3. WHO GETS PUBLIC SUPPORT TO INNOVATION? EVIDENCE FROM THE PORTUGUESE ALENTEJO REGION

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ABSTRACT

The aim of the study is to assess which factors influence the policymaking decisions to financially support an innovative investment project. Based on the case study of the Portuguese Innovation Incentive System in the Alentejo region, we estimated an econometric model based on firms' and application' characteristics, controlling for macroeconomic environment. The results indicate that the selection process is more focused on the expected project impact than on firms' past performance. Furthermore, we found that government preference for promoting employment and exportation are shown to be higher than the impact on firm productivity.

PRESENTATION

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**LEARNING FROM IMPLEMENTATION AND EVALUATION OF THE EU COHESION POLICY
LESSONS FOR A *RESEARCH-POLICY* DIALOGUE. Brussels, 13 June 2016**

INTRODUCTION

- INNOVATION ➔ COMPETITIVENESS ➔ GROWTH
  - MARKET FAILURE ➔ NEED OF PUBLIC SUPPORT
- PORTUGUESE INNOVATION INCENTIVE SYSTEM:
  - SUBSIDIZED LOANS
- PORTUGUESE ALENTEJO REGION
  - CONVERGENCE REGION
- CONTRIBUTION OF THE STUDY:
  - WHO GETS PUBLIC SUPPORT?
  - IS SELECTION PROCESS EFFECTIVE?

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WHICH PROJECTS ARE FUNDED?

Main characteristics of applicants to PIIS and expected project impact foreseen in application form

VARIABLES	APPROVED		NOT APPROVED
Size (n.° employees)	5.0 jobs	>	4.8 jobs
Experience in PIIS procedures	19.4%	>	10.6%
Experience in R&D activities	7.9%	>	4.3%
Investment (x1.000€)	3.058€	>	1.913€
Variation of Patent (n.°)	0.43	>	0.20
Export Intensity (%)	50.6%	>	37.4%
Variation of Jobs (n.°)	13.9	>	9.4
Variation of Skilled Jobs (n.°)	6.6	>	4.2
Variation of Net Income (x1.000€)	1.078€	<	1.184€
Variation of Productivity (x1.000€)	80.5€	<	95.3€

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DETERMINANTS OF PUBLIC SUPPORT TO INNOVATION (I)

WHICH FACTORS INFLUENCE THE PROBABILITY OF OBTAINING A PUBLIC SUPPORT FOR INNOVATION?

POSITIVE IMPACT

- INVESTMENT ➔ OUTCOME MAXIMIZATION
- EXPERIENCE IN PIIS ➔ "PICK THE WINNER"
- EXPORTATION, SKILLED JOB AND PATENT STOCK ➔ TARGET OF PIIS
- EURIBOR ➔ REDUCE THE COST OF FINANCING
- REGIONAL GDP VARIATION ➔ NOT EFFECTIVE IN ECONOMIC CRISIS PERIOD.

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DETERMINANTS OF PUBLIC SUPPORT TO INNOVATION (II)

NEGATIVE IMPACT

- PRODUCTIVITY ➔ PROJECTS FUNDED = LOW INCREASE IN PRODUCTIVITY.

NOT SIGNIFICANT IMPACT

- DETERMINANTS OF CREDIT BANK DECISION AND RISK: SIZE (N.° JOB), SOLVABILITY RATIO AND RETURN ON EQUITY.
- PAST R&D ACTIVITY ➔ PREFERENCE GO TO SUCCESSFUL INNOVATION

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CONCLUSION

- IS THE SELECTION PROCESS EFFECTIVE?
  - GOVERNMENT PREFERENCE ➔ EMPLOYMENT AND EXPORTATION (NOT FIRM PRODUCTIVITY)
- HOW COULD GOVERNMENT IMPROVE THE EXPECTED OUTCOMES?
  - NOT INCLUDE (MAIN DETERMINANT IN SELECTION PROCESS): INCREASE OF JOBS NUMBER
  - INCLUDE: CURRENT PERFORMANCE OF FIRM

