

Title

The influence of Science and Technology Parks' characteristics on firms' innovation results

Authors

Alberto Albahari, School of Industrial Engineering, Department of Economics and Business Administration. University of Malaga, Malaga, Spain.
E-mail: alberto.albahari@uma.es

Andrés Barge-Gil, Department of Economic Analysis II (Quantitative Economics). Complutense University, Madrid, Spain.
E-mail: abarge@ccee.ucm.es

Salvador Pérez Canto, School of Industrial Engineering, Department of Economics and Business Administration. University of Malaga, Malaga, Spain.
E-mail: spc@uma.es

Aurelia Modrego, Department of Economics. Laboratory for the Analysis and Assessment of Technical Change, Carlos III University, Madrid, Spain,
E-mail: modrego@eco.uc3m.es

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Extended abstract

Science and Technology Parks (STPs) have shown a great diffusion worldwide, although their effectiveness as a technology and innovation policy instrument is still debated.

On the one hand, some authors believe that STPs do not have any relevant impact on firms' results as they do not succeed in encouraging the creation of synergies that could result in added value for tenants, questioning the STP's model itself to such an extent that Quintas et al. (1992) talk about STPs as 'high-tech fantasies'. According to other authors STPs create added value for their firms and positive externalities for the territory in which the Park is located.

Empirical evidence on the impacts of STPs on innovation indicators, such as R&D expenditure on sales (Fukugawa, 2006; Leyden et al., 2008; Yang et al., 2009; Westhead, 1997 and Colombo and Delmastro, 2002), likelihood to patent (Squicciarini, 2008, 2009; Löfsten and Lindelöf, 2002 and Colombo and Delmastro, 2002) and R&D productivity (Siegel et al. 2003; Yang et al., 2009; Westhead, 1997) is also contrasting.

Recently the implicit assumption that firms equally benefit from being on park has been relaxed. Some authors (Hervas-Oliver and Albors-Garrigos, 2009; Barge-Gil et al., 2011; Huang et al., 2012) have analyzed the influence of firms characteristics, such as size or R&D intensity, upon the benefits from location. We propose another possible explanation for previous contrasting evidence: Parks are heterogeneous. Some Parks work well and manage to generate value for their tenants, while others do not (in line with Massey et al., 1992). More generally, Siegel et al. (2003) suggested that different "types" of STPs could have different impacts on their firms. Nonetheless, although literature on STPs is rapidly growing, to our knowledge there have been no attempts to empirically analyze whether some characteristics of STPs contribute to improve the performance of innovative firms. This paper aims at filling this gap by studying how innovative performance of tenants are affected by several STP's characteristics, such as age, dimension, location or management.

Our purpose is to study the effects that park's age, dimension (proxied by number of tenants and by squared metres), location (in terms of technological

development of surrounding environment) and characteristics of the management of the park (in terms of number of employees and provision of services) have on the innovative performance of its firms, measured by the turnover from products new to the market (as a percentage of total turnover).

Multiple sources have been used to perform this study. Data on firm level have been obtained using the 2009 Community Innovation Survey (CIS) for Spain (published in 2011) managed by the Spanish National Statistics Institute (INE), This allows us to rely on a much wider sample of firms compared with previous studies on STPs: the 2009 survey collects very detailed information about the characteristics of the innovation process of 37.201 companies, allowing us to use a wide set of covariates.

Since 2007 the Spanish survey includes a question on the possible on-park location of the firm: in 2009, out of the 37.201 firms surveyed, 849 firms were located on 25 STPs¹ in 12 different Spanish regions. Thus this paper can also rely on a much higher heterogeneity across STPs than previous studies, which are mainly based on few case studies. Furthermore the CIS allows the employment of harmonised indicators and comparability with other countries.

STPs' characteristics have been gathered using two different datasets: parks' age, parks' dimension and characteristics of park's management have been obtained using an internal survey (i.e. the Survey 2009 on the Characteristics and Results of Science and Technology Parks) that the former Department of Science and Innovation of the Spanish government yearly supply to Spanish STPs. In very few cases, the lack of data on a particular park called for direct contact with park managers.

We have estimated the models using OLS clusterised by park, taking into account a wide set of covariates regarding both general firms' characteristics (i.e. total turnover, exports, industrial sector, firm's age) and more innovation-specific firms' characteristics (i.e. innovation effort and perceived obstacles to innovate).

¹ We have considered within the STP's sample only those STPs that were *full members* of the Association of Science and Technology Parks of Spain (APTE) at least two years in advance.

We have also dealt with the sample selection problem caused by the endogenous decision to locate inside a Park; to this end we used Heckman selection models, and identified by using an indicator of regional availability of STP location.

Results show that:

- a) The effect of age of the park is very statistically significant and has a non-linear effect on innovative performance. Firms located on younger and older STPs show better innovative performance. We interpret this result as showing the confluence of two different types of impact on tenants. First, a short-term impact, probably due to increased visibility or reputation and, second, a long term impact, probably related with the better access to external knowledge.
- b) The dimension of a STP, in terms of number of tenants, positively affects the innovative performance of its firms: the more tenants the park has, the better innovative results firms obtain. This finding can be interpreted as the result of agglomeration economies. No evidence of congestion effects is found.
- c) Firms in less technologically developed regions benefit more from being on-park. This finding supports the view of STPs as a local development policy instrument.
- d) The number of full-equivalent employees in the management of the park positively affects innovation of tenants. The provision of services to foster internationalization of firms is not statistically significant, while consultancy services provided by the management of the park have a negative impact on innovation results. This finding could indicate that the best choice for on-park firms could be to buy the services they need from the best providers, which could be outside the park.

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