Services Innovation and Economic Performance: An analysis at the firm

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Abstract In this paper we estimate a model linking innovation effort and economic performance, along the lines of the Mairesse and Mohnen (2003) model. We examine this relationship in the context of services sectors instead of Research and Development intensive manufacturing sectors. Much effort has already been made to explore the innovation-performance relationship for manufacturing sectors but it is still much understudied for services, particularly for Portugal. In this paper we aim to take a step in fulfilling this gap. We use new firm level data for ten services sectors from the Second Community Innovation Survey of Portugal, to estimate the model.

In fact, empirical innovation studies have, until recently, focused almost exclusively on manufacturing industries. The reason is obvious: Research and Development and even the wider concept of technological innovation are more visible in the manufacturing firms. Implicitly services activities were seen as independent of technology, although nothing was really stated explicitly about it. This situation stayed unquestioned until the mid 1980's when the Information and Communication Technologies began to diffuse rapidly, first in the financial sectors and then spread to virtually every industry. Since then, services activities started to be a separate object of economic investigation from a technological and innovation perspective (they were already individually studied in management science and sociology, for instance). At the same time, the ever increasing weight of services in product and employment at the national level, in the more developed economies, points to a structural change in these economies. This fact made even more acute the need to empirically study services activities.

The increased attention in this area revealed that innovation took other forms besides technology (organizational, design). In a first moment these were considered as particular characteristics of services that required a different approach from the one used in manufacturing. This is still the object of much debate but some more recent perspectives point to a continuum of characteristics that apply both to services and manufacturing, with each industry having its own combination of characteristics, without a clear separation between services and manufacturing.

In fact, services studies have called attention to aspects not exclusive of services but also relevant in the manufacturing domain, that were kept unnoticed only because they are less visible than strictly technological aspects, more visible in manufacturing contexts. The integration of services and manufacturing is a trend that seems to be increasing.

Nevertheless, the usual empirical difficulties of measurement are, in general, even more serious in services industries. That is the reason why the large majority of services studies use descriptive methods, a common characteristic of areas of investigation that are still in their early stages of development. Descriptive analysis is obviously valuable and it is through it that clues might be found for more rigorous approaches. These difficulties should not be an argument for not trying to use quantitative methods. Even with the severe limitations imposed by the available data, these tentative steps seem very useful because they reveal directions for further qualitative inquiry and, in this interaction, we hope, progress can be made.

As far as we know, only two such works have been done, so far, relating innovation to productivity. The present work differs from former approaches, in the services context, in two aspects: the way the innovation-productivity relationship is modelled and the econometric estimation methods used.

Instead of establishing a simple direct link between innovation and labour productivity, we have taken into account not only the result of the innovation process but also the activities prior to the market introduction of the innovation, allowing for a direct and an indirect effect (through innovation output) of this variable on labour productivity. We model the relationship between innovation and economic performance as a set of simultaneous equations and so we decompose this relationship into three relationships. The first explains the innovation effort intensity (an input in the innovation process). The second one relates service innovation (an output of the innovation process) to effort intensity, and some other explanatory variables. Finally, the third relationship links labour productivity to both service innovation (a direct effect) and effort intensity (an indirect effect that operates through the production of innovation output, that itself feeds onto productivity). In each relation, we consider a set of common determinants and some idiosyncratic ones. A feedback effect of innovation output on innovation input is introduced. In so doing, we add some more structure to the estimation of the complex relationship between innovation and economic performance.

We have also tried to deal with the many econometric problems of this economic relationship and this data. That effort is still in progress.

We examine the sensitivity of the results to a level versus a growth rate specification and to alternative econometric estimation techniques.

Estimating the three relationships as a system, with the Generalized Method of Moments, gives a negative impact of innovation output on productivity and a positive impact of effort intensity.

As other services innovation studies use a single equation specification we also estimated the equations of the model separately. We estimate the innovation effort equation as an independent Tobit and innovation services equation as an independent Probit. We estimate the labour productivity equation by the Instrumental Variables approach through a two steps procedure. We observe that the results change dramatically. Estimating the equations separately gives a positive and very large effect of innovation output on productivity and a negative effect of innovation intensity. This unexpected result leads us to conclude that the econometric methods used are of crucial importance in this context and that particular care must be taken in this respect (including evaluating, in the specific data context, the validity of the hypothesis implied by the estimation methods) in order to have confidence in the results one gets from the empirical estimation of models. As a consequence, this paper doesn't present final results (as far as one can qualify a conclusion as final) but is more an exploratory work pointing to further investigation, which we are currently doing.

The great sensitivity of the results to different specifications and different estimation methods clearly indicates the need for further investigation in this area. It is still not clear actually which type of specification and estimation should be preferred. The specific characteristics of the data (heteroscedasticity, endogeneity, selectivity and censoring) require particular care with the econometric methods used.

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