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INEQUALITY, ECONOMIC GROWTH AND TRADE OPENNESS: A CASE STUDY FOR CENTRAL AND EASTERN EUROPEAN COUNTRIES (ECE)

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Abstract
The paper analyzes the phenomenon of income inequality in ten countries from Eastern and Central Europe (ECE), by highlighting two aspects: (1) the link between growth and income inequality; (2) the effects of trade openess and other key factors on income inequality, such as: foreign direct investment (FDI), market capitalization and educational level of labour force. The method used was the Panel Data Analysis with statistical data from the period of 2000-2014. An increasing effect in income inequality was identified due to the trade openess, the inward stock of ISD and the market capitalization and an equalizing effect in the income distribution generated by the educational level of labour force. A positive association was also found between the growth of PIB per capita level and the increase of income inequality in the examined countries.

Keywords: inequality, trade, panel data, FDI, Eastern and Central Europe (ECE).

JEL Classification: D31, F14, C23, C51, C52, O11

Introduction

Income inequality is an important economic, social and political issue. Inequality can affect economic growth and development, the social and economic balance.Inequality became global issue, a focus of the debates in the political environment, reducing inequality and improvement in cohesion is an objective of the European Union and stated in its 2020 Europe Strategy.

Income inequality has risen in most countries and regions over the past two decades even in developed countries. This period was associated with unprecedented trade and financial integration due to business globalisation or trade liberalisation. As a consequence, the focus of scholars was shifted to explore the determinants explaining inequality patterns, such as:

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trade openness, foreign direct investments, market or financial liberalization or educational level of labour force.

For the European countries members of the EU, income inequality, growth, and market, economic and financial integration are subjects of European and national policies as well as requirements of their economic integration. Economic convergence and social and economic cohesion are European policy targets monitorised through statistical indicators analyzed in periodical reports.

Countries from Central and Eastern Europe have particular features due to their similar past and performances, the experience of the central planned economy, but with different sizes and scales, and with different natural resources endowment. As post-communist countries, they faced differently the transition period, but with similar efforts, through trade and business liberalization, financial and markets, and institutional and governance development.

Most of them joined to the EU in the second wave (2004) (Poland, Czech Republic, Slovakia, Hungary, Estonia, Lithuania, Latvia, Slovenia), except Romania and Bulgaria which are EU members since 2007. They are developing countries, where two performers (Slovenia and Czech Republic) have a GDP per capita very close to the European average for the explored period (2000-2014), but they experienced persistent high level of inequality relatively to developed European Union's countries. In this context, a raised question can be: how justified are inequality-reducing or cohesion-increasing policies in these countries taking into consideration that all of them are experiencing (at first sight) an increase in inequality associated with economic growth?

We aim to explore the phenomenon of income inequality in these countries, by highlighting two aspects: (1) the link between growth and income inequality; (2) the effects of trade openess and other key factors on income inequality, such as: foreign direct investment, market capitalization and educational level of labour force. We have used as econometric model the Panel Data Analysis to estimate the effects of these factors on income inequality.

The paper is organised as follows. A review of literature on inequality and growth and determinants of inequality is presented in the second section. This is followed by a brief description of economic growth and inequality in these countries during 2000-2014. The econometric model and data are described in the third section and main results are presented in the fourth section. Finally, the fifth section concludes.

1. Review of the scientific literature

In 1955, Kuznets communicated his hypothesis on the relationship between two economic indicators: income inequality and economic growth, suggesting that this relationship is an inverted-U shape. He assumed that an economy will experience an initial inequality which, during the economic growth process, will be reduced due to public policies measures and transitions from agricultural to non-agricultural (industrial) sector.

Many empirical studies attempt to investigate the existence of Kuznets' inverted-U hypothesis using panel and cross-section data. The findings were divided in two groups: some to support the hypothesis and others to contradict it. For instance, Paukert (1973) used data from 56 countries, including 40 developing countries and found a link between Gini

coefficient and GDP per capita. The Kuznets' hypothesis is confirmed as follows: an increase in income inequality in countries of low levels in GDP per capita and a reduction in those of high levels of GDP per capita. In a multivariate regression analysis for a sample of 60 countries, Ahluwalia (1976) concluded a same strong support for the Kuznets' inverted-U curve. Later, other two studies (Anand and Kanbur, 1993; Deininger and Squire, 1998) provided little support to Kuznets' hypothesis.

