

The role of Science and Technology Parks in Spanish regional innovation ecosystem

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- The interest of researchers and policy makers in the effects of Science and Technology Parks (STPs) on firm innovation has been growing in recent years (Feldman and Kogler, 2010).
- There is scarce empirical evidence on STP's effect outside their perimeters.
- Several studies show positive effects on innovation tenants' performance.
- Previous research has evaluated STP's effect mainly on:
 - i) research inputs (R&D investments intensity and workforce quality)
 - ii) innovative results (patenting activity) and
 - iii) R&D productivity Cita
- Several studies show a positive impact on the number of patents; this is being used as a proxy of innovative performance. (Huang et al, 2012; Lamperti, 2017)
- This proxy has some drawbacks as it does not take into account patent's importance. (Archibugi, 1992; Griliches, 1990)
- Each patent has associated a technological and economic importance. Some patents are more valuable than others (Scherer and Harhoff, 2000), that is: patent value is skewed.

- The main objective of the project is to study the STP's effect on innovation performance of firms located inside and in the surroundings of STPs.
 - What is the STP's impact on tenants' innovative performance?
 - *Using patent quality as proxy of innovative performance*
 - What are the channels through which park's effect take place?
 - *Using determinants of patent quality*
 - Does this effect extend to firms located outside the STP's perimeters?
 - *Taking into account the distance among firms and STP's*
- Our contributions:
 - The quality of the patents provides a better approximation of firms' innovation capacity.
 - Measuring the STP's effect on tenants' innovative performance and firms' innovative performance located outside their perimeters.

- We build an original dataset using different sources of information:
 - The corporate information database SABI by Bureau Van Dijk
 - The OECD REGPAT database
 - The Patent Quality Indicators Database of the OECD
 - The directories of companies located in Spanish STPs. The data are published by the Spanish association of STPs (APTE) from 2004 to 2019.
 - The public census of regional companies by using data from the Central Companies Directory (DIRCE).
- The final sample contains observations from 2004-2017:
 - 9,012 patents for firms on-park and off-park.
 - 1,415 patents for STP's firms

- We use different types of regressions to obtain more robust results: OLS regression, non-linear regressions (Poisson and Probit) and instrumental variable method (IV).
- The instrumental variable we selected for the IV method is the number of companies located in an STP as a percentage of total companies in the region in which the company is located.
- The indicators of the dimensions of patent quality chosen for the study are forward citations and renewals.
 - Forward citations reflect the technological importance of the patent (Trajtenberg, 1990; Hall, et al., 2005; Harhoff et al., 2003)
 - Higher number of citations is an indicator of higher quality of the patent (Jaffe and De Rassenfosse, 2016; Harhoff et al., 1999; Trajtenberg, 1990).
 - Number of renewals is an indicator of the economic value of the patent (Griliches, 1990; Lanjouw et al., 1998; Nagaoka et al., 2010).
- The selected channels through which STPs carry out their effect, these being usual determinants of patent quality: science-industry links, internationalisation and collaboration.

Table 1. STP's effect on patent quality indicators

	(1) Fwd_cits5	(2) Renewal	(3) Fwd_cits5	(4) Renewal	(5) Fwd_cits5	(6) Renewal
Patpark	0.049*** [0.017]	0.038** [0.015]	0.202*** [0.067]	0.049*** [0.017]	0.191*** [0.061]	0.028 [0.055]
Log(Firm_age)	-0.045*** [0.007]	-0.035*** [0.007]	-0.183*** [0.029]	-0.036*** [0.007]	-0.035*** [0.008]	-0.036*** [0.008]
Log(Emp_app_year)	0.002 [0.006]	0.007 [0.006]	0.012 [0.029]	0.009 [0.007]	-0.005 [0.007]	0.007 [0.007]
Log(Sales_app_year)	0.017*** [0.005]	0.006 [0.004]	0.072*** [0.021]	0.008* [0.005]	0.018*** [0.005]	0.006 [0.004]
Year dummies	YES	YES	YES	YES	YES	YES
Tech_field dummies	YES	YES	YES	YES	YES	YES
Industry dummies	YES	YES	YES	YES	YES	YES
Region dummies	YES	YES	YES	YES	YES	YES
Constant	0.116** [0.048]	1.864*** [0.052]	-1.542*** [0.296]	1.845*** [0.060]	0.101** [0.049]	1.865*** [0.053]
<i>N</i>	9012	9012	9012	9012	9012	9012

Marginal effects; Standard errors in brackets; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- Our preliminary results:
 - confirm those of previous studies finding evidence of the positive influence of STPs on their innovative performance (Huang et al., 2012; Lamperti et al., 2017; Siegel et al., 2003b; Squicciarini, 2008)
 - find that patents obtained by firms located in STPs are more cited than patents obtained by off-park firms.
 - Regarding the channels through which STP's effect may take place :
 - Our preliminary estimations show that patents obtained by STPs tenants involve larger teams of inventors and rely more on science-industry links than patents located outside STPs.
 - This confirms that collaboration and science links are two channels through which STPs may increase patent quality
 - The tenants' patents tend to have smaller patent families than the patents of firms located off-park, which indicates that they are less international
- Next steps:
 - Exploring the determinants which influence the effects of STPs.
 - Introducing the distance to STP variable to analysis.

Feedbacks are more than welcome!!

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