

SCIENCE PARKS, KNOWLEDGE SPILLOVERS, AND FIRMS' INNOVATIVE PERFORMANCE. EVIDENCE FROM FINLAND

Referee Report

This empirical article studies the role played by science parks (SP) in encouraging the innovative activity of tenant firms. The cross-section data used combines information regarding 18 Finnish SPs and 252 local tenants. Apart from the innovative activity of a firm, accounted for using data on applications for patents and utility models over the period 1970-2002, all the other firm and SP characteristics refer to the year 2002. The estimations are done using count models such as Poisson and the negative binomial model, and the Tobit model for censored data.

The paper is very well and clearly written. I also appreciate that the author emphasizes in several instances that her empirical analysis is only able to show the existence of relations between variables but does not reveal the direction of causality.

The subject addressed by the author is highly relevant as it brings new evidences regarding the importance of extant infrastructures for the innovative activity of firms. This subject fits very well within the theme of this special issue, "The Knowledge-Based Economy: Transition, Geography and Competition Policy".

I would like to raise several questions regarding the empirical analysis:

1. The dependent variable is defined as the total number of patent and utility model applications that a firm has submitted after becoming tenant of a SP. As different firms have entered a SP in different years, the dependent variable varies across firms due to differences in the innovation levels, but also due to differences in tenancy length. I would suggest replacing this dependent variable with the average number of patents per year during the occupancy of a SP. Also, I would suggest replacing the explanatory variable $Npout_i$ by the average number of patents per year that a firm has submitted before SP tenancy. These variables will facilitate the comparison between the innovative activity of a firm before and after becoming a SP tenant, and the comparison of the innovative activity across firms. In addition, they will account in a more direct way for selection and self-selection problems, and $Npout_i$ and $Yyout_i$ will not be anymore correlated.
2. It would be nice to have some further descriptive statistics regarding several variables:
 - a. the moment in time when firms have joined the SPs (maybe the distribution of firms by year of entry). Is there a big variation in the entry year?
 - b. in general, the paper needs to have some descriptive statistics for all the variables used in the model (at least their means and their standard deviations and, not necessarily included in the paper, a correlation matrix of all the variables).
 - c. the % of zeros in the dependent variable
 - d. patents and utility models: it would be nice to have same statistics, separately, for each type of protection (for example to have the information in table 1 and figure 3 separately for patents and for utility models).
3. Since the author uses data on patents and utility models that tend to protect different types of innovations, it would be interesting to see if tenancy to a SP promotes equally or not

the two types of innovation.

4. From the definition of “patent rate” (the second line from the bottom on page 24), I don’t see any difference between this variable and the former dependent variable (the number of patent applications). Also, I couldn’t find the results based on the “patent rate”.
5. The existence of spillovers is inferred based on the coefficient of the number of companies co-located in a SP. If the data allows, it would be further interesting to investigate if it is the overall number of tenants of a SP that matters for spillovers, or it is rather the number of tenants within the same industry (as the two, I guess, are correlated).
6. Furthermore, I wonder what the coefficient of the number of tenants in a SP actually captures. Does it capture spillovers or does it capture new collaborations within the SP that has lead to new patent applications. If it is not too difficult, the author might want to take into account the number of patents done in collaboration with other tenants of the same SP to distinguish between actual spillovers and the fact that the number of patents might grow due to new collaborations created inside a SP.
7. On page 30, the author might want to justify her choice of the interaction terms, *unibio* and *bigele*. Why she thought that, among many interaction terms, these should lead to significant results? Such an explanation would improve the readability of the paper.

Other comments

- The definition of the dependent variable (“the number of patent applications”) given on page 23, the first paragraph of section 5, is not clear. Only in the next page it is stated that the dependent variable takes into account only patent applications submitted after becoming a SP tenant.
- In the introduction, when discussing the results, it would be nice to mention the SPs’ and firms’ characteristics that make SPs to perform their role of seedbeds of innovation.
- One of the important concepts used in this paper, that it is mentioned frequently, is the “utility model”. Since utility models are not so well known, it would be good to mention that they offer a shorter protection for the innovation and that are cheaper to obtain and maintain. In Finland utility models offer a 10 years protection while patents generally offer protection over no more than 20 years.
- From the definition of *howm_i*, it is not clear if this variable stands for the number of branches that a firm has in the same SP or all over the 18 SPs. The discussion that follows the definition suggests it is the second case. How a situation in which a firm has more than one unit located in the same SP could be distinguished from the case when a firm has the same number of units but are all located in different SPs?

Other minor comments

- the list of references is not complete. For example the following articles are not included in it:
 - Tekel (2009)
 - Schankerman and Pakes (1986)
 - Trajtenberg (1990, 1996)
- as in the case of firm characteristics ($X_{i,s}$), when presenting the SPs ($Z_{j,s}$) the author might enumerate these variables at the beginning of the section (4.1.1 Science parks’ main

features) rather than in the paragraph above this section.

- a “.” is missing on page 19, first paragraph, the sentence that ends with “lifetime (and that, therefore, might have got incubated)”
- in footnote 19 the author could specify the chapter of Green (2000) that the reader should consult.