Chapter 6
The Relationship Between R&D Expenditures and Economic Growth in OECD Countries With Different Causality Tests

Gökhan Karhan
Batman University, Turkey

ABSTRACT

In this chapter, the relationship between research and development (R&D) expenditures and economic growth was investigated with both Emirmahmutoğlu and Köse Causality test and the Dimitrescu and Hurlin Panel Causality test based on Rolling Windows Regression for the selected 19 OECD member countries for the period 1996-2015. The results concluded that for all panel there is a causality from economic growth to R&D expenditures. In this study, the relationship between variables was investigated using different mathematical techniques like rolling windows. According to the results of the Dimitrescu and Hurlin Panel Causality Test based on Rolling Window Regression, which is applied differently from other studies in the literature, there was a causality from economic growth to R&D expenditures in 2010. In 2011, there was causality from R&D expenditures to economic growth for all panels.

INTRODUCTION

Most of the increase in living standards is due to innovation. Today, innovative performance is an important factor for determining competitiveness and national progress. In addition, innovation is important to find solutions for specific problems such as climate change and sustainable development (OECD, 2007). Humanity has managed to develop itself as a result of coincidence for many years. As of the recent past, development has begun to occur by resorting to more systematic means to reach today's level of civilization. Today, no national economy or business has grown to the point where it can be left to chance. Therefore, every business and national economy must pay attention to investments in research and development (R&D) within its financial capabilities (Zerenler, Turker, & Sahin, 2007).

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Today, the productivity levels of national economies and production structures have attained great importance in terms of achieving stable economic growth and increasing social welfare. In this framework, the tendency towards R&D and innovation activities are gaining momentum globally, and countries are creating added value with fewer resources. Research shows that innovation has a positive impact on labor and total factor productivity (TFP) and contributes to an increase in welfare. R&D expenditures are considered among the inputs required for innovation (Erkiletlioglu, 2013). Therefore, national R&D expenditures are considered as a demonstration of the innovation cultures of those countries.

The increase in R&D activities contributes to the raise in the level of innovative products which, in turns, brings an increase in economic growth via the transfer mechanism. In this context, the importance that countries give to R&D activities has become an indispensable element of sustainable economic growth. As Aghion et al., (2010) highlights, market competition in the market is caused by the entry of new innovations into the market and the exclusion of old technologies, thus increasing economic growth.

THEORETICAL BACKGROUND

Until the emergence of endogenous Growth Models, classical economists such as the Neoclassical economists and the Evolutionary approach failed to fully explain the relationship between technological growth and economic growth. These deficiencies have been addressed with the studies of Romer (1986) and Lucas (1988), whose investigated economic growth model that includes knowledge referred to as Endogenous Growth Models.

The ''endogenous'' term refers to innovations that arise from conscious activities realized by companies or consumers to maximize their profits or benefits (Dinopoulos & Şener, 2003).

The Endogenous growth theories emphasize that the main driving force to ensure the sustainability of growth are R&D activities and that the inputs related to these activities should be supported. Although there are many studies that attempt to explain the impact of R&D activities on growth, there are two main approaches.

In the first group of models (Romer, 1986; Lucas, 1988; Rebelo, 1991; and Barro 1990), technological development is indirectly caused by economic activities which are related to some other factors. The common feature of these group models is that they are based on competitive market conditions. Rebelo's model (1991) which shows in the simplest way that per capita growth can be sustained even in the absence of external technological development by abolishing the assumption of the diminishing marginal return of capital.

$$Y = AK$$

In the model, Y represents output of economy, A represents level of technology and K represents capital. In this function, it is assumed there is a linear relationship between the capital and the output of the economy. A general feature of the model is the broad evaluation of the capital factor which is shows by K. In other words, there are human capital factors within the capital. The distinguishing feature of the second group of models (Romer, 1990; Grossman & Helpman, 1989; Aghion & Howitt, 1992) is that technological development can be achieved via direct investment to technology by a separate sector and based on non-competitive markets. In the extant literature the second group of models are also referred