



Invention and sales of new products

Is the firm or the region key? *

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Project outline

Abstract

In this paper determinants of the sales of new products as a share of total revenue is analyzed for Spanish firms for the period 2005-2016. Using the PITEC database the region of the firm is identified through the main location of its R&D personnel. Though regional controls sort out some of the heterogeneity firm-level R&D activity greatly surpasses potential regional spillovers from R&D spending in other firms. Especially continuous internal basic research drives the product innovation in the long-run.

Keywords Research & Development • Product innovation • Basic research • Spanish firms • Regional spillovers

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1 INTRODUCTION

In a global competition a firm's ability to innovate and come up with new and successful products is crucial for the development of the firm as well as regional growth and jobs.

Innovations is not just the result of isolated research and development (R&D) processes within firms but can also be expected to be driven up by knowledge spillovers from a high share of R&D spending in other firms within the same region by the means of formal and informal interactions between firms and employees of different firms. Though I do not find significant spillovers from regional R&D expenses a few of the regional dummies correct some of the heteroscedasticity in the estimation. The internal R&D activity seem to be the more important, especially the continuity of in-house basis research.

I proceed by outlining the theoretical background in section 2, the empirical strategy and the data in section 3 and 4 respectively, before presenting the results in 6 and concluding in 6.

2 BACKGROUND

2.1 Theory of firm-level innovations

As point of departure I use the same theoretical framework which Sternberg and Arndt (2001) use to analyze the probability of innovations in 10 different European regions. As a region level proxy for regional knowledge-spillovers I let the average share of R&D spending relative to total revenue in other firms within the region affect firm-level innovations.

As analyzed by Harrison et al. (2014), though primarily positive, the effect of R&D spending and introduction of new products in other firms can be expected to capture effects in two directions: while there can be positive spill-overs through development, interaction and exchange of human capital and technology there is also the risk that sales in other firms might take over market shares. As an elaboration one could expect that

2.2 Results in other studies

Barrios Cobos et al. (2001) measure the effects of R&D spendings and regional spillovers on firms' export from Spain. Harrison et al. (2014) estimate the effects of innovations on employment growth in Spanish firms using the PITEC database. Vogel (2015) find effects of R&D spendings and evidence of local technology spillovers through her estimation of a long run model for convergence in Total Factor Productivity (TFP) between all European regions. Though they find that both region-level variables and firm-level variables are significant, Sternberg and Arndt (2001) found regional characteristics and

regional between-firm spillovers to be of less importance than the characteristics of the individual firm itself.

3 EMPIRICAL STRATEGY

The aim is to model the firm level inventions, measured as share of sales due to new products, as a function of within-firm R&D spendings as well as the average share R&D spendings in other firms within the region. That is, for firms within the same sector and in other sectors respectively. I use a panel regression controlling for time-constant firm-level random effects using GLS which provides efficient, though not consistent estimates due to the presence of endogeneity. As opposed to a Fixed Effects model this however allows for both the inclusion of time-invariant controls as well as using cluster robust standard errors.¹

4 DATA

Using the PITEC database² the Spanish region of the firm is identified using the firm's location based on information on the region in which they have at least 75% of their R&D department.³ This implies that the modified dataset will be limited to single-unit firms that have some internal R&D personnel employed for at least one of the years.

Dependent variables

- Sales of new products (share of total sales constituted by products, invented within the past two years).
 - Due to including products invented within the year as well as in the past two years, this variable is included as a lead one year ahead.

Main explanatory variables

- Regional level as well as firm level variables on R&D's share of total expenditure. For the regional level the average share is calculated for each firm after deducting the R&D expenses and total revenue for the firm.
- Whether there is continuity in R&D activity or not. Disaggregated into basic and applied research as well as investments in technological development.

Controls

- Regional dummies.

¹The STATA do-files can be accessed from github.com/thornoe/ub/tree/master/Regional_Urban/paper/stata_code

²Description of the methodology, the full questionnaires etc. in PITEC is available by the Spanish Foundation of Science & Technology at icono.fecyt.es/pitec

³This novel identification strategy for regions is developed by Enrique López-Bazo.

- Year dummies, not shown in the regression table.:
- Statistical Classification of Economic Activities (CNAE93), not shown in the regression table.
 - The manufacturing sector and service sector respectively is split into six industries for each.
 - Other sectors are dropped.

5 RESULTS

The estimation results are shown in table 1 below for the split samples of manufacturing and services respectively.

Table 1: Estimates of sales of new products as share of total revenue

	(1) manufact b/se	(2) services b/se
log R&D expenses in region	-0.782 (1.166)	-0.485 (1.358)
log internal R&D expenses	1.746*** (0.406)	1.782*** (0.330)
log external R&D expenses	0.166 (0.613)	0.155 (0.430)
Cont. of basic research	1.373** (0.693)	0.951 (0.788)
Cont. of applied research	0.605 (0.454)	-0.065 (0.607)
Cont. of technological development	0.066 (0.453)	0.810 (0.613)
Cont. of external R&D only	-0.632 (0.951)	-1.054 (1.254)
Andalucía	0.000 (.)	0.000 (.)
Aragón	0.845 (2.354)	0.381 (3.297)
Asturias (Principado de)	-8.054*** (2.415)	-0.359 (3.189)
Balears (Illes)	-11.382*** (3.817)	-9.087*** (2.806)
Canarias	-2.768 (2.013)	-2.061 (3.349)
Cantabria	-3.077 (3.049)	-6.974** (3.393)
Castilla y León	-0.464 (2.655)	-2.288 (2.531)
Castilla-La Mancha	-5.059** (2.374)	-5.981** (2.897)
Cataluña	-1.344 (1.768)	-1.614 (1.902)
Comunidad Valenciana	0.235 (1.908)	-0.607 (2.256)
Extremadura	-1.648 (4.942)	-4.670 (3.793)
Galicia	-4.169* (2.251)	-1.936 (2.400)
Madrid (Comunidad de)	-2.351 (2.080)	-1.703 (1.881)
Murcia (Región de)	-0.764 (2.699)	-3.361 (3.198)
Navarra (Com. Foral de)	-2.605 (2.294)	-2.504 (3.678)
País Vasco	-1.018 (2.051)	3.604 (2.420)
Rioja (La)	-5.084* (2.664)	-6.471 (5.575)
cons	13.301*** (2.155)	11.439*** (2.757)
N	21531	11615

Cluster robust standard errors are in parentheses. * p<0.10, ** p<0.05, *** p<0.01
Time dummies and industry dummies are estimated but not shown.

6 CONCLUSION

The internal R&D expenses strongly dominate any regional effects except for a few regions in which the share of newly developed products in total sales is extraordinarily small. In the long term, continuity of basic research is a strong determinant for having a high share of new products in the portfolio.

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