Foreign Direct Investment, Production Factors Productivity and Income Inequalities in Selected CEE Countries

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Abstract: The issue of global economic inequality has inspired researchers to explore the potential connection between income inequalities and foreign direct investment (FDI), as it is one of the driving forces of globalization. Although there is a large body of theoretical as well as empirical studies linking these variables, the empirical literature on the relationship between FDI, production factors productivity and income inequalities is not conclusive because most scientists treat FDI as uniform. Therefore there is a lack of reliable empirical evidence on the distributional effects of FDI, especially in emerging countries, such as in Central and Eastern Europe (CEE). The research presented in the article fills this gap.

The aim of the study is to analyze the impact of the inflow of foreign direct investment on the productivity of production factors (labor, capital and total factor productivity) and income inequality of households in four Central and Eastern European countries (Poland, the Czech Republic, Slovakia and Hungary) in the period 1990–2016. The four countries were selected for analysis as a classic example of European countries transforming their economic structures and similar in terms of the level of economic development. In turn, the choice of the analysis period was related to the availability of necessary statistical data.

According to the theory of economics, the inflow of foreign direct investment should have a positive impact on production factors productivity as well as on income inequalities of households in

investment receiving countries. In the study, a research method based on the study of economic literature in macroeconomics and international finance and econometric methods (vector autoregression models—VAR) was used. Results of the research suggest a significant and positive impact of greenfield investment inflow on labor productivity and total factor productivity, as well as a positive impact of brownfield investment inflow (mergers and acquisitions) on capital productivity in countries receiving investments. Moreover, the results also revealed the lack of a statistically significant impact of greenfield and brownfield investment on income inequalities in all of the examined countries. The statistical data used in the study came from the statistical databases of the Organization for Economic Cooperation and Development (OECD), the World Bank (World Development Indicators), World Income Inequality Database (United Nations University World Institute for Development Economics Research) and Total Economy Database (The Conference Board of Canada).

Keywords: *foreign direct investments, income inequality, production factors, total factor productivity*

1. Introduction

There is no single theory capable of sufficiently explaining the phenomenon of foreign direct investment; a theory, which at the same time would respond to the question of why companies invest abroad, i.e., which would explain where they invest, and thus indicate their location when investing, at what stage of their development, and how to invest, or which would represent ways of entering the foreign markets, or their order. Different theories explain only some of these questions. All they try to explain is why a company invests abroad, the majority of authors proposing only one predominant reason. Only a few of the theories provide answers to more than one question.

There are significant differences of opinion as to the motives and meanings of foreign direct investment inflows into the country. The overarching theme in the opinions of some economists considers the maximization of the rate of profit in the long run. Others, proceeding from the separation of ownership and management, conditional legal form (limited liability company) companies come to the fore as ensuring the existence and

growth of the enterprise (survival by development) and preservation of the managers. Representatives of the theory claiming that a company does not operate in perfect market conditions conclude that the owners are not compelled to maximize the rate of profit. If they receive income equal to the cost alternative, they have the freedom to achieve other objectives within the company, for example, maximizing sales, increasing market share, making risky investments, striving to eliminate competitors from the market and increasing the prosperity of other participants in the company (stakeholders), i.e. employees and managers, which in the case of the pursuit of profit maximization would not be taken.

Behaviorists say that it is difficult to identify the relevant factors to maximize profit, in order to avoid attracting new competitors and the critical attitude of the government and the public, the company will generate a satisfactory rather than maximum profit. It must take into account ethical, environmental, safety-related work and safety of operation.

The effects of foreign direct investment in the host country can be both positive and negative. Hence, the aim of this study is to analyze the impact of foreign direct investment inflows in the form of greenfield investment and mergers and acquisitions on the productivity of production factors (labor, capital and total factor productivity) and income inequality of households in the four countries of Central and Eastern Europe in the period 1990–2016. For a detailed analysis of the abovementioned interdependences, two hypotheses were formulated.

