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Foreign direct investment and income inequality in Central and Eastern Europe

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Abstract. *The paper explores the impact of foreign direct investment (FDI) on income inequality in ten countries from Central and Eastern Europe (CEE) in the period 1990 – 2012. First, the theoretical and empirical literature on the distributional effect of FDI is outlined. Second, we discuss briefly general trends in FDI inflow and income inequality in the countries from CEE after 1990. Third, we estimate several fixed effects regression models and find that FDI has the potential to exert influence on income inequality but this effect varies depending on the level of education and economic development of the host countries.*

Keywords: foreign direct investment, income inequality, Central and Eastern Europe, panel data.

JEL Classification: F23; F62; O15.

1. Introduction

In line with the trend of increasing economic globalization taking place in the last three decades, an extensive body of theoretical and empirical literature has been devoted to studying the various effects of FDI on host economies. As some authors point out, however, most studies have traditionally focused mainly on the efficiency outcomes of FDI such as economic growth and productivity, leaving their distributional effects largely neglected (Figini and Görg, 2006). Therefore, studies concerning the impact of FDI on income inequality are still relatively new, scarce and ambiguous, which calls for further research on this topic. Furthermore, there are rising public concerns about the socio-economic consequences of high income inequality especially in the aftermath of the recent global economic crisis, making this issue figure prominently in current political and academic discourse.

This paper tries to contribute to the existing literature by exploring the distributional impact of FDI in the context of ten post-socialist countries from CEE, currently members of the European Union (EU) – Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia and the Czech Republic. Due to the similar political and economic changes that EU membership requires, these countries provide high level of comparability (Mahutga and Bandelj, 2008). Moreover, they represent a unique context for analysis of the distributional effect of FDI because of the fact that the latter was absent in the previous regime but afterwards played an important role in the transition to a market-based economy. Starting from a very low level in the beginning of the 90s, FDI inflow in the CEE region increased substantially, with the steepest rise taking place between 2004 and 2007. Although FDI inflow in CEE countries decreased as a result of the global crisis, FDI stock is significant and has the potential to exercise significant influence on their economic and social development.

Besides the intensified economic globalization during market transition, CEE countries also experienced a pronounced upward trend in income inequality. The parallel development of these two processes suggests that there might be some sort of relationship between them which is worth studying. We argue that FDI has the potential to affect income inequality in CEE countries but its influence is not homogeneous and depends on certain features of the host economies such as their level of economic development and human capital. In order to explore the distributional effect of FDI we use a panel of the abovementioned ten countries observed over the period 1990 – 2012 and use fixed-effects method to control for time-invariant country-specific characteristics.

The rest of the paper is organized as follows: section 2 summarizes the existing theoretical and empirical research on the relationship between FDI and income inequality. Section 3 describes briefly general trends in FDI inflow and income inequality in CEE countries after 1990. Section 4 presents the chosen econometric approach and the data used. Section 5 discusses the empirical results and section 6 concludes.

2. Literature review

Several contending theories have been traditionally used by researchers to account for the distributional impact of FDI especially in developing countries. Modernization theory on the one hand and dependency and world-systems theories on the other are the first attempts to delve into the relationship between foreign capital penetration and income inequality in host economies.

Modernization theory, which emerged in the 50 - 60s and is close to neoclassical economics, assumes that countries progress from traditionalism to modernity in stages (Rostow, 1960). It states that less developed economies can converge with advanced economies by following their path of development and an integral part of this process is the integration into the world economy. Proponents of modernization theory argue that foreign capital penetration generates a variety of positive direct and spillover effects for the host economy – transfer of technology, know-how and managerial skills, employment creation, enhancement of competition, productivity and growth. As far as inequality is concerned, it is perceived as a necessary precondition for the eventual improvement of each individual's income. This is in line with the famous "Kuznets' inverted-U curve" hypothesis, according to which income inequality increases at the early stages of development but declines later once a certain stage of development is reached (Kuznets, 1955). Although modernization theorists address the distributional effect of FDI indirectly, their position is evident from the fact that regardless of the origin of capital, they always treat it positively because it fosters growth and its benefits are eventually spread throughout the whole economy. Even if FDI-induced growth is initially limited to several sectors where workers receive higher wages, in the long run the growth in these leading sectors has the potential to contribute to the decrease of income inequality in the host country.

Another set of theories includes dependency and world-systems theories which occurred in the 60s and 70s respectively as a critical reaction to modernization theory. A central tenet in dependency theory is the differentiation between core and periphery. The core is formed by developed and rich economies whereas the least developed countries form the periphery. In these theories underdevelopment is perceived as a result of exogenous factors, namely international trade and FDI which lead to a high integration of peripheral countries into the world economy. The latter, however, is dominated by the advanced industrial nations from the core which restrain the opportunity of dependent peripheral countries to follow their own path of development. It is exactly through the process of dependent development that the degree of inequality within a peripheral country is determined (Rubinson, 1976). Contrary to the implicit arguments of modernization theory, dependency theory has put forward some very specific criticisms about the negative impact of FDI on income distribution (Tsai, 1995). In the course of industrialization, accompanied by FDI penetration in less developed countries, it becomes common that employees in foreign firms tend to form a new social class ("labor elites")

and earn significantly higher wages than local firms (Girling, 1973). Although FDI entry might lead to an increase of wages in the traditional sectors, it is most likely to be accompanied by a more capital-intensive production, which in turn results in higher unemployment in the traditional sectors, thus contributing to a rise in inequality. Furthermore, within the dependency/world-systems framework the state is assumed to have a dominant role in the economy and since the aforementioned "labor elites" usually include powerful actors in the state organization, both being supported by foreign credits, an economic and political "triple alliance" occurs naturally (Evans, 1979). It has the potential to deter state's policies aiming at improving income distribution and thus to contribute to the increase of inequality.