Later studies used panel data and times series in analysis. For example, in a panel data of 35 countries, Fields and Jackubson (1998) didn't find a U-inverted link between income inequality and growth. Similar findings are related to Ram (1997), Bruno, Ravallion and Squire (1996).

In the late nineteenth century, other studies revealed a link between Gini coefficient and real GDP per capita corresponding to an inverted-U, as hypothesized by Kuznets (Forbes, 2000; Barro, 2000; Thornton, 2001; Pradhan, Upadhyay and Bhandari 2010).

Recently, re-examining the existence of the Kuznets curve for a panel data of 91 countries for 2002-2012, Kiatrungwilaikun and Suriya (2015) found that the relationship between economic growth and Gini coefficient is a U-shaped curve, invalidating the Kuznets' hypothesis.

In the analysis of income distribution, beside economic growth, we include other driving factors such as: trade openess, foreign direct investments (FDI), financial openess and educational level of labour force.

Generically, trade openess and financial openess are features examined in relation with business globalisation. International trade and good and services flows have risen in last decades mainly in developing countries. According to the Heckscher-Ohlin-Stopler-Samuelson (HOSS) theory, the income inequality in the developing countries will decrease as the demand of unskilled labour increases.

Empirical works examining the link between trade openness and income inequality can be divided in two groups: one group shows that intensification of trade flows is frequently associated with an increase in the relative demand for skilled labour and a consequent rise in the skill premium. For instance, Barro (2000), Ravallion (2001), Cornia and Kiiski (2001); Lundberg and Squire (2003), Milanovic and Squire (2005) had shown in their sample that international trade is associated with an increase in income inequality. Another group of works document a decrease in income inequality after trade liberalisation (Bourguignon and Morrissn, 1990; Calderon and Chong, 2001; Dollar and Kraay, 2004) or do not register any significant link between trade and income distribution (Edwards, 1997; Li, Squire and Zu, 1998; Lee and Vivarelli, 2006).

Analysing the link between trade openess and income inequality in a sample of 96 countries for 16 years, Ghose (2001) has found that a rising income inequality between countries was associated with a decrease of international inequality.

In developing countries globalisation is positively associated with income inequality increase (Kahai and Simmons, 2005; Fields and Jakubson, 2006; Meschi and Vivarelli, 2009). Other cross-country studies have found that a higher trade openess is associated with a lower impact on income inequality (Anderson, 2005). In the EU-27 countries trade openness exerted an equalizing effect of income in 1996-2009, while financial globalization has been driving force of inequality within EU countries. The recent financial crisis led to a significant rise in inequality only in the EU-periphery and the New Member States (Asteriou, Dimelis and Argiro, 2014).

FDI have positive effects on economic growth in developing countries (De Mello, 1997) but they are associated with a higher income inequality (Tsai, 1995; Feenstra and Hanson, 1997; Gopinath and Chen, 2003) and promote economic inequality (Figini and Görg, 2011). The long-run effects of FDI on income inequality are negative in average and they have a positive causal effect on income inequality in the short run (Herzer and Nunnekamp, 2013).

A large empirical literature explored the effects of education on earnings. A higher enrolment in secondary education is associated with a low income inequality (Barro, 2000; Alderson and Nielsen, 2002; Rodriguez-Pose and Tselios, 2009; Tsounta and Osueke, 2014). Education has a significant impact on development (Sianesi and Van Reene, 2003) and in developed countries, tertiary education are differentiating the income (Berry and Glaeser, 2005; Shapiro, 2006).

Economic growth and income inequality are inverserly associated (Ostry et al., 2014) and trade openess is identified as a key driver of income inequality and negatively related with it (Dabla-Norris et al., 2015). The main drivers of income inequality are: financial development, labour markets regulation, technological progress (Dabla-Norris et al., 2015).

2. Methodology and data

The essential methodological concepts of the paper are income inequality expressed by Gini coefficient and the estimation resulted from a panel data using the soft Eviews 8.

The Gini coefficient is commonly used as a measure of personal income or wealth. It measures the extent to which income distribution deviates from a perfect equal distribution. In a graphic representation, the Gini coefficient measure the area located between the Lorenz curve and the first bisector (diagonal line), expressed by a percent of the total area located under the curve (Anghelache et al., 2006). The Gini coefficient takes values between 0 (perfect equality) and 100 (perfect inequality).

There are several ways to calculate the Gini coefficient. In the initial formula propose by Corado Gini:

$$G = \sqrt{\sum_{i=1}^{n} g_i} \tag{1}$$

where:

g_i – means the share of individual i in the total income of population, the coefficient values were included in the range $\left[\sqrt{\frac{1}{n}},1\right]$.

