The Influence of Foreign Direct Investment on Research and Development in EU Countries

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Keywords:
Foreign Direct Investment; R&D; Innovation; EU countries

Abstract: Over the last few decades, in modern conditions of globalization, the innovation landscape has changed quickly, affecting the world. In developed countries and economies in transition, Foreign Direct Investment (FDI) has become a driver of economic development and modernization. Research and Development (R&D) is widely acknowledged as a critical factor that stimulates innovation and technological advancement to increase productivity and economic growth. FDI promotes rapid economic restructuring and facilitates the acquisition of new technologies. FDI, as a crucial conduit of cross-border technology diffusion, is a significant factor influencing R&D activities in an economy. One of the most efficient ways for national economies to overcome the technology gap with their global competitors is to use knowledge spillovers from FDI. In order to improve their technical capacity, countries may encourage companies to invest more in R&D through FDI and absorb technology transfers from it. This paper’s objective is to test the influence of FDI net inflows on the R&D investment in the sample of 27 EU countries for the period 2015-2021. To provide an empirical investigation of the influence of FDI on R&D, regression analyses were performed. The results of the analysis confirm the importance of FDI for R&D in the case of EU countries. This study revealed that FDI has a positive influence on R&D. The evaluation of the obtained results can serve as a foundation for drawing further conclusions, contributing to the existing literature and FDI strategy of EU economies.

1. INTRODUCTION

Nowadays, in a highly globalized world, the wealth of natural resources is no longer a major determinant of competitiveness. For countries that want to improve their competitiveness, it is essential to develop new technologies and products due to the sharp and intensive structure of global competition. The capacity to develop various and more innovative high-tech products, generated through R&D and innovation, supported by FDI, has recently gained greater significance (Erdal & Göçer, 2015, p. 749). Due to the substantial technological gap in emerging economies, it is challenging for domestic firms to reach the level of technology-developed companies. To overcome the technological gap with their international competitors, local firms in developing countries can benefit from knowledge spillovers from FDI. As a result, the presence of FDI might encourage local enterprises to invest in R&D and innovation and to take advantage of technology transfers from it (Khachoo & Sharma, 2017). One of the common methods that companies increase their technological capacity and enhance their market intelligence is through FDI in R&D (Li et al., 2022).

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The 21st century has been described as the “knowledge-based economy” following the growth of high-tech industries, which is being formed through significant scientific R&D activities (Wang, 2010, p. 103). A well-organized process of knowledge production, diffusion and application is well-known as research and development (R&D). One of the main factors affecting the economic growth of a country is the accumulation of knowledge. A deliberate investment in R&D or the widespread use of current technologies may both expand the stock of knowledge. Technology spillovers from the stock of knowledge, generated by R&D activities, have a significant role in improving a company’s productivity. R&D fosters innovation as well as enhances a company’s capacity to discover, integrate and utilize outside knowledge. Besides that, R&D indirectly leads to a greater level of technology spillovers and boosts the firm’s capacity for absorption.

The ability to develop countries to compete in a dynamic international market structure depends on a combination of the technological capabilities of national companies and the impact of external factors such as FDI (Erdal & Göçer, 2015, p. 751). FDI is one of the most significant vehicles for the diffusion of technology because it allows the transfer of technology embedded in human capital. FDI is particularly significant due to that promotes faster economic restructuring, stimulates stronger corporate governance, and makes it easier to acquire new technologies (Kathuria, 2008, p. 46).

This research paper is organized as follows. Firstly, after the introduction, the theoretical aspect and the relevant existing literature on the relationship between FDI and R&D is given. The second section gives a quick overview of the data used, the important methodological concerns, as well as an overview of the results and their discussion. A summary of the conclusions is presented at the end of the paper.

2. LITERATURE REVIEW

The impact of FDI on R&D has been a topic of discussion at the macro and micro levels. From a macro-perspective, it is related to the issue of de-industrialization, while from a micro-perspective, the case focuses on how FDI affects R&D at the corporate level (Lin & Yeh, 2005, p. 1790). From a macro aspect, some authors (Lin & Yeh, 2005, p. 1790) emphasize that FDI may substitute for domestic investment. Still, they also note that better resource allocation and technical advancement can boost industrial productivity. Conversely, macroeconomically, FDI motivation and strategic goal may be used to infer the impact of FDI on business internal R&D. FDI is intended to acquire strategic assets or develop firm-specific advantages.