When analyzing the theoretical groundings of the "FDI-income inequality" nexus many authors also use international trade theory. They reckon that the distributional effect of FDI in a developing host economy is similar to that of international trade according to the Heckscher-Ohlin model and the Stolper-Samuelson theorem. They predict that both trade and FDI should take advantage of the abundance of low-skilled labor in developing countries. This leads to increased demand and higher wages for low-skilled workers, which in turn decreases wage dispersion and income inequality in the host economy. The reverse processes take place in the developed country, which is the source of FDI, with the final result being an increase in income inequality. However, some authors have addressed important theoretical arguments against these predictions. First, according to Feenstra-Hanson's model (1997) what is unskill-intensive in a developed country may be skill-intensive in terms of the labor market of the recipient developing country. In this case FDI inflow from the developed towards the developing country may result in increasing income inequality both in the former and in the latter. Second, since the technologies transferred through FDI are likely to be more skill-intensive than those used in the host economy before FDI liberalization, FDI penetration may lead to results that are opposite to those predicted by the Stolper-Samuelson theorem, namely an increase in the demand for skilled labor and so an increase in income inequality (Lee and Vivarelli, 2006). Third, globalization is often accompanied by market-oriented policies (such as liberalization of the domestic labor market or privatization of state-owned enterprises) which might also lead to higher income inequality in the host country (Milanovic, 2003).

The brief review of the theories underlying the distributional impact of FDI reveals that they are very ambiguous which calls for empirical research on this topic. The empirical literature, however, is also far from conclusive. Earlier studies generally provide support for the dependency/world systems hypothesis. A survey of Bornschier and Chase-Dunn (1985) shows that among the fifteen studies reviewed, all but one by Weede and Tiefenbach (1981) find that FDI deepens income inequality. However, the literature that has emerged since the 90s is much more diverse. Some studies find evidence for a detrimental distributional effect of FDI, others show that FDI alleviates income inequality

and a third group of studies fails to find a statistically significant relationship between the two variables.

The first group of studies, which reveal that FDI deepens inequality, is the most extensive. In a panel data analysis on 88 countries in the period 1967 – 1994, Alderson and Nielsen (1999) find a positive relationship between FDI and income inequality. Using panel data for 65 countries in the period 1980 – 1995, Beer and Boswell (2002) find that the dependence on FDI might turn problematic for countries that are committed to the problem of income inequality. They also point out the important role of education in improving human capital, which contributes to a more even income distribution without negative effects on growth. Pernicious distributional impact of FDI is also found in the study of Reuveny and Li (2003), which uses data on 68 countries in the period 1960 – 1996. A similar conclusion is reached by Choi (2006), whose study is based on 119 countries in the period 1993 – 2002 and finds that the rise of FDI stock is associated with higher income inequality in the host country. In a panel data study on 119 developing countries in the period 1970-1999, Basu and Guariglia (2007) find that FDI fosters growth but also leads to an increase in income inequality in the host countries. For FDI to manifest positive distributional effects, the authors suggest policies aimed at improving poor people's access to education. Similar results, revealing the detrimental distributional impact of FDI, as well as the importance of education in alleviating this problem, are found in a study by IMF economists (Jaumotte et al., 2008). In a study on 10 European countries in the period 1980 – 2000, Herzer and Nunnenkamp (2011) find that FDI deepens income inequality but only in the short run. In the long run FDI contributes to a decrease of inequality. In a more recent study on Latin America, however, Herzer et al. (2013) find that in the long run FDI increases inequality.

Several studies on a single country also find that FDI leads to higher inequality. Worth mentioning are the studies of Feenstra and Hanson (1997) on Mexico, Lipsey and Sjoholm (2001) on Indonesia, Mah (2002) on South Korea, Zhang and Zhang (2003) on China, Nunnenkamp et al. (2006) on Bolivia.

A second group of empirical studies, although less extensive than the previous one, finds that FDI decreases income inequality in the host country. An example is the study of Jensen and Rosas (2007), which finds that FDI in Mexico leads to a reduction in income inequality at the state level. Bhandari (2006) examines FDI in the USA and finds that it has a beneficial distributional impact although the latter is not homogeneous across states. A similar conclusion is reached by Chintrakarn et al. (2010), who find that FDI in the USA decreases inequality but this effect is again heterogeneous across states.

A third group of studies, which fail to find statistically significant relationship between FDI and income inequality, adds to the ambiguity of the empirical literature on this topic. Milanovic (2002) uses panel data on 88 countries in the period 1985-1991 and finds that FDI doesn't exert any effect on income distribution. In a study on 29 developing

countries in the period 1970-1990, Sylwester (2005) also fails to find evidence of a distributional impact of FDI.