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INTRODUCTION

The EU strategy 'Europe 2020' has set a main target to create smart, sustainable and inclusive growth, where innovation is considered the main economic driver for economic growth and creation of jobs, already since the Lisbon Agenda (Council of the European Union, 2000). The financial instruments of Cohesion Policy were designed in order to remove barriers to innovation within the EU. Public policies to support entrepreneurship and innovation play a vital role when firms have difficulties in accessing finance. In the presence of market failings, public support for Research & Development & Innovation (RDI) aims to fill financial gap, in order to improve knowledge production and come it as close as possible to the socially optimal level. To achieve the goal, governments give special attention to increasing the effectiveness and efficiency of innovation policy instruments. Nevertheless, the literature highlights some difficulties with public support directed at subsidized firms that are less efficient than non-subsidized firms (e.g. Bernini and Pellegrini, 2011; Jorge and Suárez, 2011). For example, Bernini and Pellegrini (2011) found that subsidized firms tend to show lower productivity growth than non-subsidized firms because firms are induced to reach their optimal level of employment (balance between input and output) in order to obtain the subsidy. In this case, the inefficiency of subsidized firms could lead to ineffectiveness of public funds in the long-run (difficulty to achieve policy goal). So, could this ineffectiveness to be linked to the selection process for awarding public support?

The aim of the present contribution is to explain which factors influence the public decision to financially support innovative projects and to identify if the selection process was effective or not. The analysis is based on the case study of the Portuguese Innovation Incentive System (PIIS) and on the applications managed by the Alentejo Regional Operational Program in the period 2007 – 2013. The PIIS is an instrument that was part of the Portuguese National Strategic Reference Framework (2007 – 2013) and was funded by the European Regional Development Fund (ERDF). The Portuguese Alentejo region was considered as a European region (NUTS-2 level) belonging to the Convergence Regions group, due to its major structural problems.

The results of this study provide an understanding of policy decision directed at improving innovation investment and employment which may have long

term implications for productivity growth – the real driver of living standards. At the end, we will be able to identify if the failure highlighted by other authors could be in the upstream of public policy implementation process. Recommendations and conclusions could be useful beyond programs funded by ERDF to include all CP funds, since for the period 2014-2020 the same rules of management and control are applied also to the ESF.

BACKGROUND THEORY

Several determinants affect the probability of receiving an R&D subsidy. Previous studies (e.g. Czarnitzki and Fier, 2002; Aerts and Thorwarth, 2008; González and Pazó, 2008; Czarnitzki and Lopes Bento, 2011; Hud and Hussinger, 2015) identify age, size of the firm, previous experience of receiving subsidies, the qualification of human capital, patent stock, past R&D activities and export intensity as determinants of subsidy provision. In general, government tends to select firms that are already best performers (e.g. higher level of exportation, patent stock, skilled job and R&D activities), based on "picking the winner" principle. This choice could be justified with the aim maximize potential outcomes in funded firms to easily achieve policy goals.

Bearing in mind this assumption, we expect a certain government preference for firms with a specific profile – higher probability of successful project (e.g. higher survival rate and growth of profitability).

The selection process of PIIS is based on four main criteria: i) Quality of the project; ii) Impact of project in company's competitiveness; iii) Contribution of the project to national competitiveness; iv) Contribution of the project to regional competitiveness and territorial economic cohesion. Within these fields, we can highlight the followings dimensions in the regulation of the PIIS: increase of productivity, representativeness in the international market, exploitation of R&D results, and creation of highly skilled job, wealth and employment in the region. In the model developed, we include all the mentioned variables and also others used by banks when assessing credit risk, namely the return on equity and the solvency ratio of applicant firms (e.g. Chaibi and Ftiti, 2015), in order to control for the effectiveness of PIIS in

counteracting debt and equity financing constraints. Indeed, firms with historically lower levels of these indicators are less attractive for new investors or banks because they show lower performance and more financial vulnerability.