According to the first hypothesis of the research, foreign direct investment in the form of mergers and acquisitions is an important factor in determining the productivity of production factors and income inequality in the selected countries of Central and Eastern Europe. Namely, the inflow of foreign direct investment in the form of mergers and acquisitions has a positive effect on the productivity of production factors, and a positive impact on income inequality in the countries of Central and Eastern Europe.

Finally, according to the second research hypothesis, the inflow of foreign direct investment in greenfield type is an important factor in determining the productivity of production factors and income inequality in the countries of Central and Eastern Europe. Also, in this case, the inflow of greenfield investment has a positive effect on the productivity of production factors and on income inequality in the surveyed countries.

2. Literature review

The impact of foreign direct investment on economic growth has been largely studied empirically, both at the macro and micro level. These studies were inspired by the theories of the technological spillover which transnational corporations can transfer with foreign investment to the host country. These theories identified several channels through which followed the spillover of technology. As for the phenomenon of imitation by local companies, technological solutions were applied in the context of transnational corporations; the acquisition of new managerial and organizational skills of local workers employed by the transnational corporations engaged in foreign investment in the domestic market and increased competition from multinational corporations, which may force the domestic enterprises to more efficient use of technical knowledge. All of these factors contribute to the higher productivity of domestic firms.

Despite many empirical studies conducted so far, in economic literature, there is still no uniform views regarding the role of foreign direct investment in promoting economic growth. While some empirical studies have demonstrated the positive impact of foreign direct investment on economic growth (Garcia-Santana *et al.*, 2016; Bitzer & Gorg, 2009; Woo, 2009), other studies have shown that the presence of foreign investors has a negative impact on productivity growth in the host country, or that the impact of these investments in the national economy is not entirely clear (Carbonell & Werner, 2018; Ang, 2009; Azman-Saini, Law & Ahmad, 2010).

There are also no uniform views among economists on the impact of the inflow of foreign direct investment on income inequality in the host country. According to the so-called optimal income disparity hypothesis, it assumes that there is a certain level of income inequality which is optimal from the economic growth point of view. If income inequality is lower than the optimal level, the most creative, productive and skilled workers are not sufficiently paid and motivated to make full use of their abilities and skills in business. When the income of these workers does not differ significantly from the income of less qualified employees and is characterized by lower yields, the former employees may feel undervalued. This situation leads to lower efficiency of their work and motivation and desire to improve their skills. In this situation, the inflow of foreign direct investment may help to reduce or even decline in labor productivity growth of the most qualified employees and to increase their income. This situation may result in an increase in

income disparities in the country (Lipsey & Sjöholm, 2004).

On the other hand, if income inequality is higher than the optimal level, lower-skilled workers receive relatively low wages. This can cause a feeling of injustice, exploitation and poverty. This situation is detrimental to the social bonds that weaken the ties between workers and employers. As a result, workers with relatively low incomes are less likely to creative thinking and commitment to work. In this situation, the location of foreign direct investment in the country due to lower labor costs may increase the income of workers and contribute to the reduction of income inequality in the country.

Herzer, Huhn and Nunnenkamp (2013) analyzed the impact of foreign direct investment on income inequality of households in Latin American countries during the period 1980–2011 using cointegration techniques. The study panel revealed a significant and positive impact of the inflow of foreign direct investment on income inequality in the analyzed economies.

Chintrakarn, Herzer and Nunnenkamp (2011) studied the impact of foreign direct investment on income inequality in the US in the period 1977–2001. The results of the analysis revealed a significant and negative impact of foreign direct investment on income inequality in the United States. At the same time, it should be emphasized that studies have shown that there is considerable diversity of the long-term impact of foreign direct investment on income inequality in each state. Namely, in 21 of the 48 states surveyed, a positive impact of foreign direct investment on income inequality was reported.

Basu and Guariglia (2007) analyzed the relationship between foreign direct investment, economic growth and income inequality in 119 developing countries in the period 1970–1999. The results showed the positive impact of the inflow of foreign direct investment on economic growth and the negative impact of foreign investment on income inequality in the countries surveyed.

A study by Adetunji and Musibau (2018), concerning the effects of inward FDI on income inequality in Nigeria between 1980 and 2016, showed that positive FDI shocks reduce income inequality while negative FDI shocks increase income inequality in the short run. However, in the long run, relationships between these two categories were inconclusive.

