Chapter 14
The Impact of Research and Development Expenditures on the Growth of Turkish Manufacturing Industry

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ABSTRACT

Emerging markets depend on technological development and innovation rather than cheap labor, as they are important instruments for sustainable economic growth. The most common indicators of technological development and innovation are the Research and Development (R&D) expenditures and the number of employees participating in research and development activities. The aim of this chapter is to measure the impact of research and development expenditures as a technological innovation indicator on the growth of firms in the Turkish manufacturing and non-manufacturing industry for the time period 2003 and 2007. In this framework, labor, investment, and R&D expenditures are used as factors, which affect the growth of the firms. Then, economic activities of manufacturing industries are classified with respect to technology intensity as high, medium-high, medium-low, and low technology level. Empirical findings indicate that R&D expenditures enhance firm growth, especially for the firms in low and medium technology level sectors.

INTRODUCTION

In parallel with the development and deepness of the economic systems, importance of competition has increased not only among countries but also among firms. In the fast growing economic markets, individuals' demand for the goods makes a major contribution to this competitive environment. In the competitive markets, economic units need technological innovation in order to make a difference. The Research and Development (R&D) activities using human capital and existing knowledge stock generate technological innovation, which in turn is used in the production of

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final goods and leads to permanent increases in the growth rate of output. Griliches (1979) was the first to consider R&D capital stock as a factor of production, arguing that R&D activities add to the existing stock of accumulated knowledge of firms, leading to productivity growth through product and process innovation. It is well known that technological progress is endogenous and driven by the deliberate investment of resources by profit-seeking firms, and that a firm's innovation activity is central to its technological progress and productivity growth (Smolny, 2000). Thus, R&D can be considered as a key long-run determinant of productivity and economic growth.

Technological innovation is regarded as one of the major determinants of productivity, as the same level of output may be produced with less input of both labor and capital. Moreover, technological innovation may also increase efficiency by enabling firms to reach the production frontier. Furthermore, technological innovations may enable firms to reduce the costs at the production process. Hence, profit maximizing firms have to make technological innovations in the competitive markets. Additions of new goods to the economic system, improvements of the quality of available goods, usage of new transportation ways of products and the change or the development of the manufacturing type are regarded as the contributions of technological innovation activities to the economic systems.

BACKGROUND

Studies of the relationship between R&D expenditures and productivity appear at different levels of aggregation (economy, sector, firm) depending on the objective of the analysis. Generally, these studies reach the conclusion that R&D fosters firm productivity with estimated output elasticity with respect to business R&D varying from 10% to 30%[1]. The large variation in the R&D elasticity is mainly attributed to the fact that studies differ in terms of the econometric specification, data sources, number of economic units, measurement methods for R&D and economic performance, and periods under study. The bulk of studies examining the relationship between innovation and firm-level productivity is inspired by the seminal paper by Crépon *et al*. (1998), which employ a structural model where R&D expenditure, innovation output and productivity are modeled in a sequential manner. Innovation output is measured by either the number of patents or the share of innovative sales. Variants of this model employed by Crépon *et al*. (1998), have been estimated for developed and less developed countries based on firm-level data (See for example Parisi, et al., 2006, for Italy; Loof & Heshmati, 2002, for Sweden; Loof, et al., 2003, for Finland, Norway, and Sweden; Galia & Legros, 2004, for France; Benavente, 2006, for Chile; Stoevsky, 2005, for Bulgaria). These studies generally confirm the findings of Crépon *et al*. (1998) reporting that innovation expenditure affects innovation output and the latter affects productivity.

Although investigation of determinants of technological innovation of firms has become an important research area, there is limited empirical evidence concerning growth effects of R&D activities in Turkey. The empirical studies about innovative technological development of Turkey mainly focus on the relationship between R&D activities and employment in the manufacturing industry. It has been reported that innovative activities of firms enhance their productivity, but its effect on employment in manufacturing industry is ambiguous (Taymaz, 1997; Ansal, 1998; Taymaz, 2001). There is another strand of literature that investigates the determinants of R&D expenditures in Turkey. Pamukcu and Boer (2000) report that the size of the firms, structure of the market, profit ratio of the firms, competition in the international market, international technology transfer and qualified work force create a positive effect on the innovation. Ansal (2004) discuss relation between technological innovation and economic