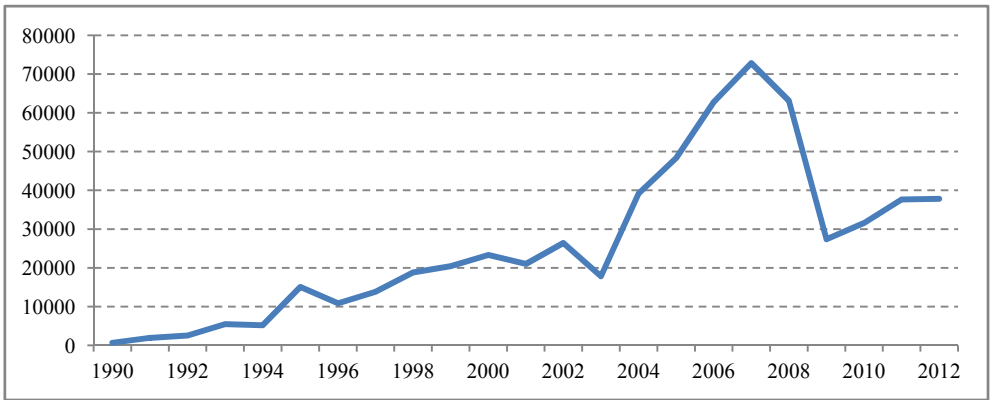
The scarcity of the empirical studies on the distributional effect of FDI is all the more pronounced in the case of CEE countries. Among the studies, which find that FDI deepens inequality, the one of Bandelj and Mahutga (2008) is worth mentioning. Using data on ten CEE countries, currently members of the EU, they find that the detrimental distributional impact of FDI is due to the higher wages in foreign affiliates, as well as the wage gap between the management and the workers in these companies. Halmos (2011) examines data on 15 Eastern European countries and also finds that FDI leads to higher income inequality which the author explains with the increase in the return to skilled labor as a result of the technology transfer that accompanies FDI entry. Using a larger dataset encompassing ten CEE countries, which are currently EU member states, the countries belonging to the Commonwealth of Independent States and four South Eastern European economies, Grimalda et al. (2010) find that FDI increases income inequality only in the new EU member states. A study based on a single country, where evidence of a negative distributional impact of FDI is found, is the one of Skuratowicz (2005). The author finds that FDI in Poland leads to higher demand for qualified labor and thus increases wage inequality.

Studies, which find evidence of a beneficial distributional effect of FDI in CEE counties, are very few. An example is the one of Georgantopoulos and Tsamis (2011), which finds that FDI in Hungary after 1990 has contributed to a more even income distribution. There are also few studies on CEE countries, which do not report any statistically significant relationship between FDI and income inequality (see Bruno et al., 2004; Franco and Gerussi, 2010).

3. General trends in FDI inflow and income inequality in CEE countries

In the first years of market transition, FDI inflow in the ten CEE countries under study (CEE-10) was scarce because in many of them the economic and political environment was not quite favorable to foreign investors (drop in output, high inflation, underdeveloped financial services, as well as political instability and delay of reforms in some countries). As Figure 1 shows, until 1994 the total volume of FDI inflow in CEE-10 was less than 10 billion USD.

Figure 1. *FDI inflow in CEE-10 (million USD), 1990 – 2012*



Source: UNCTAD.

Apart from being at a low level, FDI in the beginning of the transition process was also quite unevenly distributed across CEE countries. Until 1997 the predominant part of FDI inflow was concentrated in Hungary, Poland and the Czech Republic, which at that time were more advanced and ahead in implementing market-oriented reforms. Despite the small size of FDI inflow, in terms of GDP per capita Estonia was close to Hungary, which was due to the early adopted liberal course in its economic policy.

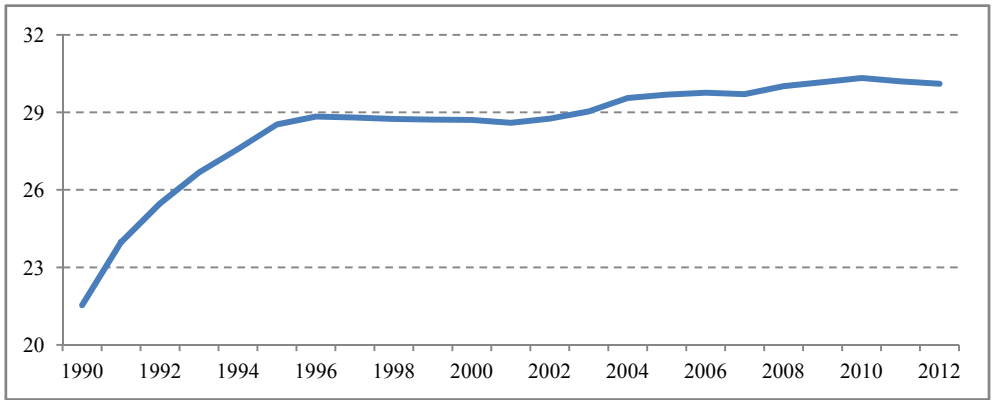
After 1998 there was a slow increase in FDI inflow, followed by a drop in 2003, which was largely due to the end of the privatization in the Czech Republic and Slovakia. Between 2004 and the onset of the global economic crisis in 2007 - 2008, FDI inflow in CEE experienced a steep increase. Another feature of this period was the emergence of some countries from the Balkans, such as Bulgaria, as preferred destinations for FDI. Being at a very low level in the first years of transition, FDI inflow in Bulgaria started to grow after macroeconomic stabilization was achieved through the adoption of a currency board in 1997. As a result of this, in the period 1998 – 2007 Bulgaria ranked first among CEE countries in terms of average FDI inflow as a percentage of GDP, followed by Estonia and Slovakia.

The global financial and economic crisis led to a reduction in FDI inflow, which affected severely all countries in the region. The largest drop was in 2009 when FDI inflow in CEE-10 amounted to 27.3 billion USD which was more than 50 % less than the previous year. In the following years there were fluctuations in FDI inflow but in all countries it still remained a long way below pre-crisis levels. Despite the drop of FDI inflow as a result of the crisis, FDI stock as a percentage of GDP in CEE countries is substantial, especially in Bulgaria, Estonia, Hungary and the Czech Republic, where in 2012 it reached 98%, 86%, 82% and 70%, respectively.