A research conducted by Bogliaccini and Egan (2017) revealed that foreign direct investment in the services sector is associated with greater income

inequality, while foreign direct investment in the production sector is not strongly associated with higher income inequality. Their research is based on panel data from 60 middle-income countries in the period 1989–2010. The researchers believe that skill-oriented technological change, along with the redistribution of investment and employment away from the manufacturing sector, creates a link between FDI and higher inequalities in developing countries.

Bruno and Cipollina (2017) analyzed, in their research, some of the latest findings presented in the economic literature regarding the impact of foreign direct investment on economic growth in the old and new EU Member States. Their research results show that, on average, FDI has a positive, indirect impact on productivity. The impact is particularly significant in selected European countries and was interpreted by the authors as a sign of better absorption capacity in these countries.

Desbordes and Franssen (2019) analyzed the intra-industry and inter-industry effects of foreign direct investment inflow on the productivity of 15 emerging economies in 2000 and 2008. The authors revealed a large positive impact of intra-industry FDI on total and export-related labor productivity. Foreign companies increase the efficiency of their host economies mainly through the composition effect. Foreign companies are usually larger than domestic companies; they use physical capital, human capital and semi-finished products more intensively and have greater access to foreign markets. Therefore, their greater prevalence in a given sector automatically increases average labor productivity and export efficiency.

3. Measures of production factors productivity

Factor productivity indicators measure the size of the product, which is created with the involvement of specific resources. Such a construction of these indicators implies two basic criteria for their division, which includes, on the one hand, the type of inputs as to which productivity is measured, and on the other hand, a method for measuring the effects, which brings commitment data inputs. Both of these criteria are complemented by the distribution of different types of sectoral divisions that allow us to assess the state of development of different areas of the national economy of the country concerned.

Table 1. Basic types of productivity measures

Type of output measure	Type of expenditure		
	Labor	Capital	Labor and capital
Gross output	Labor productivity (based on gross output)	Capital productivity (based on gross output)	Capital-labor MFP (based on gross output)
Value added	Labor productivity (based on value added)	Capital productivity (based on value added)	Capital-labor MFP (based on value added)
Factor productivity	Single factor productivity measures		Multifactor productivity (MFP) measures

Source: OECD, 2001

Labor productivity is generally calculated as real GDP divided by the number of employees or the number of hours worked. Labor productivity increases if real GDP increases faster than the number of employees (hours worked). Labor productivity is one of the most important factors in long-run economic growth and a very important indicator of the competitiveness of countries. Labor productivity is positively correlated with real income and living standards. The increase in labor productivity means that companies are willing to increase employment, provided that there is sufficient market demand for their manufactured goods or services. This, in turn, causes an increase in labor demand and wage growth.

Growth in labor productivity can also benefit consumers. More efficient companies can reduce the price of goods and services produced, which means that consumers can purchase more of these goods, or redirect the money saved for the purchase of other goods. This, in turn, will bring an increase in revenues for their manufacturers, which should translate into an increase in wages and/or an increase in hiring.

Companies can also assign all or part of the profits on new investment or pay it as dividends to shareholders. In a situation where both employees and business owners decide to save as a result of productivity growth measures, the overall demand in the economy is also expected to increase, because the increase in savings causes downward pressure on interest rates. If that

happens, it will encourage consumers to borrow (cheaper) loans, which will allocate, e.g., for the purchase of assets, such as real estate or cars.

Among the negative impacts of the increase in labor productivity, the most important one is a possible increase in income inequality (wage growth may spread out unevenly among different groups of employees). In the case of labor productivity growth and the lack of sufficient demand for their products or services, companies can also reduce labor surplus. However, neither the economic theory nor empirical data support the growth of labor productivity leading to higher unemployment. New jobs may, however, emerge in other locations (towns) or in other sectors of the national economy to replace the jobs that have been lost due to labor productivity growth.