The Gini index was modified by Struck, R., the unstable lower limit being transformed in a constant one, the values range becoming [0,1]:

$$GS = \sqrt{\frac{n\sum_{i=1}^{n} g_i^2 - 1}{n-1}} \tag{2}$$

This new calculation method extended the usage of Gini coefficient in the analysis of phenomena of economic diversification and territorial specialisation (Săvoiu, Iorga Simăn and Crăciuneanu, 2012).

Another way to estimate the Gini coefficient is to calculate it by halving the average distance between all individual income:

$$G = \frac{\sum_{j=1}^{n}\sum_{i=1}^{n}\left|x_i - x_j\right|}{2\sum_{j=1}^{n}\sum_{i=1}^{n}x_j} \tag{3}$$

where:

x_i – is the income of individual i of population consisting of n individuals.

In the EUROSTAT methodology, the Gini coefficient is calculated using the level of equivalised disposable income of households per adult.

The income inequality expressed by the Gini coefficient from EUROSTAT data base has increased in all ECE examined countries in the period of 2000-2014. We can divide the ten countries in 3 groups, according to the average levels of GDP per capita (Eur/inhabitant): (1) highest: Slovenia and Czech Republic (2) lowest: Romania and Bulgaria and (3) medium: Estonia, Lithuania, Latvia, Poland, Hungary, Slovakia.

In Czech Republic the Gini coefficient of income has small variations arround the average, but in Slovenia the variations are higher, with maximal values in 2005-2006 and 2010-2011. It is obvious that in the examined period of time the differentials of income inequality are very small in both countries (figure no. 1).

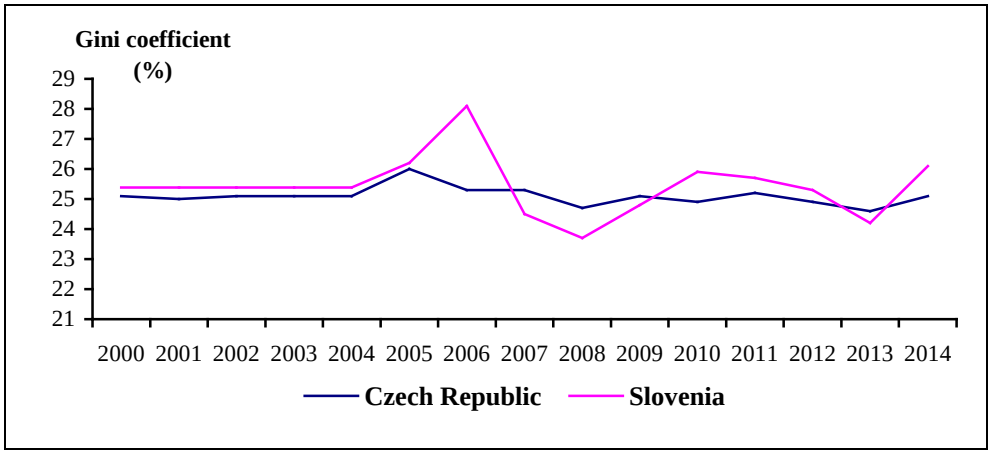

Figure no. 1: Evolution of income inequality in the group of countries with highest levels of PIB per capita (2000-2014)

Source: authors' computation based on EUROSTAT data

Bulgaria and Romania have experienced the highest level of Gini coefficient of income in the group of Eastern and Central European Countries (figure no. 2).