Apart from the economic liberalization and integration into the world economy, another feature of the transition process in CEE was the increase in income inequality. As seen

from Figure 2, the greatest rise in income inequality in CEE-10 was in the first seven years of transition when the average Gini index increased from 21.4 in 1990 to 28.8 in 1996. After 2000 there was again a rise in income inequality but it was much slower and smoother than in the beginning of the 90s.

Figure 2. *Income inequality in CEE – 10, measured by the average Gini index, 1990-2012*



Source: Standardizing the World Income Inequality Database, Version 4.1, March 2014.

The most significant rise in income inequality in the beginning of the transition process was accompanied by the implementation of market-oriented reforms in CEE countries and falling of their economies into a deep recession. Among the main transition-related drivers of income inequality, Mitra and Yemtsov (2006) point out the following: wage decompression and growth of the private sector, restructuring and unemployment, changes in government expenditure and taxation, price liberalization and inflation, asset transfer and growth of property income. To the list of determinants of income inequality, however, the authors also add technological change and globalization. This implies that if in the beginning of the period under study the main drivers of inequality were transition-related factors, later on globalization and FDI in particular started to play an important role in shaping its dynamics.

The way the different determinants of income inequality interact with each other depends on the circumstances and the policy choices in each country. That is why, although rising income inequality is a common trend in CEE, its level and dynamics vary across the different countries. In the first six years of transition all countries experienced an increase in income inequality, which was most pronounced in Estonia and Lithuania and least pronounced– in Poland and Hungary (see Figure A1 in the Appendix). After the initial rise of the Gini index, its dynamics has been the weakest in Poland, the Czech Republic, Hungary, Slovenia and Slovakia. In Bulgaria the Gini index fluctuated and after a decrease between 1998 and 2003, it has started to grow again. The country with the steepest increase in income inequality throughout the whole period is Latvia. In 2012 it has the highest Gini index (35.4), followed by Bulgaria (34.6) and Lithuania (34.2). The

countries with the lowest income inequality in 2012 are the Czech Republic (24.3), Slovenia (24.7) and Slovakia (26.1).

4. Methodology and data

The sample comprises ten CEE countries in the period 1990-2012, which forms an unbalanced panel of 190 observations. Descriptive statistics of the data is shown in Table A1 in the Appendix. In order to estimate the impact of FDI on income inequality we use the following basic model:

$$GINI_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_k X_{itk} + u_i + \varepsilon_{it} \quad (1)$$

where GINI is Gini index in country i in year t. This is the most widely used measure of income inequality. It can take values from 0 (perfect equality) to 100 (perfect inequality). Data for the Gini index is taken from the Standardized World Income Inequality Database (SWIID) developed by Solt (2009), which is one of the most comprehensive and comparable datasets on income inequality. As pointed out by Herzer et al. (2013), the SWIID combines information from the World Income Inequality Database (WIID) provided by the World Bank with information from the Luxembourg Income Study (LIS) database, which offers harmonized micro-data collected from multiple countries, and data from UNU-WIDER to create a dataset with greater coverage than the LIS data and greater comparability than the WIID. SWIID has been used in the recent studies of Bergh and Nilsson (2010), Herzer et al. (2013) and Ostry et al. (2014).

FDI is the main independent variable and it is measured as FDI stock as a percentage of GDP. As in Herzer and Nunnenkamp (2011), we use FDI stock rather than FDI inflow because FDI stock captures long-run effects more effectively than annual FDI inflow, which fluctuates considerably. Data source for FDI stock is UNCTAD. Due to the contending theories about the distributional impact of FDI, the sign of β_1 is a priori ambiguous. X_k is a vector of control variables, discussed below; u_i is the individual and time-invariant country's fixed effect and ε_{it} is the standard error term.

In order to control for factors of income inequality other than FDI, we include several control variables. In line with previous studies (Tsai, 1995; Jensen and Rosas, 2007, Bandelj and Mahutga, 2008), we control for the spread of education by including secondary school enrollment ratio (EDUC). It is expected to reduce inequality based on the following reasoning. Education increases the overall level of human capital which results in higher supply of skilled labor force. This, in turn, contributes to a decrease in skilled wage premium, lowering overall income inequality.

A traditional measure of economic development, GDP per capita (GDPPC), is also included in the model. It is introduced in order to control for the possibility that within-country income inequality can be affected by the stage of economic development, as for instance theorized by Kuznets (1955). The impact of GDP per capita in CEE countries is

difficult to predict because it has specific dynamics, characterized by a significant drop in the first years of transition, followed by an upward trend after 2000 and a slump in 2009 as a result of the global financial and economic crisis. However, if we base our reasoning on the specifics of Kuznets hypothesis and take into account that GDP per capita in CEE is lower than in the developed Western economies, we might expect that income inequality in CEE tends to increase as a result of rising level of economic development. GDPPC is computed in terms of Purchasing Power Parity with reference to 2011 constant international dollars and is expressed in natural logarithm.

Due to the distributional impact of inflation, which was very high in the first years of transition (Ivaschenko, 2002), we add the inflation rate as a control variable (INFL). As inflation erodes real wages and disproportionately affects those in the bottom part of the distribution, it tends to increase income inequality. The variable is measured by the annual growth rate of the consumer price index and is expected to have a positive effect on the Gini index.

Within-country income distribution may also be shaped by the government through its fiscal policy. It has been suggested in the literature that the retrenchment of government spending in the post-socialist economies might be one of the factors explaining the upswing in income inequality during transition (Ivanova, 2007; Bandelj and Mahutga, 2008). Hence, we include a variable which controls for this effect (GOVERN). It is measured as general government final consumption expenditure as a percentage of GDP and is expected to have a negative impact on the dependent variable.

