

# A comparative perspective on innovation and productivity in manufacturing and services

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**Abstract.** This paper serves as another complementary link in a chain of a rather limited number of investigations in the R&D-innovation-productivity relationship within service industries. Innovation has been found to be a major contributor to productivity growth in manufacturing. In this paper, the importance of innovation is explored by comparing manufacturing and service firms in a sample of knowledge intensive industries. In particular, we intend to find evidence on the following two issues. First, is there any evidence that the reported weak rate of productivity growth in knowledge intensive services can be explained by a low propensity to be innovative? Second, is it possible that knowledge-intensive service firms are less efficient in deriving benefits from innovation than knowledge-intensive manufacturing firms? Empirical results based on innovation survey data indicate a surprising similarity in innovation performance between the two categories of firms.

**Key words:** Productivity – Innovation – Manufacturing – Services – Applied Econometrics

**JEL Classification:** C31, D24, L60, L80 O31

## 1 Introduction

The purpose of this paper is to bring a comparative perspective into the relationship between innovation and productivity in manufacturing and services. A large number

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\* The author gratefully acknowledges financial support from Vinnova, Swedish Agency for Innovation Systems. The author would like to thank Almas Heshmati, Gunnar Eliasson, Roger Svensson and one anonymous referee for very helpful comments and suggestions on an earlier version of this paper.  
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of studies have been done on the innovation-productivity link in the manufacturing sector. This study reports new results on this link by incorporating services into the analysis.

The uniqueness of this paper is that it is one of the first attempts to estimate a quite large number of firm level observations from both manufacturing and service firms based on an identical questionnaire as well as an identical modeling framework.

During the last two decades, the rate of growth in the manufacturing sector in Sweden has been about twice as high as the growth rate in the service sector. Finding a similar pattern in the U.S. economy, Triplett and Bosworth (1999) refer to the classical Baumol (1967) article and argue that, if the data are right, one might infer that the shift in the economy towards a larger share of services suggests slower growth in the aggregate productivity of the total economy.<sup>1</sup>

This paper considers two different samples of knowledge intensive firms, which represent some of the most dynamic parts of the Swedish economy when value added is considered. First, we have a group of manufacturing industries: pharmaceuticals; machinery and equipment; office machinery and computers; electrical and communication equipment; instruments and watches; and transport equipment. They are defined as knowledge-intensive according to their high degree of R&D intensity. The second category is business service firms the knowledge intensity of which is reflected in the high ratio of employees with a university degree to the total number of employees, as well as in a high ratio of R&D investments to sales.

Since the beginning of the 1980s, the average annual growth rate in value added has been an impressive 5 percent for both knowledge-intensive manufacturing and business services. The reported growth rate in labor productivity, however, differs considerably. While the average value added per working hour in knowledge-intensive manufacturing increased by 130 percent between 1980 and 1998, the corresponding rate of growth in business services was only 20 percent or about one percent per year.

One possible explanation for this large difference in growth rates is that it is much harder to increase productivity in service producing industries than in manufacturing, in line with the Baumol hypothesis. But the figures might also be incorrect. It is well documented in the literature that there are notorious problems measuring service production.<sup>2</sup>

In this paper, two in several aspects homogenous samples of manufacturing and service firms are compared. Both have domestic manufacturing firms as the main customers, and knowledge is a crucial production factor for competitiveness

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<sup>1</sup> There is also a large degree of heterogeneity in the annual productivity growth rates in the manufacturing sector. The extremes of the 2-digit ISIC code levels in Sweden are, on the one the end, electrical and communication equipment, with more than 10% annual growth rates, and, on the other, office machinery computers, with a negative rate of growth. The service sector shows smaller disparities between individual industry growth rates, but there are rather substantial differences. For example between post and telecommunications on the one hand, and personal services and hotels and restaurants on the other.

<sup>2</sup> For instance, see Fuchs (1969), Mohr (1992), Griliches (1992), Griliches and Mairesse (1993), Sherwood (1994), Armknecht et al. (1992), Dean and Kunze (1992), Armknecht et al. (1997), Baily and Zitzewitz (2001), Heshmati (2003).