Capital productivity is the ratio of the total volume of manufactured product to the capital expenditure incurred to produce the same product. What is more, the concept of the average product of capital is often used. A somewhat different meaning of the productivity of capital is represented by the product per unit in capital expenditure. The productivity of capital depends on the relative rate of change of the product and capital expenditures.

The concept of capital productivity is related to the concept of marginal productivity of capital, understood as the increase in the volume of production as a consequence of the capital increase in the volume of the unit, in a situation where the rest of the production factors remain unchanged. It seems to be important to introduce the term of diminishing marginal productivity of capital, consisting in the fact that in the situation the size of the workload does not change above a certain level, as the amount of capital increases the marginal productivity of capital decreases.

If the marginal product of capital is greater than the productivity of capital, then the capital increases by one unit in capital expenditure, which will increase the productivity of capital. In connection with the *law of diminishing returns*, marginal product relatively quickly drops below the average product. As a result, a further increase in capital expenditure will make the decrease of average product.

A far better measure of productivity than labor productivity is the ratio of total factor productivity (multi-factor productivity), showing the generalized output per unit in capital expenditure—i.e., the efficient use of both labor and capital (physical and human). The differences between labor productivity and total factor productivity for the same periods are mainly due to the changing of the second factor, the capital-labor relations.

TFP calculation can be made using one of two methods. The first method uses the index technique, and the second—the production function. If the production is a Cobb-Douglas production function, the level of TFP (defined as production made from a combination of units of production factors) in the period t is expressed as:

$$TFP_t = \frac{Y_t}{f(K_t, L_t)}$$

The transformation of the expression (2) to form $Y_t = TFTP \cdot f(K_t, L_t)$ and compare the output equation leads to the conclusion that the level of TFP corresponds to the factor $A(t)$, describing production technology in a two-factor production function with neutral technological progress in the sense of Hicks.

Estimation of elasticity is possible by specifying the form of the production function. It generally takes a two-factor Cobb-Douglas function in the form of power:

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha}$$

where Y_t is the volume of production in constant prices; A_t —total factor productivity ($t = \text{FPT}$); K_t —the value of capital in constant prices; L_t —workload; α ($1 - \alpha$)—production elasticity relative to capital and labor inputs.

To estimate the TFP rate of growth, it is sufficient to know about manufacturing flexibility with regard to individual factors. Technical progress, and therefore also the total factor productivity, are often treated as an exogenous variable. Attempts to explain the sources of technological progress (TFP growth) are taken on the basis of the theory of endogenous growth.

4. Measures of income inequality

Inequality means different things to different people. For some, it is an ethical problem, and therefore a high level of inequality should be avoided. One of the forms of inequality is income disparity, i.e. the inequality of income distribution of households in the country. Generally, there are three “levels” of inequality. Global inequality refers to disparities in income between all the people in the world. International inequalities relate to economic disparities between countries. There is also national inequality—i.e., income disparities

between people in the country. To analyze these disparities, the average income or GDP per capita is tested in each country, and these analyses are complemented by the Gini index as a measure of the standard deviation of the dispersion of income in the countries surveyed.

Table 2. Measures of income inequality

Measure	Equation
Gini index	$G = \frac{2 \text{cov ar}(y, r_y)}{ny}$
Variance	$V = \frac{1}{n} \sum_{i=1}^n (y_i - \bar{y})^2$
Atkinson index	$A = 1 - \frac{1}{y} U^{-1} \left(\frac{1}{n} \sum_{i=1}^n U(y_i) \right)$
Dalton index	$D = 1 - \frac{\frac{1}{n} \sum_{i=1}^n U(y_i)}{U(\bar{y})}$
Theil index	$T = \frac{1}{n} \sum_{i=1}^n \frac{y_i}{y} \log \left(\frac{y_i}{y} \right)$
Herfindahl index	$H = \left(\frac{y_i}{ny} \right)^2$

The Gini index is a standard measure of income inequality and ranges from zero (perfect equality of income) to unity (total income inequality). A Gini index above 0.4 means high inequality of income.