Last but not least, it is important to control for the distributional effect of the specific structural changes in CEE during transition. It has been suggested that the diminishing importance of the industrial and agricultural sectors and the substantial increase of the service sector, which is typically characterized by higher wage differential, might be one of the key factors behind the rise in income inequality in post-socialist countries (Ivaschenko, 2002; Franco and Gerussi, 2010). Given that, we include a control variable (SERV), which is measured by the value added of the service sector as a percentage of GDP and is expected to increase income inequality. Data for all control variables is taken from the World development indicators of the World Bank.

In order to investigate further the complex relationship between FDI and income inequality, we estimate two interaction models, which test whether the distributional effect of FDI depends on some features of the host economies such as their level of education and economic development. In the first interaction model we generate an interaction term between the variables measuring FDI and education and include it as a separate regressor. It has the following form:

$$GINI_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 EDUC_{it} + \beta_3 FDI_{it} \text{ x } EDUC_{it} + \beta_k X_{itk} + u_i + \varepsilon_{it} \qquad (2)$$

What is central in this specification is not the distributional impact of education itself but the way it modifies the relationship between FDI and income inequality. In other words, education is the modifying variable and the coefficient in front of the interaction term

shows how the marginal effect of FDI on income inequality changes at different levels of education.

In another model we check whether the distributional effect of FDI depends on the level of economic development of CEE countries. In this case GDP per capita is treated as the modifying variable. An interaction term between FDI and GDP per capita is included in the model to illustrate how the marginal effect of FDI on income inequality changes at different levels of economic development. The specification has the following form:

$$GINI_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 GDPPC_{it} + \beta_3 FDI_{it} \times GDPPC_{it} + \beta_k X_{itk} + u_i + \varepsilon_{it} \quad (3)$$

The use of panel data in the estimation of these models requires to control for unmeasured heterogeneity across cases by using fixed effects or random effects methods. The fixed effects method is preferred for several reasons. First, a crucial assumption for the random effects model is that the country-specific terms are uncorrelated with the other explanatory variables. If such correlation exists, random effects estimates are biased and inconsistent whereas the fixed effects estimates are still unbiased. In order to test whether the country-specific effects are correlated with the regressors, Hausman test is performed for each model. The results, shown in Table A2 in the Appendix, lead to rejection of the null hypothesis according to which there is no such correlation and suggest the use of fixed effects estimation.

Second, when one cannot consider the observations to be random draws from a large population (especially if the data refers to large geographical units), it often makes sense to treat the individual effects as parameters to estimate, in which case one should use fixed effects estimation (Wooldridge, 2002).

Third, fixed effects estimator (also called "within" estimator) allows one to focus on how changes in within-country characteristics are related to changes in within-country inequality (Ivashenko, 2002). Hence, since the main goal of the paper is to explore how FDI has caused changes in income inequality over time within countries rather than to explain variation of inequality across countries, the use of the fixed effects method is very appropriate.

In order to assure the consistency of the estimates, tests for heteroskedasticity, autocorrelation and cross-sectional dependence are performed for each of the three models. The results from all diagnostic tests are shown in Table A3 in the Appendix. The modified Wald test for groupwise heteroskedasticity leads to rejection of the null hypothesis for each of the three models. This indicates presence of heteroskedasticity, which causes the standard errors of the estimates to be biased. Since autocorrelation represents a problem in macro panels with long time series and causes the standard errors to be smaller than they actually are, Wooldridge test for autocorrelation is performed. The results lead to rejection of the null hypothesis, which means that there is autocorrelation.

Another issue to be considered is the possibility of cross-sectional dependence, which can cause biased statistical inference. To test whether the residuals are correlated across entities, Pesaran cross-sectional dependence test is performed. The results lead us to

reject the null hypothesis and conclude that there is cross-sectional dependence in the case of each of the three models. In order to account for all these problems, we estimate the fixed-effects models with Driscoll and Kraay standard errors as suggested by Hoechle (2007). These standard errors are heteroskedasticity consistent and robust to general forms of cross-sectional and temporal dependence. All regressions and diagnostic checks are performed using the econometric software STATA.

5. Empirical results

The results from the basic model, presented in column 1 in Table 1, do not indicate statistically significant relationship between FDI and income inequality in CEE countries. A possible explanation might be that for the distributional effect of FDI to manifest, certain levels of education and economic development of the host countries must be reached. As for the coefficients of the control variables in the first model, all of them, except for government expenditures, are statistically significant and have the expected signs. The negative sign of the coefficient of EDUC reveals the important role of education in mitigating income inequality, which was also pointed out in previous studies. The positive sign of the coefficient of GDPPC confirms the conjecture that due to the lower level of economic development in CEE compared to other developed countries, the increase in GDP per capita is accompanied by a rise in income inequality. INFL has a coefficient with a positive sign, which confirms the inequality-increasing effect of inflation in CEE countries. The coefficient of the variable SERV is also positive, which indicates that one of the major structural changes in CEE, namely the rapid growth of the service sector, has been a key determinant of income inequality.

