | 0,01 *** | 15,24 | | | 0,0004 | 0,18 | 0,01 *** | 16,53 | | | | | | | 0,00 | 0,58 |
| Age | | | -0,33 *** | -14,38 | | | | | -0,33 *** | -14,82 | | | | | -0,35 *** | -15,48 | | | | | | | | |
| GFCF | | | 0,52 *** | 44,61 | | | | | 0,56 *** | 48,63 | | | | | 0,58 *** | 50,86 | | | | | | | | |
| Turnover(log) | | | -0,47 *** | -26,95 | | | 0,28 *** | -6,02 | -0,50 *** | -29,04 | | | -0,263 *** | -5,74 | -0,52 *** | -30,73 | | | | | | | -0,27 *** | -6,29 |
| FinAut | | | 0,00 *** | 3,30 | | | 0,00 | 0,57 | 0,00 *** | 3,56 | | | 0,0021 | 0,99 | 0,00 *** | 3,43 | | | | | | | 0,00 | 1,22 |
| Profit | | | 0,00 | -0,34 | | | 0,00 | 0,23 | 0,00 | -0,26 | | | 5E-07 | 0,04 | 0,00 | -0,32 | | | | | | | 0,00 | 0,12 |
| _cons | 0,65 *** | 33,93 | 1,29 *** | 6,42 | 0,91 | 67,60 | 3,89 *** | 7,26 | 0,70 *** | 38,39 | 1,16 *** | 5,94 | 0,91 *** | 81,11 | 3,67 | 6,96 | 0,74 *** | 43,27 | 1,19 *** | 6,23 | 0,90 *** | 109,72 | 3,84 *** | 7,69 |
| Number of obs | 75445 | 47858 | 75445 | 53184 | 82447 | 51787 | 82447 | 57670 | 89385 | 54926 | 61838 | | | | | | | | | | | | | |
| F | 217,92 | 244,95 | 65,50 | 11,07 | 77,52 | 265,29 | 5,17 | 53,14 | 6,54 | 79,54 | 297,94 | 44,71 | 9,73 | 0,0000 | | | | | | | | | | |
| Prob > F | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | 0,0000 | | | | | | | | | | |
| R-squared | 0,0086 | 0,0757 | f.e. | f.e. | 0,0028 | 0,0758 | | | 0,0027 | 0,0799 | | | 0,0027 | 0,0799 | | | | | | | | | | |
| Adj R-squared | 0,0086 | 0,0754 | f.e. | f.e. | 0,0028 | 0,0755 | | | 0,0026 | 0,0796 | | | 0,0026 | 0,0796 | | | | | | | | | | |
| Root MSE | 4,4437 | 3,907 | | | 4,5868 | 4,0115 | | | 4,6949 | 4,0905 | | | | | | | | | | | | | | |

| Invntta | 2012 | | | | | | 2013 | | | | | | 2014 | | | | | | | | | | | |
|---------------|----------|-------|-----------|--------|-----------|--------|-----------|-------|-----------|--------|----------|-------|-----------|-------|-----------|--------|----------|-------|----------|------|-------|-------|-----------|-------|
| | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | Coef. | t | | | | | | |
| t | 0,65 *** | 14,20 | 0,58 *** | 10,08 | -0,36 *** | -6,35 | -0,12 | -1,81 | 1,08 *** | 22,99 | 0,71 *** | 12,81 | 0,02 | 0,27 | 0,24 *** | 3,58 | 0,91 *** | 19,56 | 0,47 *** | 8,90 | -0,01 | -0,09 | 0,14 ** | 2,23 |
| TRAT_yr | 1,83 * | 1,80 | 1,64 * | 1,63 | | | | | 1,76 ** | 2,01 | 1,41 * | 1,78 | | | 0,14 *** | 0,11 | 0,19 | 0,16 | | | | | | |
| tTRAT_yr | 3,80 *** | 2,97 | 2,14 * | 1,74 | 6,33 * | 1,94 | 1,74 * | 0,60 | -0,10 | -0,10 | -0,08 | -0,09 | -0,34 | -0,83 | -0,51 | -1,27 | 5,07 *** | 3,52 | 2,24 | 1,58 | 2,46 | 0,92 | -0,55 | -1,25 |
| Sector_3 | | | 1,07 *** | 3,52 | | | | | 1,10 *** | 3,89 | | | | | 1,11 ** | 4,04 | | | | | | | | |
| Sector_4 | | | 1,17 *** | 11,31 | | | | | 1,24 *** | 13,07 | | | | | 1,24 *** | 13,68 | | | | | | | | |
| Sector_5 | | | 1,54 *** | 17,09 | | | | | 1,74 *** | 19,69 | | | | | 1,75 *** | 20,62 | | | | | | | | |
| Sector_6 | | | 2,08 *** | 21,49 | | | | | 2,27 *** | 23,86 | | | | | 2,30 *** | 25,15 | | | | | | | | |
| Sector_7 | | | 0,41 *** | 4,21 | | | | | 0,61 *** | 6,41 | | | | | 0,68 *** | 7,40 | | | | | | | | |
| Staff(log) | | | 0,03 | 1,32 | | | 0,07 | 1,17 | 0,04 | 1,55 | | | 0,08 | 1,35 | 0,04 ** | 1,90 | | | | | | | 0,09 | 1,55 |
| Univ% | | | 0,01 *** | 18,12 | | | 0,00 | 0,94 | 0,02 *** | 21,02 | | | 0,00 * | 1,76 | 0,02 *** | 23,35 | | | | | | | 0,00 ** | 2,21 |
| Age | | | -0,36 *** | -15,91 | | | | | -0,37 *** | -16,45 | | | | | -0,37 *** | -17,08 | | | | | | | | |
| GFCF | | | 0,61 *** | 53,25 | | | | | 0,64 *** | 56,83 | | | | | 0,65 *** | 58,98 | | | | | | | | |
| Turnover(log) | | | -0,55 *** | -32,22 | | | -0,28 *** | -6,06 | -0,60 *** | -35,04 | | | -0,30 *** | -6,71 | -0,60 *** | -36,57 | | | | | | | -0,34 *** | -8,00 |
| FinAut | | | 0,00 *** | 3,72 | | | 0,00 ** | 2,11 | 0,00 *** | 5,10 | | | 0,01 *** | 4,74 | 0,00 *** | 6,07 | | | | | | | 0,01 *** | 5,70 |
| Profit | | | 0,00 | -0,21 | | | 0,00 | -0,37 | 0,00 | -0,10 | | | 0,00 | -0,03 | 0,00 | -0,22 | | | | | | | 0,00 | -0,07 |
| _cons | 0,79 *** | 46,32 | 1,21 *** | 6,31 | 0,93 *** | 116,60 | 3,96 *** | 7,48 | 0,81 *** | 47,65 | 1 | | | | | | | | | | | | | |