For the measurement of income inequality in the country and a more precise comparison of this phenomenon among countries, economists often use the Lorenz curve instead of the Gini index. The Lorenz curve shows the relationship between the accumulated interest on the sum of earned income and the total shares of households from the poorest to the richest. Curve inclined at an angle of 45 degrees shows an even distribution of income in society.

Figure 1. Lorenz curve

Equal distribution of income means, for example, that 80% of the population receives 80% of the income. In reality, however, the Lorenz curve lies below the curve of equality. An example of inequality may be the fact that 80% of the population accounts for only 50% of revenues.

5. Research methodology

The analysis here employed a research method based on the study of literature on macroeconomics and international finance as well as the econometric method. In the theoretical part, the conducted study was mainly based on the analysis of foreign literature, and in the empirical part, the results of empirical studies led by foreign researchers were used. Additionally, in the empirical part of the study, econometric models using vector autoregression procedures (vector autoregression model—VAR) were used. The choice of the VAR model was determined by the fact that the VAR models and appropriate tests do not only allow assessing the impact of one variable on another but also enable to determine the percentage of the strength of this interaction. Moreover, as the results of the empirical research showed, the analyses, conducted using vector-autoregression models, are consistent with the economic theory and the results of the analyses were confirmed by standard cause-and-effect models.

To analyze the impact of the inflow of foreign direct investment on the productivity of production factors (labor, capital and total factor productivity) and income inequality of households in the selected countries of Central and Eastern Europe in the period 1990–2016, four econometric models were used, which were ultimately presented as follows:

$$\text{LABOR} = f(\text{GREENFIELD}, \text{M\&A}) \quad (1)$$

$$\text{CAPITAL} = f(\text{GREENFIELD}, \text{M\&A}) \quad (2)$$

$$\text{TFP} = f(\text{GREENFIELD}, \text{M\&A}) \quad (3)$$

$$\text{GINI} = f(\text{GREENFIELD}, \text{M\&A}) \quad (4)$$

where *LABOR* (*L*)—changes in labor productivity (contribution of labor to GDP growth, expressed in %); *CAPITAL* (*C*)—changes in capital productivity (contribution of total capital to GDP growth, expressed in %); *TFP* (*T*)—changes of total factor productivity, expressed in %; *GINI* (*G*)—changes in social inequality index, expressed in %; *GREENFIELD* (*F*)—inflow of greenfield investment in relation to GDP, expressed in %; *M&A* (*M*)—inflow of mergers and acquisitions (brownfield investments) in relation to GDP, expressed in %.

The results of the conducted Granger causality test showed, in fact, that there were no significant relationships between labor productivity, capital, TFP, the Gini index and the inflow of foreign investment in the form of greenfield and brownfield investments. In the case of Poland, null hypotheses were rejected as regards the lack of greenfield investments' impact on labor productivity, the lack of impact of brownfield investment on capital productivity and TFP. In the case of the Czech Republic, the null hypothesis concerning the lack of greenfield investment impact on capital productivity was rejected, while in the case of Hungary, the null hypotheses regarding the lack of impact of greenfield and brownfield investment on total factor productivity were rejected.

Before the estimation models (1)–(4), it was necessary to determine the stationarity of time series used in research, because the lack of stationarity of time series could lead to the apparent regression between variables. To this purpose, the augmented Dickey-Fuller test (ADF) was used. No stationarity of time series *I*(1) and *I*(2) forced the functional form models. In the case of VAR, the modification consisted in replacing the volume of the analyzed variables by their first differences or second differences.

Table 3. Granger causality tests for Poland, Czech Republic, Slovakia and Hungary