Table 1. *Estimation results from the fixed effects regression models*

Variable	1	2	3
FDI	-0.017 (0.015)	0.396 *** (0.067)	1.121 *** (0.333)
EDUC	-0.101 ** (0.043)	0.021 (0.062)	-0.065 (0.045)
FDIxEDUC	-	-0.004 *** (0.001)	-
GDPPC	3.860 *** (1.358)	4.613*** (1.440)	6.864 *** (1.565)
FDIxGDPPC	-	-	-0.116 *** (0.033)
INFL	0.003 *** (0.001)	0.003 *** (0.001)	0.004 *** (0.001)
GOV	-0.080 (0.072)	-0.043 (0.060)	-0.040 (0.056)
SERV	0.245 *** (0.036)	0.202 *** (0.047)	0.160 *** (0.051)
Observations	190	190	190
R^2	0.53	0.59	0.59

Notes: Dependent variable is GINI. Driscoll and Kraay standard errors are reported in parentheses.
* p-value < 0.1; **p-value < 0.05; *** p-value < 0.01.

Contrary to model 1, in model 2 the coefficient of FDI is statistically significant and has a positive sign. This suggests that FDI deepens income inequality but in the same time the statistically significant and negative sign of the interaction term shows that this effect diminishes when the spread of education improves. However, as argued in Brambor et al. (2005), the interpretation of multiplicative interaction models differs a lot from linear-additive regression models. The major reason for this is that the coefficient of the independent variable in an interaction model (FDI in our case) shows the effect of this variable on the dependent variable (income inequality) when the modifying variable (education) is zero. However, since there are no cases in which the variable EDUC is zero, the results from column (2) in Table 1 are not that informative and to illustrate the marginal effect of FDI across the range of values of the modifying variable (EDUC) we use Figure 3. It has also been suggested by Brambor et al. (2005) as a better way of interpreting interaction models.

Figure 3. *Marginal distributional effect of FDI depending on the spread of education*

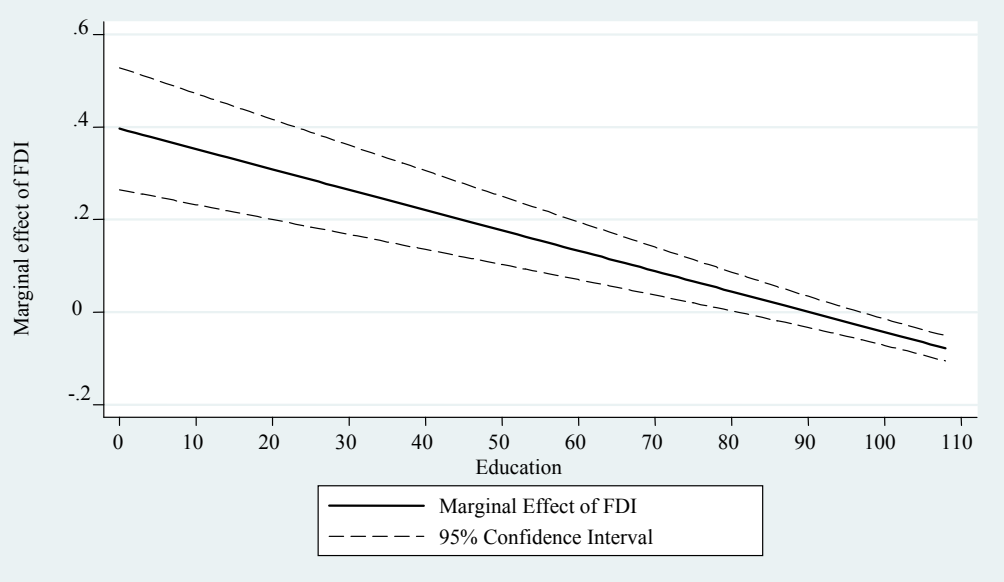


Figure 3 shows how the marginal effect of FDI on income inequality changes across the observed range of the variable measuring the spread of education. The solid sloping line indicates this marginal effect, which at any particular point on this line is equal to:

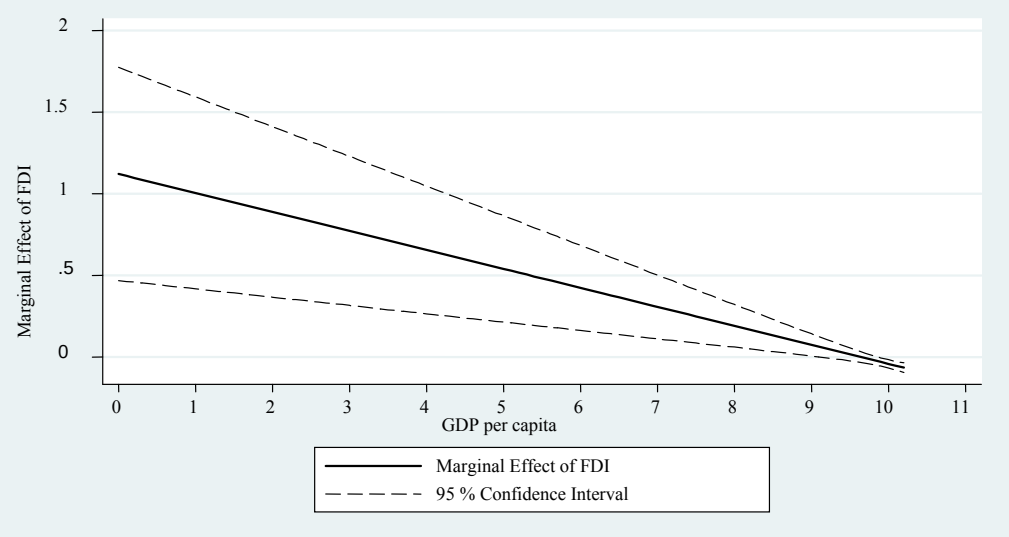
$\frac{\partial \mathrm{GINI}_{it}}{\partial \mathrm{FDI}_{it}} = \beta_1 + \beta_3 \mathrm{EDUC}_{it}$. 95% confidence intervals around the line allow us to determine the conditions under which FDI has a statistically significant effect on income inequality – this effect is significant whenever the upper and lower bounds of the confidence interval are both above (or below) the zero line. As seen from Figure 3, FDI has statistically significant positive effect on income inequality but this effect diminishes with the increase of education and becomes insignificant when secondary school enrollment

ratio reaches 81% (at this point the lower confidence interval crosses the zero line). For better interpretation of these outcomes it is necessary that we also report the percentage of the sample that falls within the region of significance. After examining the sample, we found that secondary school enrollment ratio has a value below 81% only in Romania until 2004. This means that only in this country FDI has been a determinant of income inequality and this effect is due to the lower level of human capital.