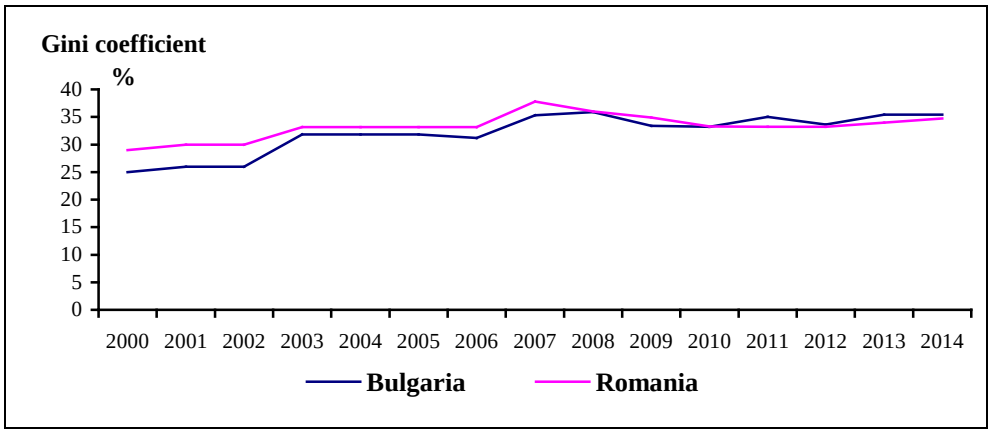

Figure no. 2: Evolution of income inequality in the group of countries with lowest levels of PIB per capita (2000-2014)
Source: authors' computation based on EUROSTAT data

In 2000, the highest levels of income inequality were registered in Lithuania and Estonia (higher than in Romania and Bulgaria) but in the last fifteen years they have kept under control the income inequality. The income inequality has increased in Romania, with a maximal value in 2007-2008, the general trend remaining ascending. A similar ascending trend can be identified in Bulgaria where the income inequality has increased with 10 percentage points (from 25,4% to 35,4%).We can notice that only Estonia and Lithuania register a slight down of income inequality in last years (after the economic crisis) (figure no. 3).

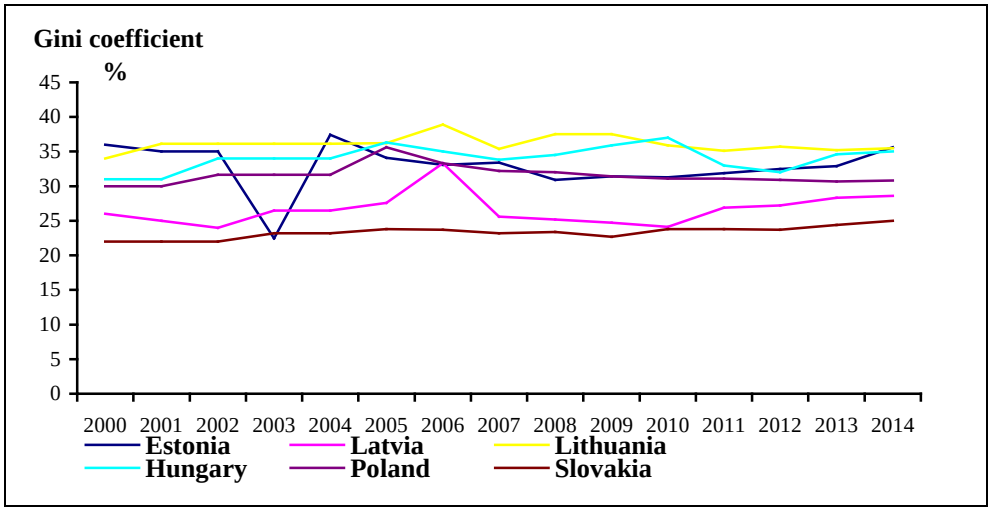

Figure no. 3: Evolution of income inequality in the group of countries with medium levels of PIB per capita (2000-2014)
Source: authors' computation based on EUROSTAT data

A panel data regression differs from a regular time-series or cross-section regression in that it has a double subscript on its variables (Baltagi, 2008, p.13):

$$Y_{it} = c + \beta \cdot X_{it} + u_{it} \tag{4}$$

where:

i - denotes countries or entities;
t - denotes time;
i - denotes the cross-section dimension;
t - denotes the time-series dimension;
c - is a scalar;
β - is K x1;
X_{it} - is the i-th observation on K explanatory variables;
u_{it} - is the error.

In most applications that use pane data, errors have the following form:

$$u_{it} = \alpha_i + \varepsilon_{it} \tag{5}$$

where:

α_i - is the error component specific to individual i;
ε_{it} - is the random component of error.

In the analysis of panel data there are two main approaches: the fixed effects model and the random effects model.

Fixed effects model assumes that characteristics of each individual unit may impact the dependent variable and the effects of time-invariant characteristics are not taken into consideration.

In a fixed effects model, the regression equation can be written as follows:

$$Y_{it} = (c_0 + \theta_i \cdot D_i) + \beta \cdot X_{it} + \varepsilon_{it} \tag{6}$$

where:

Y_{it} - is the dependent variable;
c_0 - is a constant;
θ_i - is a country-specific value;
D_i - is dummy variable for each country in the group;
β - is the parameter of independent variable;
X_{it} - is the independent variable;
ε_{it} - is the error.