Several theories have been presented in the literature that FDI inflows increase the R&D conducted in the host economy. In order to examine the effects of FDI on R&D and innovation in 10 Asian economies between 1996 and 2013, Erdal and Göçer (2015) employed the panel causality and integration technique. They discovered that FDI inflows increase the host country’s R&D and innovation efforts. In a sample of 21 developed and emerging countries, Alvi et al. (2007), explored whether patent protection and knowledge transfer encourage R&D. The findings imply a threshold effect, according to which FDI only has a positive impact, if the country depends heavily on FDI inflows. Sandu and Ciocanel (2014) affirmed that FDI is boosting the output of high-tech products, the number of patent applications and national intellectual capital through R&D investment. According to a study on Indian manufacturing companies “FDI inflow induces foreign-owned firms in high-tech industries and firms with minority ownership to invest in R&D” (Sasidharan & Kathuria, 2011, p.126). Findings of some academics (Anwar & Sun, 2015; Khachoo & Sharma, 2017),
confirm that FDI has a significant effect on local firms’ R&D investment. Likewise, Taiwanese authors (Lin & Yeh, 2005), found a strong positive relationship between FDI and R&D in the IT sector. As the authors rightly think that FDI and R&D should be treated as endogenous variables in empirical studies, they used an endogenous switching regression model to examine the mutual influence of FDI and R&D in Taiwan’s IT sector. Another study has attempted to investigate the effects of FDI on R&D and innovation using the panel causality and cointegration model in ten developing countries (China, South Korea, India, Iran, Pakistan, Malaysia, Singapore, Thailand, Saudi Arabia, and Turkey) in Asia (Erdal & Göçer, 2015). The results show that one one-point increase in the amount of FDI inflow is associated with a 0.83 % increase in R&D expenditures and, a 0.42% increase in patent applications in these countries for the 1996-2013 period.

The idea that FDI has a negative impact on R&D is widely accepted in the literature. This argument is predicated on the premise due to that FDI makes foreign technology accessible, and imitation becomes more affordable and credible (Tan & Azman-Saini, 2017, p. 469). Instead of conducting their R&D, domestic companies that lack financial and research resources will simply copy or import foreign technology. Wang (2010), used an extreme bound analysis approach to investigate the factors influencing R&D investment in 26 OECD countries. The results of his study revealed that the transfer of foreign technology through trade and FDI has a significant negative influence on R&D.

3. METHODOLOGY AND DATA DESCRIPTION

This paper aims to investigate the influence of Foreign direct investment (FDI) on the R&D activity of EU countries. The research is based on the data of the following indicators: Foreign direct investment, net inflows (FDI) and Research and development expenditure (R&D). Both indicators are expressed as percentages of GDP. Bearing in mind the various research presented in the literature review, the following hypothesis was defined:

**Hypothesis H1:** Foreign direct investment and net inflows (FDI) have a positive impact on the Research and development expenditure (R&D) in the next year.

In the research of this paper, data was obtained from the official website of The World Bank (World Bank, 2022a, 2022b). In the model of the research, FDI is an independent variable, while R&D is the dependent variable. The proposed model was tested using the program Stata (version 12.0). Firstly, all raw data was transferred in natural logarithm values. Secondly, panel regression analysis was used to evaluate the influence of the independent variable on the dependent variable in the research model. Lastly, after the identification of a balanced dataset and the assumptions are met, the fixed effects model (FEM) and random effects model (REM) were tested. Afterward, the Hausman test for the model was performed to select FEM or REM. The Hausman test had a significance cut-off point of 0.05. Therefore, the value statistically significantly less than 0.05 indicates the selection of FEM, otherwise, REM should be interpreted.

Based on the data presented in Figure 1, it's evident that among all EU member states, Cyprus (58,07%), Hungary (26,72%), Ireland (23,65%), Luxembourg (24,50%) and Malta (28%), recorded the greatest average FDI net inflow (% of GDP), throughout the period from 2015 to 2021. Analysing the presented data, Estonia (7,36%), Latvia (4,06%), Lithuania (3,93%) and the Czech Republic (3,61%) registered an average FDI net inflow below 10%. As can be seen in Figure 1, the average net inflow of FDI, expressed as a % of GDP, decreased in Austria (-2,57%) and Belgium (-0,66%). The average FDI net inflows were below 3% in all other EU countries.
Observing the R&D data shown in Figure 2, it can be noticed that Sweden had the highest average R&D expenditures (3.35%), followed by Austria (3.12%) and Germany (3.07%) between 2015 to 2021. Denmark (2.96%), Belgium (2.95%) and Finland (2.88%) had the next-highest rates. With the lowest average R&D expenditures recorded in Ireland and Poland (1.19%), Luxembourg (1.18%), Croatia (1.01%) and Lithuania (1%), six more member states reported average R&D expenditures that were less than 1% of their GDP from 2015 to 2021 (Romania – 0.48%; Cyprus, 0.53%; Latvia – 0.61%, Malta – 0.62%; Bulgaria – 0.81%).