Macroeconomic factors in the year of submitting the application, measured by the regional GDP variation and the value of Euribor (Euro Interbank Offered Rate) are also taken into account with the aim of controlling for external factors which affect SMEs' access to finance and growth.

DATA AND METHODOLOGY

The dataset was built with cross-information from 'Information System of the National Strategic Reference Framework Incentive Scheme' and statistical data from official entities (e.g. Portuguese National Institute of Statistics and PORDATA database).

The sample has 451 observations, which correspond to the total number of applications submitted to PIIS by firms located in the Alentejo region and near to 8% of total applications to the program. The approval rate is 48%. The total amount of investment approved was 660 million euros associated with 306 million euros of subsidized loans. More than 66% of applications were submitted by micro-sized enterprises. Applications for industry sector[1] and tourism activities account for nearly 70% of the observations. Approved applications, compared with non-approved ones, foresee a higher amount of investment and a higher increase in total employees, skilled jobs and number of patents. Having experience in the PIIS procedures and past enrolment in R&D activities is also higher in the group with applications approved. Approved applications have a higher export intensity after project implementation however, a lower increase of productivity, compared to non-approved ones.

Using an econometric model (for more details see Appendix 1) the study aims to determine which factors influenced the probability of obtaining public

[1] Industry sector includes all types of manufacturing industries (low and high tech).

support for an innovative investment. The explanatory variables are categorized into three main groups:

i) Firms' characteristics:

- Size, measured by number of employees;
- Activity sector (Industry, Tourism, Services, Trade and Other sectors);
- Financial performance and risk level, measured by the Solvability ratio (equity/debt);
- Return on Equity ratio (net income/equity);
- Experience in R&D activities: has the company a history of R&D activities in the year before the application submission (i.e. with a previous positive spending on R&D)?
- Experience in the Portuguese Innovation Incentive System procedure: has the company submitted an application to the Innovation Incentive System before this one?

ii) Project or application's characteristics:

- Amount of investment foreseen in the application form;
- Expected impact: variation of patent number foreseen; export intensity (exportation/total turnover) foreseen; variation of skilled jobs number[2]; variation of productivity (variation of net income/variation of job) foreseen;

iii) Cyclical factors:

- Euribor 12 months in the year of application submission;
- GDP variation in the region (NUTS 3 level) of project implementation in the year of application submission (Alentejo NUTS 2 is divided in four NUTS 3 regions).

[2] Under the program regulation, a highly qualified worker is a person with at least a post-secondary pre-tertiary level of education

RESULTS AND DISCUSSION

The results (see Appendix 2) indicate that the **selection process is more focused on the expected project impact than on firms' past performance**. Factors that influence the credit risk and the decision to give a bank loan, such as solvability ratio and return on equity, seem not to influence the government evaluator in funding some projects. Nor does previous experience in R&D activities seem to matter. Indeed, the selection process of PIIS appears to give preference to companies that foresee an increase of patent portfolio (successful innovation) over those showing past R&D activities.

The variation of patent numbers and the variation of skilled jobs, as the result of the investment project, show a positive impact on the probability of receiving the public incentive, but at a higher level the effect tends to inverse and the probability of having an application selected decreases. One justification for this trend could be that projects with a higher number of additional patents in the short-term could be riskier and consequently have a higher risk of failure. Indeed, the process of patent registration could be hard and long. Then again, to hire a high number of new skilled workers could also be riskier because it requires a larger additional income in order to justify this and to make new jobs profitable.

The variation in productivity shows a slightly negative impact, which means that having a project funded is linked to a low expected increase in productivity. At this stage, we do not know the real return of investment; however, if it materializes, this finding could suggest a long-term inefficiency in funded firms, as other authors also found based on real returns (Bernini and Pellegrini, 2011; Jorge and Suárez, 2011). One possible explanation for our result could be that in the selection process increased employment has priority over increased net income. However, on the other hand, projects with high growth rates may also be too ambitious and sometimes unrealistic in terms of execution, in a country and region affected by the economic and financial crisis, namely between 2009 and 2013.