The variation accross countries or entities can be correlated with the independent variables.

Unlike the fixed effects model, the variation across countries is assumed to be random and uncorrelated with the predictor or independent variables included in the random effects model (Greene, 2008, p.183).

In a random effects model, the regression equation is the following:

$$Y_{it} = c_0 + \beta \cdot X_{it} + \varepsilon_{it} \tag{7}$$

where:

$$\varepsilon_{it} = \lambda_{it} + \gamma_{it} \tag{8}$$

then:

$$Y_{it} = c_0 + \beta \cdot X_{it} + \lambda_{it} + \gamma_{it} \text{ and } Y_{it} = c_0 + \lambda_{it} + \beta \cdot X_{it} + \gamma_{it} \tag{9}$$

where:

Y_{it} - is the dependent variable;

c_0 - is a constant;

β - is the parameter of independent variable;

X_{it} - is the independent variable;

ε_{it} - is the error term;

γ_{it} - is the common white noise error;

λ_{it} - is the specific error term.

In the random effects models, the error is totally random and not correlated with regressors (Baum, 2001).

In order to select between fixed and random effects models, the commonly-used Hausman test is required to be performed. The Hausman test is designed to detect violation of the random effects assumption that the explanatory variables are ortogonal to the unit effects. If there is no correlation between the independent variables and the unit effects, the estimates of β in fixed effects model ($\hat{\beta}_{FE}$) should be similar to the estimation of β in random effects model ($\hat{\beta}_{RE}$). The Hausman statistic (H) is a measure of the difference between them:

$$H = \left(\hat{\beta}_{RE} - \hat{\beta}_{FE}\right)' \left[Var\left(\hat{\beta}_{FE}\right) - Var\left(\hat{\beta}_{RE}\right)\right]^{-1} \left(\hat{\beta}_{RE} - \hat{\beta}_{FE}\right) \tag{10}$$

Under the null hypothesis of ortognality, H is the chi-square distribution with degree of freedom equals to the number of regressors in the model. A finding that *p* is less than 0.05 is taken as an evidence that, at conventional levels of significance, the two models are different enough to reject the null hypothesis and to reject the null hypothesis in the favour of the fixed effects model. If the Hausman test does not indicate a significant difference

(p>0.05), the null hypothesis is accepted and the fixed effect model is rejected in the favour of the random effects model (Clark and Linzer, 2006).

Following Elmawazini et al. (2013) and Chintrakarn, Herzer and Nunnenkamp (2012) we assume that the correct specification of the relationship between income inequality and trade openess in ECE countries is given by a multivariate model of the form:

$$INQ_{it} = \alpha + \beta \cdot TO_{it} + \gamma \cdot X_{it} + \varepsilon_{it} \tag{11}$$

where:

INQ_{it} - is the Gini coefficient of disposable income in country *i* in the year;

TO_{it} - is the trade openess in country *i* in the year *t*;

X_{it} - is a control vector;

α - is a constant;

ε_{it} - is the error.

In order to measure the income inequality (INQ_{it}) we use the Gini coefficient from EUROSTAT data base.

Trade openess`(TO_{it}) is the ratio of the sum of exports and imports to GDP. Studies conducted by Frankel and Romer (1999) and Barro (2000) used this measure to examine the impact of trade on inequality within countries.

The control variables in vector X have been selected on the basis of existing studies on the determinants of income inequalities whithin ECE countries and include: `FDI ratio to GDP`, `market capitalization` and `educational level of labour force`.

The `ratio of FDI inward stock to GDP` was used by Herzer and Nunnekamp (2013) to explain the differences in income inequality accross Europe and also by Chintrakarn, Herzer and Nunnenkamp (2012) for the USA.

`Market capitalization`or the market value of domestic listed companies is a measure of financial openess of economies, associated with trade openess and FDI inflows. Stock market capitalization was identified by Asteriou, Dimelis and Argiro (2014) as one of the driving forces of inequality in the EU-27 since 1995.

Education should also be taken into account, due to the fact that an increase in education implies an increase in the supply of skilled labour, a decrease in the relative skilled/unskilled wage differential, and an overall decrease in income inequality. `Educational level of labour force` mainly secondary educated people were associated with a decrease of income inequality (Alderson and Nielsen 2002; Barro, 2000). As a proxy of education level of labour force we use the share of secondary educated people in the labour force.