Figure 3 also shows that at higher levels of human capital (when secondary school enrollment ratio is above 96%) the marginal effect of FDI on income inequality becomes negative. The countries, where the average value of this indicator exceeds 96 %, are Estonia, Lithuania and Poland. Those, which have secondary school enrollment ratio higher than 96% only in the second half of the period under study, are Hungary, Latvia and Slovenia. This means that when the host economy reaches a higher level of human capital, FDI contributes to a decrease of income inequality. This result has its theoretical groundings. According to the theoretical framework of the studies of Figini and Görg (2006) and Franco and Gerussi (2010) for example, one of the main reasons for the inequality-increasing effect of FDI is related to the transfer of technologies induced by FDI. These technologies very often require the use of skilled labor. The higher demand and limited supply of such labor in the host economy initially leads to a rise in the wages of skilled workers and thus the increase of the wage differential between skilled and unskilled workers contributes to an increase of income inequality. Improving the spread of education, however, leads to a higher supply of skilled labor. In this way, with the gradual increase of the level of human capital and the adoption of the new technologies by the local firms, income inequality starts to decrease. The results from model 2 show that because of the higher level of human capital in some countries in CEE, FDI has exactly such inequality-decreasing effect.

The results from the other interaction model are displayed in column (3) in Table 1. They reveal how the marginal distributional effect of FDI changes depending on the level of economic development. As in model 2, in this specification the coefficient of FDI is statistically significant and positive whereas the coefficient of the interaction term is statistically significant and negative. This means that FDI increases income inequality but this effect diminishes with the increase of GDP per capita. This result is illustrated in Figure 4.

Figure 4. *Marginal distributional effect of FDI depending on GDP per capita*



In Figure 4 the marginal distributional effect of FDI is equal to: $\frac{\partial \mathrm{GINI_{it}}}{\partial \mathrm{FDI_{it}}} = \beta_1 + \beta_3 \mathrm{GDPPC_{it}}$ and it changes across the range of values of GDP per capita. When the variable GDPPC has values, which are below 9.2, FDI has a statistically significant positive effect on the dependent variable, i.e. it increases income inequality. Examination of the range of values of GDPPC shows that this effect applies mainly to Bulgaria in the first half of the transition period and also to Latvia, Lithuania, Poland and Romania for shorter time spans again in the first years of transition. Furthermore, Figure 4 shows that when the level of economic development gets higher (values of GDPPC above 9.9) FDI again exerts statistically significant effect but it is negative, which means that FDI reduces income inequality. Such effect is observed mainly in the Czech Republic and Slovenia and for shorter periods of time after 2000 also in Estonia, Hungary, Latvia, Lithuania, Poland and Slovakia. These results reveal that the distributional impact of FDI in CEE countries depends to a great extent on the level of economic development of the host economy. FDI tends to deepen income inequality when GDP per capita is low but with the increase of the latter, the effect of FDI changes and when a certain higher level of economic development is reached, FDI even contributes to a reduction of income inequality.

As far as the control variables in models 2 and 3 are concerned, the results are similar to those from model 1. Government expenditure is again insignificant whereas inflation and the value added in the service sector are found to increase income inequality in CEE countries.

6. Conclusions

The paper analyses the impact of FDI on income inequality using panel data for ten CEE economies observed in the period 1990 - 2012. Using fixed effects regression models, we find that FDI has the potential to affect income inequality but the manifestation of this effect depends on the absorptive capacity of the host economy. At lower levels of human capital and economic development FDI tends to increase income inequality but if the spread of education and GDP per capita increase, this distributional effect of FDI diminishes. After higher levels of human capital and economic development are reached, FDI can even contribute to a reduction of income inequality. As for the other determinants of income inequality, we find that inflation and the expansion of the service sector have contributed to the increase of income inequality in CEE economies.

The results from this paper might lead to some tentative policy recommendations for the countries in CEE. First, more efforts should be put in order to enhance the spread and quality of education. Improving the level of human capital leads to an increase of the supply of skilled labor which not only weakens the inequality-increasing effect of FDI but also makes it possible for the host economies to benefit from FDI. Second, countries should introduce more policies which facilitate investments in high value added activities and foster productivity. This is important in terms of increasing host countries' level of economic development, which seems to be an important precondition for reducing the negative distributional effect of FDI and taking advantage of their potential to mitigate income inequality when a higher stage of development is reached.

The conclusions and the policy considerations mentioned above are in line with previous studies, which argue that the benefits of FDI, in terms of the spillover effects they generate, depend on the absorptive capacity of recipient countries (see Bijsterbosch and Kolasa, 2009). Besides the level of wages in foreign-owned affiliates, which represents a direct transmission mechanism, it is exactly trough spillover effects that FDI channels its indirect influence on income inequality (through the induced changes in the productivity of local firms and the resulting changes in the level of wages in these firms). In order to better understand the distributional effect of FDI in the case of CEE countries, future research should focus on exploring how these transmission mechanisms work using microeconomic data on the firm level.