The export intensity ratio after project implementation shows a positive impact on the probability of having an application funded, as expected according to the scientific literature (cf. Aerts and Thorwarth, 2008; Czarnitzki and Lopes Bento 2011). Indeed, one goal of the program is to boost firms' presence in international markets.

The amount of investment has a positive impact on the probability of being funded. If we take into account that, first, the amount of investment represents the sum of public incentive (percentage of the eligible investment) and private expenditure (equal to the remainder) and, second, the aim of the program is to stimulate innovative investment, it is expected that government will tend to approve applications with a higher amount of expenditure because this implies a greater private effort. Indeed, Santos et al. (2016) found that the amount of funded investment has a positive impact on the probability of firm survival because higher investments tend to be better planned. Because they are riskier, they need a higher additional cash-flow to be economically viable. **So when governments choose to fund projects with a higher amount of investment, this tends to maximize the outcome: higher private effort and low failure rate.**

Previous experience in the PIIS procedure increases by 19.8% the probability of having an application approved. These findings could be linked with "pick the winner" principle, in which experience in subsidies is a sign of firm best performance and successful project (see e. g. Aerts and Thorwarth, 2008; Aschhoff, 2009; Hud and Hussinger, 2015). Nevertheless, in our model this conclusion is not necessarily good news. On one hand, this could reveal that the public incentive goes more to the same companies, and that firms could receive more than one subvention under the PIIS. Or it could reveal that firms familiar with the application process could easier have access to public support because they know in which factors to put emphasis in the application form.

Company size, measured by the number of employees, seems not to influence the probability of having an application approved, contrary to the literature, but these results could be a limitation of the study, due to size and characteristics of the sample. Indeed, the sample is mainly composed of micro and small companies, and the average number of employees in both groups (approved and not approved applications) is almost the same and around 5 workers.

The activity sector of the investment project also matters, particularly if it is in the industry, tourism and services sector. Compared to other sectors (reference category), applications in these areas have a higher probability of being approved, possibly because the regional policy, namely the Research and Innovation Strategies for Smart Specialization (RIS3) for the Alentejo

region, is more focused on developing innovation in these sectors, due to regional specialization, namely in agri-business and tourism activities. Then again, services, namely specialized services, are a sector with high added value and growth potential that are now included in the RIS3 for Alentejo.

The model shows that when firms have a higher cost of financing their project in the financial market, represented by the Euribor, the probability of having an application approved increases. This conclusion could illustrate the mechanism of public support in trying to reduce the cost of innovation and in counteracting the financial market's failings.

In periods of economic growth the probability of getting a subsidy increases, which could mean that the public instrument is not effective in the period when it approves projects, because an inverse relationship should be the case. In periods of economic crisis, the aim of the public instrument is to improve conditions for launching more projects in the regions.

TABLE 1. IMPACT ON GETTING PUBLIC SUPPORT TO INNOVATION: MAIN FINDINGS

POSITIVE IMPACT	NEGATIVE IMPACT	NON-SIGNIFICANT
Amount of investment	Increase of productivity	Determinants of credit bank decision and risk
Experience in application procedure		Experience in R&D activity
Export intensity		
Increase of skilled job and patent stock		
Macroeconomic environment (Euribor and GDP variation)		

Source: Authors own elaboration

CONCLUSION AND POLICY RECOMMENDATIONS

The Portuguese Innovation Incentive System was an important instrument of the Portuguese National Strategic Reference Framework 2007 – 2013, developed with the aim of stimulating innovation and promoting competitiveness. Between 2007 and 2013, 451 applications to PIIS were submitted under the Alentejo Regional Operational Program. The approval rate was 48%. **Entities in charge of evaluating applications showed on average an effective selection process**, particularly when the incentive is supposed to counteract financial market failings. Indeed, an interesting finding was that when firms have a higher expected cost of financing investment, the public policy instrument seems to provide additional financial support to innovative firms, in order to be more competitive. On the other hand, firm characteristics influencing credit risk such as size, profitability and solvency ratio are not relevant factors for being selected for R&D subsidies. However, government evaluators are also cautious selecting projects with a low potential failure risk in order to maximize the expected outcome for society, namely in terms of jobs creation.