The data collected for this study ranges 15 years (2000-2014) from a panel of 10 European countries from Eastern and Central Europe (ECE). Definitions of all variables and their sources are presented in the table no. 1.

Table no. 1: Data description

Variable	Name	Description	Source
INQ	Gini coefficient (0÷100 or 0÷1) 100 or 1 is the maximal value meaning the maximal inequality	Gini coefficient of equivalised disposable income The Gini coefficient is defined as the relationship of cumulative shares of the population arranged according to the level of equivalised disposable income, to the cumulative share of the equivalised total disposable income received by them.	EUROSTAT EU SILC, 2016
TO	Trade openess (trade % of GDP)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	World Bank, 2016a
FDI	Share of FDI inward stock on GDP (% of GDP)	Foreign Direct Investment inward stock GDP at market prices	calculated based on UNCTAD, 2016 (FDI inward stock) and World Bank, 2016b (GDP at market prices)
EDUS	Labour force with secondary education (% of total)	Share of secondary educated labour force in total labour force	World Bank, 2016c
MKCAP	Market capitalization of listed domestic companies (% of GDP)	Market capitalization (also known as market value) is the share price times the number of shares outstanding (including their several classes) for listed domestic companies. Investment funds, unit trusts, and companies whose only business goal is to hold shares of other listed companies are excluded. Data are end of year values.	World Bank, 2016d

3. Main findings

We have progressively included in the equation 11 all control control variables: FDI, EDUS, and MKCAP, resulting four econometric models tested with Eviews software. The estimation results are displayed in the tables no. 2-5. As a result of Hausman test, we have selected a random effects model (RE) and the EGLS method. All estimated coefficients are statistically validated for a significance level of 5%. The standard errors are calculated using the White cross-section method.

The estimation of the model 1 parameters is presented as following:

$$INQ = 16{,}87152 + 0{,}143624 \cdot TO \tag{12}$$

In cases in which the trade openess increases with 10 percent, the income inequality increases with 14 percent, considering constant other factors. The TO variable coefficient is statistical validated within a 5 percent materiality, the Prob being zero, respectively beneath 0.05. The coefficient of determination value R^2 is 0.7165, this means that 71.65 percent of the INQ can be attributed to the TO variable variation. The very appropiated values of the adjusted determination coefficient value and the determination coefficient show that the sample is representative for more concise rendering of the reality. The calculated F statistic (374.0810) este higher that the critical value ($F_{1,148}$ =3,84). The Prob value is zero both for the free term and for the independent variable coefficient, and Prob (F-statistic) is zero which means that the model is statistical valid. Regarding the autocorrelation errors, the DW test shows that 0 < DW=1,26 < $d_1 = 1{,}65$ ($d_2 = 1{,}69$), signifying the rejection of the null hypothesis, respectively the fact that the errors are positively autocorrelated (table no. 2).

Table no. 2: Estimation results using model 1 (one explanatory variable)

Dependent Variable: INQ				
Method: Panel EGLS (Cross-section random effects)				
Date: 03/28/16 Time: 13:56				
Sample: 2000 2014				
Periods included: 15				
Cross-sections included: 10				
Total panel (balanced) observations: 150				
Swamy and Arora estimator of component variances				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	16.87152	3.102789	5.437533	0.0000
TO	0.143624	0.026020	5.519759	0.0000
R-squared	0.716519	Mean dependent var		32.05733
Adjusted R-squared	0.714604	S.D. dependent var		3.531905
S.E. of regression	1.886832	Sum squared resid		526.9001
F-statistic	374.0810	Durbin-Watson stat		1.264185
Prob(F-statistic)	0.000000			

Source: data computation using Eviews software

The estimation of the second model is presented as following:

$$INQ = 20{,}2794 + 0{,}076956 \cdot TO + 0{,}057193 \cdot FDI \qquad (13)$$

Within an increase of 10 percent of the trade openness, the income inequality is increasing with 7.6 percent, and within an increase of the FDI stock entries of 10 percent, income inequality rise with 5.7 percent. The independent variables coefficients are statistical validated within a 5 percent materiality, the Prob values being zero. The determination coefficient value R^2 is 0.7775 form the INQ variation which can be atributed the FDI and TO variables variation. The very appropiated values of the adjusted determination coefficient value and the determination coefficient show that the sample is representative for more concise rendering of the reality.