Null hypothesis:	F-Statistic	Prob.
Poland		
F does not Granger cause L	4.84631	0.0192
M does not Granger cause L	0.32286	0.7278
F does not Granger cause C	0.15873	0.8543
M does not Granger cause C	3.03494	0.0706
F does not Granger cause T	1.95106	0.1682
M does not Granger cause T	3.12672	0.0658
F does not Granger cause G	0.14866	0.8628
M does not Granger cause G	0.32947	0.7231
Czech Republic		
F does not Granger cause L	0.29239	0.7496
M does not Granger cause L	1.02545	0.3767
F does not Granger cause C	2.67595	0.0934
M does not Granger cause C	1.67886	0.2118
F does not Granger cause T	1.10616	0.3502
M does not Granger cause T	0.19777	0.8221
F does not Granger cause G	0.44994	0.6440
M does not Granger cause G	0.44548	0.6467
Slovakia		
F does not Granger cause L	1.23694	0.3115
M does not Granger cause L	1.20003	0.3220
F does not Granger cause C	0.04408	0.9570
M does not Granger cause C	0.04148	0.9595
F does not Granger cause T	0.11160	0.8950
M does not Granger cause T	0.85104	0.4419
F does not Granger cause G	0.65384	0.5308
M does not Granger cause G	1.71917	0.2047
Hungary		
F does not Granger cause L	0.35344	0.7066
M does not Granger cause L	1.94677	0.1688
F does not Granger cause C	0.49829	0.6149
M does not Granger cause C	1.89823	0.1759
F does not Granger cause T	4.64670	0.0220
M does not Granger cause T	4.11814	0.0318
F does not Granger cause G	0.44213	0.6488
M does not Granger cause G	0.15815	0.8548

Table 4. Augmented Dickey-Fuller test statistics

Series	Integration raw			
	Poland	Czech Republic	Slovakia	Hungary
L	I(1)	I(0)	I(0)	I(0)
C	I(0)	I(1)	I(0)	I(1)
T	I(0)	I(0)	I(0)	I(0)
G	I(1)	I(2)	I(1)	I(0)
F	I(0)	I(0)	I(1)	I(0)
M	I(0)	I(0)	I(0)	I(0)

The model was estimated by means of the vector autoregression model proposed by Christopher A. Sims (1980). This approach was first used by Jonathan McCarthy (1999) when he studied different macroeconomic correlations in the countries belonging to the Organization of Economic Cooperation and Development (OECD). In the VAR method, the given phenomenon is analyzed using a system of equations, which, in accordance with Sims' postulate (1980), also eliminates the problem of exogeneity of independent variables.

Table 5. Vector autoregression estimates

	L		C		T		G
Poland							
F(-1)	-0.036236 (0.02931) [-1.23618]	F(-1)	0.006913 (0.04995) [0.13840]	F(-1)	-0.182973 (0.24451) [-0.74833]	F(-1)	-0.090824 (0.27036) [-0.33594]
F(-2)	0.085049 (0.02795) [3.04239]	F(-2)	-0.030895 (0.04929) [-0.62686]	F(-2)	0.022937 (0.24207) [0.09475]	F(-2)	0.099119 (0.26175) [0.37868]
M(-1)	-0.055510 (0.07632) [-0.72732]	M(-1)	-0.060544 (0.12828) [-0.47196]	M(-1)	-0.110225 (0.65271) [-0.16887]	M(-1)	0.655176 (0.93167) [0.70323]
M(-2)	0.068353 (0.06946) [0.98412]	M(-2)	-0.140994 (0.11976) [-1.17731]	M(-2)	0.600915 (0.53355) [1.12626]	M(-2)	-0.538639 (0.84877) [-0.63461]
Czech Republic							
F(-1)	-0.001138 (0.01090) [-0.10435]	F(-1)	0.083514 (0.02978) [2.80422]	F(-1)	0.271228 (0.19126) [1.41812]	F(-1)	0.008239 (0.15748) [0.05232]
F(-2)	-0.000704 (0.01136) [-0.06196]	F(-2)	0.000759 (0.03450) [0.02200]	F(-2)	-0.053522 (0.20848) [-0.25673]	F(-2)	0.081034 (0.17211) [0.47082]

