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Intensity of Business Enterprise R&D Expenditure and High-Tech Specification in European Manufacturing Sector

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Abstract

Endogenous growth theories draw attention to technological innovation created within the research and development (R&D) activities to explain the productivity growth of new economies. Accordingly, this study attempts to identify the relationship between the business enterprise R&D expenditure and productivity growth via indicating the role of transformation in manufacturing sector towards high tech production. Thus, the hypothesis tested in this study is whether business enterprise R&D expenditure is a main determinant of high tech sectors of manufacturing. We examine the relationship between the intensity of business enterprise R&D expenditure and high technology specification in European countries based on a panel causality analysis performed by Generalized Method of Moments (GMM) for the annual data from 2000 to 2013. Empirical findings support that there is a strong causality from increasing business enterprise R&D intensity to the expanding share of high and medium-high manufacturing. Thus, our study concludes that business enterprise R&D expenditure is one of the main sources of improvement in the technological capability of high value-added production in Europe. The important policy implication of the results is that public policies should create an appropriate incentive for private R&D activities in order to provide a transformation in manufacturing sector towards high tech specification and continued growth in economy depending on innovation.

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Keywords: Business Enterprise Research and Development; High Tech Manufacturing; Industrial Structure

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1. Introduction

In the framework of the "new economy" paradigm, while capital and labour alone cannot account for economic growth, it seems that total productivity growth related to the accumulation of knowledge is essential. Accordingly, the term "knowledge-based economy" used to call new economy results from a fuller recognition of the increasingly role of knowledge in economic growth (OECD, 1996, p.3). As a popular approach of economic growth literature, endogenous growth theory also argues that the basic source of long-run economic growth is the accumulation of knowledge**.** Accordingly, developments in science and technology as basic sources of knowledge-base play a leading role in generating economic growth**.** Indeed, numerous studies have demonstrated that technological progress has a significant impact on output performance (Romer, 1990; Grossman and Helpman, 1991; Aghion and Howitt, 1992; Hannel, 2000; Wakelin, 2001).

Consequently, economies have been experienced a dramatic structural change depending on accelerating technological improvement over the last decades. In order to capture the link between technological improvement and accelerating productivity growth it is necessary to take the structural transformation of manufacturing sector into account. Therefore, economists focus on the relationship between the changing economic structure of a country and its productivity growth. Researchers have finally revealed a shift towards technology-intensive industries in the structure of the new economy. Accordingly, they argued that the output of high-tech industries clearly expanded over the last decades and hence accounts for a significant part of modern economies' growth. In other words, high-tech sector is widely regarded as the crown of industrialization and the key to long term national growth and competiveness (Lee and Tang, 2013, p.18).

Indeed, the importance of high-tech sector on the productivity growth of new economies is widely accepted although there are some controversial empirical results has been indicated in literature (Varum et al . 2009, p.405). Thus, structural change existing by increasing share of technology intensive or high-tech manufacturing in total manufacturing sector is the direct cause of the growth in economies. To put it another way, while increasing the share of technologically most progressive industries in total manufacturing sector, countries have experienced higher productivity growth. Empirical results also show that countries that have managed to increase the share of technologically most progressive industry have experienced higher productivity growth than other countries (Fagerberg, 2000; Michael 2003). Consequently, it can be argued that permanent economic growth can be provided by enlarging the share of high and medium-high technology industries in total manufacturing.

Then, the question here is what the key factor is enlarging the share of high tech manufacturing. Accordingly, after determining the leading role of high-tech enterprises in the performance of a country's growth, economists attempt to find the determinant of the increasing weight of high tech industries in new economies. It seems that studies mostly focus on the relationship between Research and Development (R&D) performance and share of high-tech manufacturing (Nunes et al 2012, p.37). To put it another way R&D activities have been taken central stage in analysing the dynamics of enlarging high-technology industries. Based on the above consideration, the main objective of this paper is also to analyze and quantify the relationship between research and development (R&D) activities and high-tech manufacturing in European countries.

The remainder of this paper is set out as follows. Section 2 reviews the literature on the relationship between R&D investments and development of high tech manufacturing. Section 3 describes data and methodology and presents empirical results. Finally, some concluding remarks and policy implications are provided.

2. Literature Review

Research and Development (R&D) activities resulting in new production process is generally accepted as a major source of technical change leading productivity growth in an economy. In order to capture the links between R&D intensity and accelerating productivity growth, it is the best way to take the structural transformation of manufacturing sector into account. Structural transformation of manufacturing sector here refers to changes in the