The calculated F statistic (256.9433) este higher that the critical value ($F_{2,147}$ =2,99). The Prob value is zero both for the free term and for the independent variable coefficient, and

Prob (F-statistic) is zero which means that the model is statistical valid. Regarding the autocorrelation errors, the DW test shows that 0 < DW=1,50 < $d_1 = 1{,}63$ ($d_2 = 1{,}73$), signifying the rejection of the null hypothesis, respectively the fact that the errors are positively autocorrelated (table no. 3).

Table no. 3: Estimation results using model 2 (two explanatory variables)

Dependent Variable: INQ				
Method: Panel EGLS (Cross-section random effects)				
Date: 03/28/16 Time: 17:41				
Sample: 2000 2014				
Periods included: 15				
Cross-sections included: 10				
Total panel (balanced) observations: 150				
Swamy and Arora estimator of component variances				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	20.27940	0.919416	22.05682	0.0000
TO	0.076956	0.012796	6.013959	0.0000
FDI	0.057193	0.009293	6.154546	0.0000
R-squared	0.777572	Mean dependent var		32.05733
Adjusted R-squared	0.774545	S.D. dependent var		3.531905
S.E. of regression	1.677022	Sum squared resid		413.4231
F-statistic	256.9433	Durbin-Watson stat		1.503291
Prob(F-statistic)	0.000000			

Source: data computation using Eviews software

The estimation of the third model is presented as following:

$$INQ = 58{,}72492 + 0{,}076763 \cdot TO + 0{,}103803 \cdot FDI - 0{,}720288 \cdot EDUS \quad (14)$$

Within an increase of 10 percent of the trade openness, the income inequality is increasing with 7.66 percent, and within an increase of the FDI stock entries of 10 percent generates an increase of 10.38 percent in income inequality, meawhile the 10 percent increase of the secondary education persons in the total amount of the labour force will lead to an increase with 7.2 percent of the income inequality. The independent variables coefficients are statistical validated within a 5 percent materiality, the Prob values being zero. The determination coefficient value R^2 is 0.8032 form the INQ variation which can be atributed the TO, FDI and EDUS variables variation. The very appropiated values of the adjusted determination coefficient value and the determination coefficient show that the sample is representative for more concise rendering of the reality. The calculated F statistic (198.7344) este higher that the critical value ($F_{3,146}$ =2,60). The Prob value is zero both for the free term and for the independent variable coefficient, and Prob (F-statistic) is zero which means that the model is statistical valid. Regarding the autocorrelation errors, the DW test shows that DW: $d_1 = 1{,}61$ < DW=1,66 < $d_2 = 1{,}74$, signifying the acceptance of the null hypothesis, respectively the fact that the errors are not positively autocorrelated (table no.4).

Table no. 4: Estimation results using model 3 (three explanatory variables)

Dependent Variable: INQ				
Method: Panel EGLS (Cross-section random effects)				
Date: 03/28/16 Time: 17:48				
Sample: 2000 2014				
Periods included: 15				
Cross-sections included: 10				
Total panel (balanced) observations: 150				
Swamy and Arora estimator of component variances				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	58.72492	9.125662	6.435141	0.0000
TO	0.076763	0.012078	6.355798	0.0000
FDI	0.103803	0.014079	7.372760	0.0000
EDUS	-0.720288	0.170197	-4.232080	0.0000
R-squared	0.803288	Mean dependent var		32.05733
Adjusted R-squared	0.799246	S.D. dependent var		3.531905
S.E. of regression	1.582489	Sum squared resid		365.6238
F-statistic	198.7344	Durbin-Watson stat		1.661976
Prob(F-statistic)	0.000000			

Source: data computation using Eviews software

The estimation of model 4 is:

$$INQ = 65{,}27943 + 0{,}073351 \cdot TO + 0{,}103351 \cdot FDI - 0{,}840150 \cdot EDUS + 0{,}048331 \cdot MKCAP \quad (15)$$

The explanatory variables coefficients, as well as the free term are statistically valid, because the Prob is zero, at a 5 percent of significance level. The determination coefficient value R^2 is 82.07 percent which shows that the income inequality variation it is due to explicative variables variation of 82.07 percent. The model is statistically significant because the determined F statistic (165.932) is higher than the critical value ($F_{4,145}$=2,37) (table no. 5).