M(-1)	0.033150 (0.03145) [1.05400]	M(-1)	0.142133 (0.09289) [1.53012]	M(-1)	0.152868 (0.57879) [0.26412]	M(-1)	0.146969 (0.61125) [0.24044]
M(-2)	-0.016130 (0.03092) [-0.52161]	M(-2)	-0.215921 (0.08498) [-2.54095]	M(-2)	0.106159 (0.53387) [0.19885]	M(-2)	-0.213113 (0.41580) [-0.51253]
Slovakia							
F(-1)	0.001422 (0.01422) [0.09999]	F(-1)	0.027847 (0.22707) [0.12264]	F(-1)	0.054312 (0.28996) [0.18731]	F(-1)	0.038140 (0.17579) [0.21697]
F(-2)	0.011336 (0.01579) [0.71792]	F(-2)	0.040287 (0.26102) [0.15434]	F(-2)	-0.265458 (0.32775) [-0.80994]	F(-2)	-0.231747 (0.22011) [-1.05285]
M(-1)	0.005543 (0.10929) [0.05072]	M(-1)	0.183966 (1.71158) [0.10748]	M(-1)	-3.062611 (2.17678) [-1.40695]	M(-1)	-0.971960 (1.31263) [-0.74047]
M(-2)	-0.066804 (0.10115) [-0.66044]	M(-2)	-0.275655 (1.52242) [-0.18106]	M(-2)	-0.201569 (1.98053) [-0.10178]	M(-2)	-1.739685 (1.01612) [-1.71209]
Hungary							
F(-1)	0.002206 (0.00827) [0.26672]	F(-1)	0.004895 (0.00611) [0.80109]	F(-1)	-0.056600 (0.04289) [-1.31956]	F(-1)	-0.038184 (0.05292) [-0.72157]
F(-2)	0.004269 (0.00769) [0.55512]	F(-2)	-0.002666 (0.00503) [-0.52981]	F(-2)	-0.027136 (0.04024) [-0.67429]	F(-2)	0.008313 (0.04881) [0.17032]
M(-1)	-0.101798 (0.09925) [-1.02569]	M(-1)	0.085801 (0.06045) [1.41943]	M(-1)	-0.072696 (0.46331) [-0.15690]	M(-1)	0.044519 (0.59313) [0.07506]
M(-2)	0.147058 (0.09958) [1.47686]	M(-2)	0.092582 (0.06347) [1.45864]	M(-2)	0.677826 (0.45498) [1.48979]	M(-2)	-0.065949 (0.59670) [-0.11052]

Note: Standard errors in () & t-statistics in [].

On the basis of the above data, it can be stated that in the case of Poland, the inflow of foreign investment in the form of greenfield significantly determined labor productivity with the elasticity factor being less than 0.08. In the case of the Czech Republic, the inflow of greenfield and brownfield investment had the largest impact on capital productivity in this country, with the former having a positive impact on capital productivity in the country, while the latter had a negative impact. In the case of Slovakia, the inflow of foreign direct investment did not contribute significantly to changes in the productivity of production factors and the reduction of income inequalities in this country. In Hungary, on the other hand, the significant

and positive impact of foreign brownfield investment on capital productivity and labor productivity was revealed.

The next step in the analysis was to measure the impact of the inflow of foreign direct investment (mergers and acquisitions and greenfield investments) on the productivity of production factors (labor, capital and total factor productivity) and income inequality of households in four of the Central and Eastern Europe countries in the period 1990–2016. The measurement was made using the so-called impulse response function—i.e., the reaction function of each variable to a one-time unit change of foreign direct investments.

In Poland, the strongest accumulated reaction to the inflow of foreign direct investment was recorded in relation to labor productivity after five years from the shock investment change. In this case, it was about the inflow of greenfield investments. On the other hand, in the case of the Czech Republic, the strongest accumulated response to the inflow of foreign direct investment was found in the case of TFP three years following the shock investment change. In this case, it was about reactions to the inflow of greenfield investments. In contrast, in Slovakia, an analogous situation was found in relation to the accumulated reaction to the inflow of foreign direct investment, as in the case of Poland. In Hungary, however, the strongest accumulated response to the inflow of greenfield investment was found in the case of TFP three years after the shock investment change, but this impact was negative.

The last stage of the analysis was the residual component variance decomposition of production factors (labor, capital and total factor productivity) and income inequality of households in four of the Central and Eastern Europe countries in the period 1990–2016, to assess the impact of mergers and acquisitions and greenfield investment on the volatility of production factors productivity and income inequality of households.