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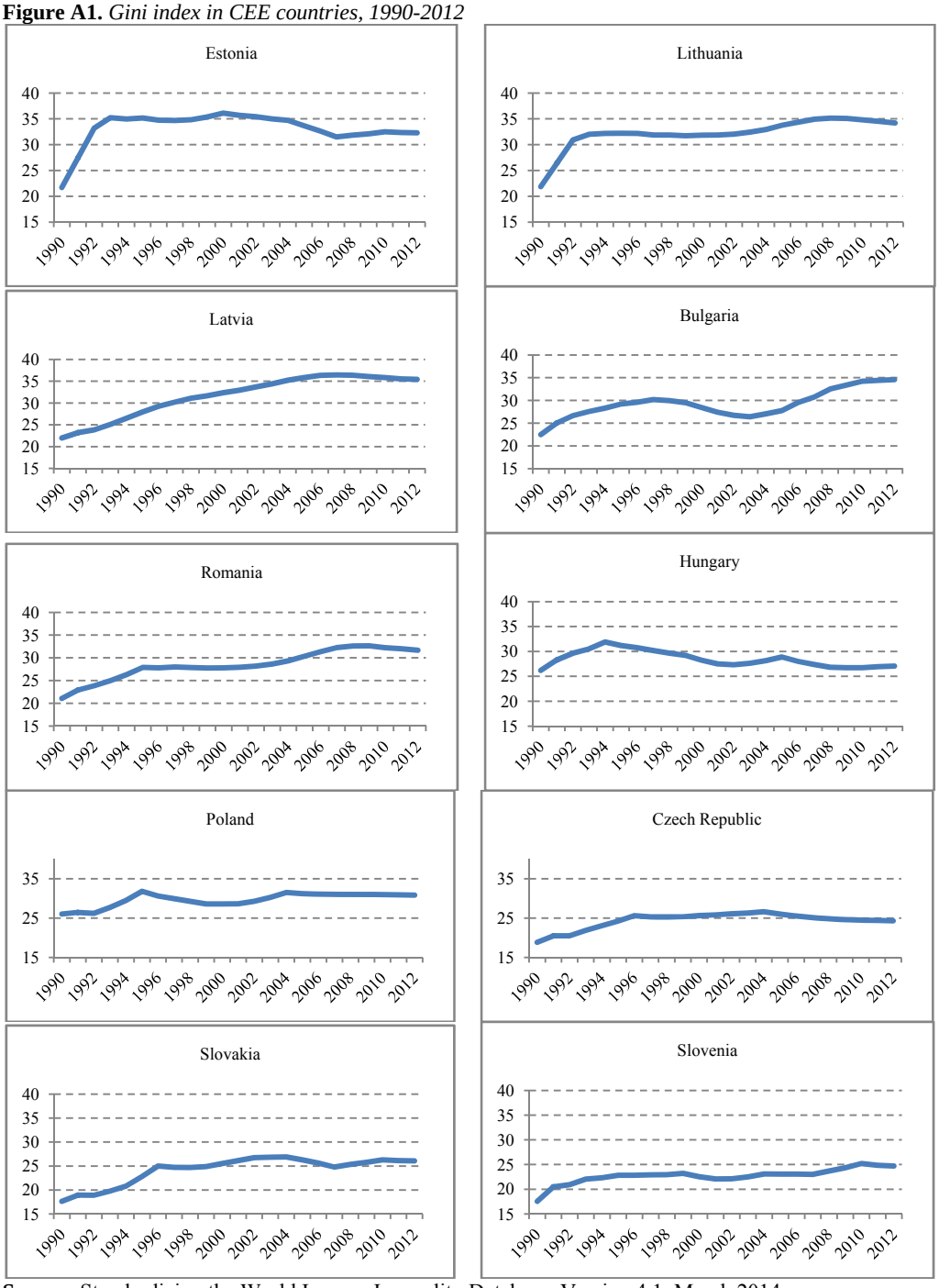
Appendix

Figure A1. *Gini index in CEE countries, 1990-2012*



Source: Standardizing the World Income Inequality Database, Version 4.1, March 2014.

Table A1. *Descriptive statistics*

Variable	Obs.	Mean	Std. Dev.	Min	Max
GINI	230	28.41	4.42	17.55	36.42
FDI	216	32.55	24.50	0.00	101.35
EDUC	221	93.84	6.93	75.22	109.37
GDPPC	227	9.66	0.34	8.98	10.32
INFL	210	29.58	95.46	-1.15	1058.37
GOV	222	18.62	4.22	5.69	28.38
SERV	210	58.90	9.28	26.32	76.06

Table A2. *Results from Hausman test*

Model	Hausman test
1	Chi-square = 137.63
	p-value = 0.0000
2	Chi-square = 224.96
	p-value = 0.0000
3	Chi-square = 112.29
	p-value = 0.0000

Table A3. *Results from diagnostic checks*

Model	Modified Wald test for groupwise heteroskedasticity	Wooldridge test for autocorrelation	Pesaran cross-sectional dependence test
1	chi2 (10) = 70.32	F(1, 9) = 146.945	Pr = 0.0015
	Prob>chi2 = 0.0000	Prob > F = 0.0000	
2	chi2 (10) = 43.82	F(1, 9) = 149.996	Pr = 0.0007
	Prob>chi2 = 0.0000	Prob > F = 0.0000	
3	chi2 (10) = 53.25	F(1, 9) = 148.270	Pr = 0.0013
	Prob>chi2 = 0.0000	Prob > F = 0.0000	