Table no. 5: Estimation results using model 4 (four explanatory variables)

Dependent Variable: INQ				
Method: Panel EGLS (Cross-section random effects)				
Date: 03/28/16 Time: 17:51				
Sample: 2000 2014				
Periods included: 15				
Cross-sections included: 10				
Total panel (balanced) observations: 150				
Swamy and Arora estimator of component variances				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	65.27943	8.928258	7.311553	0.0000
TO	0.073351	0.011611	6.317483	0.0000
FDI	0.103701	0.013491	7.686806	0.0000
EDUS	-0.840150	0.166384	-5.049454	0.0000
MKCAP	0.048331	0.013297	3.634813	0.0004

Variable	Coefficient	Std. Error	t-Statistic	Prob.
R-squared	0.820706	Mean dependent var		32.05733
Adjusted R-squared	0.815760	S.D. dependent var		3.531905
S.E. of regression	1.516006	Sum squared resid		333.2499
F-statistic	165.9320	Durbin-Watson stat		1.879407
Prob (F-statistic)	0.000000			

Source: data computation using Eviews software

The Durbin – Watson test is suggesting that the residual variables are insignificant correlated (the value it is closer to the 2 optimal values). The independent variables correlation matrix (table no. 6) shows that between FDI and TO, FDI and EDUS variables are collinear $R^2 = 0{,}8207 < r_{x_1,x_2}$, and MKCAP and FDI, respectively MKAP and EDUS evolve independently.

Table no. 6: Correlation matrix of independent variables

	TO	FDI	EDUS	MKCAP
TO	1	0.8465	0.77829	0.4698
FDI	0.8465	1	0.9203	0.5125
EDUS	0.7782	0.9203	1	0.5380
MKCAP	0.4698	0.5125	0.5380	1

Source: data computation using Eviews software

For an increase of 10% of trade openess, the income inequality will raise with 7,3%. This positive association between income inequality and trade openness is consistent with the results from studies conducted in developing countries (Dollar and Kraay, 2004; Kraay, 2006, Goldberg-Koujianu and Pavcnik, 2007).

The FDI inward stock has a lower influence: an increase of 10% in FDI will lead to an increase of 1,03% in income inequality. When market capitalization (the market value of domestic listed companies as % of GDP) increases with 10%, the Gini coefficient will raise with 0,4 %. We can conclude that regarding the role of financial openness in the group of Eastern and Central European countries (measured by the FDI inward stock and the market capitalisation) our empirical findings show an increase in inequality with the financial liberalisation. The impact is statistically significant, for level of significance of 5%. These results are consistent with existing evidence on developing countries (Kose et al., 2006; Goldberg-Koujianou and Pavcnik, 2007; International Monetary Fund, 2007 a,b).

The educational level influences intensely the income inequality. When the share of secondary educated people in the labour force will increase with 10%, the result will be a reduction of Gini coefficient with 8,4%. This is the unique factor driving to a more equal distribution of income in the examined countries. This result is in line with Barro (2000) and Alderson and Nielsen (2002) findings.

Conclusions

The paper analyzes the link between income inequality and macroeconomic output (PIB per capita) in 10 ECE countries in the period 2000-2014 and examines the effects of trade openess and other factors such as: FDI, education level of labour force and market capitalization on income inequality and educational level of labour force on income inequality.

It is found a positive association between increasing levels of GDP per capita are with increasing levels of inequality in the examined countries, an important result for the European policies having as targets the improvement of life standard and decrease of the income inequality in the Member States. Our findings are consistent with other relevant empirical studies confirming the theory that economic growth in the developing countries leads to a more inequal income distribution. The rising levels of income inequality in Central and Eastern Europe can be a right justification for inequality-reducing policies or it may suggest that they are a cost to bear in the sake of higher economic growth.

The paper results suggest that financial globalization factors, mainly inward stock of FDI and market capitalization have been responsible for the increase of inequality in the Eastern and Central Europe in recent years and trade policies have been more favorable to inequality. Therefore, any policy issue directed to reduce inequality should primarly be concerned with FDI and trade openness.

Another finding is related to the strong impact of education level of labour force on income inequality. This result is in line with studies documenting the beneficial educational effect on income distribution (see Checci, 2000). Due to the negative influence of FDI in income distribution, the experience of these countries leads to the conclusion that policymakers competing for inward FDI need to be concerned by the educational level of labour force.

The limits of our study consist on the fact that none of the channels through which the drivers of income inequality are spread in the examined economies. Future research should extensively examine the channels that make trade openness, FDI and financial flows in conjunction with appropriate educational policies affect inequality in Central and Eastern Europe. As stated by Goldberg and Pavcnik (2007), trade and financial globalization can affect inequality within countries through three types of changes, in: (1) wages, (2) relative prices and consumption and (3) household production.

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