Nevertheless, **government preference for promoting employment is shown to be higher than the impact on firm productivity**, which in the long-run could mean firm inefficiency. So, if productivity leads to competitiveness and this to economic growth, the long-run inefficiency of subsidized-firms could affect the effectiveness and sustainability of public policies.

The Portuguese Innovation Incentive System seems to be **more focused on short-term results**, such as increasing the number of jobs and intensifying the external commercial relationship, than on the long-term economic sustainability of the outcome.

Our personal recommendation move beyond short-term increase of employment in favour of support for more sustainable creation of jobs by firms. Indeed, if the problem is about sustainability and firm efficiency (output per employee), the solution could be to exclude the increase of jobs number as main determinant in the selection process. Past and current performance of firm should be also include in the selection process, because a better investment project are not necessarily linked to better entrepreneurship, namely if the application form is filled by an external consultant. It is also important that government evaluator assesses the

feasibility of project return, taking into account both the trend in the (national and international) markets and the entrepreneur profile (capacity to achieve planned targets).

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APPENDIX 1. BINARY CHOICE MODEL

$$\Pr(\text{Approved application} = 1 \mid \ldots) = G[\beta_0 + \beta_1 \text{job\_pre} + \beta_2 \text{industry} + \beta_3 \text{tourism} + \beta_4 \text{services} + \beta_5 \text{trade} + \beta_6 \text{subtmit\_before} + \beta_7 \ln\_\text{investment} + \beta_8 \text{rd\_pre} + \beta_9 \text{var\_patent} + \beta_{10} \text{var\_patent2} + \beta_{11} \text{solvability\_pre} + \beta_{12} \text{roe\_pre} + \beta_{13} \text{exp\_intensity} + \beta_{14} \text{var\_productivity} + \beta_{15} \text{var\_skill\_job} + \beta_{16} \text{var\_skill\_job2} + \beta_{17} \ln\_\text{euribor} + \beta_{18} \text{reg\_gdp\_var}]$$

APPENDIX 2. RESULTS OF MODEL ESTIMATION

TABLE 2. RESULTS OF BINARY CHOICE MODEL

VARIABLES	COEFFICIENTS (STD. ERR)		MARGINAL EFFECTS	
Job_pre	-0.00617	(0.00832)	-0.002	
Industry	1.720***	(0.610)	0.487	***
Tourism	1.180*	(0.609)	0.334	*
Services	1.590***	(0.612)	0.450	***
Trade	1.007	(0.745)	0.285	
Submit_before	0.701***	(0.203)	0.198	***
Ln_investment	0.126*	(0.0652)	0.036	*
Rd_pre_yes	0.388	(0.351)	0.110	
Var_patent	0.334**	(0.154)	0.094	**
Var_patent2	-0.0351**	(0.0171)	-0.010	**
Solvability_pre	-0.00157	(0.00210)	0.000	
Roe_pre	0.346	(0.214)	0.098	
Exp_intensity	0.993***	(0.269)	0.281	***
Var_productivity	-0.00141**	(0.000580)	0.000	**
Var_skill_job	0.0671***	(0.0182)	0.019	***
Var_skilljob2	-0.000674***	(0.000229)	0.000	***
Ln_euribor	0.285**	(0.115)	0.081	**
Reg_gdp_var	4.573**	(2.090)	1.294	**
Constant	-2.992**	(1.205)		
Observations	434			
Log likelihood function	-253.22751			
Reset Test (Wald)	0.6306			
Reset Test (LR)	0.6347			
% Correctly Classified	71.20%			

Source: Authors' own elaboration with STATA output.
Comments: Results of Cloglog Model.
*Legend: *** coefficient significant at 1%, ** coefficient significant at 5% and * coefficient significant at 10%. Standard errors in parentheses.*

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