Based on the data in Figure 3, it can be noted that changes in the inflow of greenfield investment to Poland explained approximately 25% of the variation in labor productivity in this country. However, changes in the inflow of brownfield investment to Poland explained approximately 20% of the variation in capital productivity. On the other hand, the inflow of foreign direct investment explained, to a small extent, the changes in TFP and the Gini index in Poland.

Figure 2. Accumulated response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 3. The variance decomposition

In the Czech Republic, the changes in the inflow of greenfield investment explained the changes in capital productivity in almost 40%, while the changes in labor productivity, TFP and the Gini index could only be explained, to a small degree, by changes in the inflow of foreign direct investment to this country.

In Slovakia, the changes in greenfield investment inflows explained changes in labor productivity in less than 15%, while the changes in TFP and the Gini index could be explained by the changes in the greenfield and brownfield investment inflow in around 10%. On the other hand, the inflow of foreign direct investment explained, to a small extent, the changes in capital productivity in Slovakia.

Finally, in Hungary, changes in capital productivity could be explained in about 20% by brownfield investment inflow to this country, and the TFP changes could be explained in almost 40% by brownfield investment inflow and about 10% of greenfield investment inflow. On the other hand, the changes in the inflow of foreign direct investment to Hungary explain, to a small degree, the changes in labor productivity and the Gini index.

6. Conclusions

Income inequalities have increased in both the new and old EU Member States over the past two decades. The growing concern about what will happen when the gap between the rich and the poor continues to widen, this issue of global economic inequality has prompted scientists to explore the potential relationship between income inequality and FDI, as it is one of the driving forces of globalization. Although there is an extensive theoretical literature linking these variables, the empirical literature on the relationship between FDI, production factors productivity and income inequalities are not conclusive, as most scholars treat FDI as uniform and therefore, there is a lack of reliable empirical evidence on the distributional effects of FDI, especially in emerging countries. The research presented in the article fills this gap.

The analysis covered four countries classified by the Organization for Economic Cooperation and Development as the countries of Central and Eastern Europe (Poland, the Czech Republic, Slovakia, Hungary). The statistics used in the study came from the statistical database of the

Organization for Economic Cooperation and Development (OECD), the World Bank (World Development Indicators), World Income Inequality Database (United Nations University World Institute for Development Economics Research) and Total Economy Database (The Conference Board of Canada). All statistics had an annual frequency and covered the period from 1990 to 2016.

The results of the research suggest a significant and positive impact of greenfield investment inflow on labor productivity and total factor productivity, as well as a positive impact of brownfield investment inflow (mergers and acquisitions) on capital productivity in countries receiving investments. Moreover, the results also revealed the lack of a statistically significant impact of greenfield and brownfield investment on income inequalities in all the examined countries.

The research results have important theoretical and empirical implications for a new perspective on the role of foreign direct investment in the form of mergers and acquisitions and greenfield investment in the countries receiving investment. Thanks to the results of research, the countries will be able to create effective programs (policies) for the growth of productivity of production factors and income inequalities reduction, through the deliberate and conscious attraction of desired forms of foreign investment to the country. The test results are important not only for the countries surveyed but also for economically developed countries, which are currently the biggest recipients and suppliers of foreign direct investment in the world.

The obtained research results may also be a starting point for further detailed research on the impact of direct foreign investment on the economy of the country receiving investments because this analysis does not take into account many different factors determining the effects of the investment inflow. It is about such factors as the industry and branch structure of investment or the level of economic development of the country receiving foreign investments.

Although FDI may have been beneficial to economic development, more can be done to improve its impact on income distribution in the Central and Eastern Europe countries through appropriate government policies in the areas of education, training and infrastructure. To be precise, policymakers have to take into account the fact that the income structure of a country depends on several factors, such as institutions, public policy, education, domestic and foreign preferences as well as the nature of technology.

Countries should continue to consider investing more in education, but on the other hand, government authorities should not expect to resolve income problems by attracting high-quality foreign direct investment (FDI in high technology sectors). This may not be beneficial if high-quality FDI does not match the skill profiles of their labor force.

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