Figure 3 presents information on the average FDI net inflows compared with the average R&D expenditures by year for 27 EU member states. Primary, we can notice that the highest increases in the average net inflow of FDI were recorded in 2015 (14.94%), 2019 (11.45%), 2020 (11.08%), 2016 (9.96%), whereas the average FDI net inflow dropped the most in 2018 (-1.49%). However, compared to the aforementioned years, a tendency of a decreased average net inflow of FDI
The influence of Foreign Direct Investment on Research and Development in EU countries may be seen in 2017 (5.21%) and 2021 (5.23%), as a result of the COVID-19 pandemic. When we look at the trend of average R&D expenditures in the EU, we can conclude that there were no significant variations during the observed period. The biggest increases between 2015 and 2021 were recorded in 2020 (1.78%), 2021 (1.70%) and 2019 (1.67%), while in the other years, there were only minor decreases (2015 – 1.61%; 2016 – 1.54%; 2017 – 1.57% and 2018 – 1.62%).

![Figure 3. Average FDI net inflow and R&D expenditures (% of GDP) per year for the member states of the EU](source: World Bank, 2022a, 2022b; authors’ work)

### 4. RESULTS

The following part of the work presents the research model, which is investigated by employing panel regression analysis of the data. The analysis of the influence of the indicator Foreign direct investment, net inflows (FDI), as an independent variable, on the value of the indicator Research and development expenditure (R&D) in the following year is presented in Table 1. It was hypothesized that the influence is positive.

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<th>Table 1. Results of regression analysis</th>
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*Note: t statistic in [ ] p-value in ( )*
The Hausman test indicates $\chi^2$ of 4.75 ($p = 0.0293$) so the FEM should be assessed. According to the previously defined methodological assumptions of the panel regression analysis, it can be noted that Foreign direct investment and net inflows (FDI) had a positive and statistically significant impact on the value of the indicator Research and development expenditure (R&D) in the following year. An increase in the value of Foreign direct investment, and net inflows (FDI) by 1% contributes to an increase in the value of Research and development expenditure (R&D) by 0.06% in the following year. Fixed effects model (FEM) results confirm that the model is statistically significant at the 1% significance level. This model explained 97.5% of changes in the value of Research and development expenditure (R&D) in the following year. Therefore, the research hypothesis H1 is confirmed according to the presented results.

5. CONCLUSION

In modern conditions, the R&D function is the core that drives the company forward. Research is the critical study of various concepts to discover new knowledge to create new products, processes and services. Development refers to the process in which the results of research work will be applied in practice. The purpose of research is to learn about laws (natural and social), and the purpose of development is for these laws to find their practical application. Today’s global competitiveness results in the production of high-tech products that are diverse and inventive. R&D investments and technological innovations determine competitiveness in the modern world. When countries invest in R&D facilities in the host company, the host country’s R&D stock and high-tech development are accelerated.

R&D plays a significant role in FDI decision-making, and FDI also influences R&D decision-making. Over the last decades, economic growth has been driven mainly by FDI inflows, while globalization has created a fierce battle for countries and companies to enhance their market share and competitive position. Thus, R&D has contributed to capital formation, export of services and FDI. In other words, R&D has played a fundamental role in investing.

In the field of R&D, FDI is considered a driver of innovation in emerging economies, thereby significantly facilitating access to foreign techniques and technology, development of employee skills and high labor productivity.

In examining the effect of Foreign Direct Investment (FDI) on R&D, this paper has contributed to providing fresh and new results. The paper derives an important result from the empirical analysis using panel data consisting of 27 member states of the EU from 2015 to 2021, which revealed the positive and significant impact of FDI net inflows on R&D expenditures.

Acknowledgment

This research was financially supported by the Ministry of Science and Technological Development and Innovation of the Republic of Serbia (Contract No. 451-03-47/2023-01/ 200371)
References


