Dimensions of globalization and income inequality in transition economies: taking into account cross-sectional dependence

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Abstract

This study aims to investigate the impact of different globalization dimensions on income inequality for the period from 1991 to 2013 in a panel of 11 transition economies. For this purpose, the relationship between economic, social and political globalization indices and Gini coefficient is examined with second generation panel data methods such as CCE (common correlated effect) estimator and Konya causality procedure to consider the cross-sectional dependence across transition economies. The result reveals that economic globalization negatively correlated with income inequality in China and Russia; social globalization negatively correlated with income inequality in Belarus and Poland; and the political globalization negatively correlated with income inequality in Kazakhstan. In addition, the causality test results show that economic globalization causes income inequality in China, Hungary, Moldova and Russia; social globalization causes income inequality in Hungary, Belarus, Kazakhstan and Poland; and political globalization causes income inequality in Kazakhstan, Poland and Russia.

Keywords: income inequality, globalization, transition economies, cross-sectional dependence

Introduction

In recent decades, overcoming the rising income inequality has become the crucial purpose for most of developed and developing countries. Most of the countries have implemented some policies such as reducing trade taxes and trade barriers and liberalizing financial markets which are considered the main policies to increase welfare and income distribution justice. The neoliberal view claims that economic integration between countries causes income convergence by efficiency of resource use and tends to specialize in line with their comparative advantages. According to this view, the incomes of globalizing developing countries have grown

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faster than those of developed and non-globalizing developing countries (IMF, 2007). On the other hand, controversial arguments about the effects of liberal policies on income inequality occur. It is also argued that powerful and wealthy countries do not show an interest in the goal of an equal society. In this respect, those with anti-liberal or anti-globalization views share the common argument that globalization only increases the incomes of certain segments (Wade, 2004). In particular, it is claimed that high-income segments have easy access to financial instruments than low-income segments as a result of integration in the financial sector, and that the financialization process will increase income inequality.

Based on these discussions, many researchers have both theoretically and empirically investigated the impact of globalization on income inequality. Moreover, most of these researches only deal with the economic dimension of globalization. However, it is a well-known fact that globalization is a multidimensional phenomenon and that associating it exclusively with economic integration leads to erroneous policy implications. Namely, international political agreements and socio-cultural interaction have also started to direct the economic policies of the countries. Therefore, ignoring both the social and political dimensions of globalization leads to underestimating the globalization effects on any indicator.

In line with the above explanations, this paper aims to investigate the relationship between three dimensions of globalization and income inequality in transition economies. For this purpose, the data of 1991-2013 is empirically searched by using second generation panel data methodologies. The reason for choosing this sample of countries resides in the fact that transition economies were more affected by globalization during the observed years and the effects of globalization on income inequality may be determined more specifically for these countries. For instance, After the Cold War period, the globalization process of these countries started to increase rapidly. According to the database of KOF Globalization Index, the average globalization index of the observed countries in 1991 increased from 27.57 to 35.97 in 2013. Similarly, based on the SWIID database, Gini coefficients of these countries increased from 38.08 in 1991 to 68.31. Therefore, it is important to measure how much the growing inequality for selected countries is related to globalization. The contribution of this study is threefold. First, to the best of our knowledge, this is the first study in the literature that analyses the effects of economic, social and political globalization on income inequality in transition countries, which can be described as more globalizing after 1991. Second, unlike previous studies, the dependency of income inequality is considered with the methods of CCE (common correlated effect) estimator developed by Pesaran (2006) and the causality test developed by Konya (2006) which allows the cross-sectional dependency and country-specific heterogeneity across countries. Third, the methods used in this study allow determining the relationships for each member country of the panel and thus, policy implications can be detailed for each country (Nazlioglu *et al.*, 2011; Chang *et al.*, 2013; Wolde-Rufael, 2014).

The paper is organized as follows; Section 1 deals with the literature review, Section 2 describes the data, econometric model and methodology, Section 3 presents the empirical results and Section 4 concludes the study.

1. Literature review

The studies on the globalization-inequality nexus have mostly focused on the economic dimensions of globalization and most of these studies have used trade openness or foreign direct investment (FDI hereafter) as indicators of economic globalization. However, the research on the impact of social globalization or political globalization is very limited. Therefore, we structured literature in three sections. In the first section, we review the studies which only investigated the effect of FDI on income inequality. In the second section, we discuss the literature on economic globalization (trade openness and foreign direct investment) and income inequality nexus. Finally, the third section of literature includes the studies that used globalization indices and examined the impact of social and political globalization on income distribution.

In the first section, we review the recent studies on foreign direct investment and income inequality nexus. Theoretically, the impact of foreign direct investment is mostly explained by the argument that FDI increases the relative demand for skilled labour and thus increases income inequality. Empirically, some studies focused on the host country effects of FDI. For instance, Mah (2015) examined the impact of FDI on income inequality in China for the 1982-2010 periods by using GMM and concluded that income inequality worsens with increasing FDI inflows. Similarly, Herzer *et al*. (2014) searched the relationship between FDI and income inequality in 5 Latin American countries for the period of 1980-2000 and used panel DOLS (dynamic ordinary least squares) estimation method. The results show that income inequality increases with the increasing of FDI. Trinh (2016) also probed the nexus in Vietnam for the period of 2002-2012 using with panel regression method and concluded that FDI inflows reduce inequality. In addition, some studies take into account the possible non-linearity, for example Ucal *et al*. (2016) investigated the nexus in Turkey for the period from 1970 to 2008 by using non-linear ARDL model and found that increasing FDI reduces inequality in Turkey. Moreover, some studies add some specific control variables to the empirical model, for example Sharma and Abekah (2017) explored the relationship between foreign direct investment, foreign aid and income inequality in 71 African and South American countries for the period of 1970-2014 and found that increasing FDI reduces income inequality. Some studies examined the FDI-inequality nexus at sectoral level. For example, Bogliaccini and Egan (2017) examined the impact of FDI on sectoral employment for the period from 1989 to 2010 in 60 middle income countries by using the ECM-based panel fixed effect model and found that FDI is more efficiently associated with income inequality in the service sector than in other sectors.

Unlike focusing on FDI host countries, some studies investigated the FDI-inequality nexus for both developed and developing countries to compare the effects of FDI on inequality both for host and home countries. Choi (2006) investigated the effect of FDI on income inequality in 119 countries for the period from 1993 to 2002 by using the pooled ordinary least squares method and concluded that increasing FDI increases inequality. Wu and Hsu (2012) used a dataset of 54 countries over the period 1980-2005 and an endogenous threshold regime model to test the relation between financial globalization and income inequality and ask whether the relationship depends on absorptive capacity. The results indicated that FDI is likely to increase income inequality in host countries with low levels of absorptive capacity. Lin *et al*. (2014) examined the FDI-inequality nexus for the period from 1976 to 2005 in 42 developed and developing countries by using the smooth transition regression model and concluded that increasing FDI increases income inequality.

In the second section, we focused on the studies which take into account both trade openness and foreign direct investment to determine the relationship between economic globalization and income inequality. In the case of trade, Kanbur (2000) explained the theoretical relationship between trade openness and income inequality based on Heckscher-Ohlin theory, and argued that trade openness will put downward pressure on the wages of unskilled workers in developed countries, increase capital incomes and increase inequality in these economies. Nevertheless, the same theoretical model predicts that increasing wages of unskilled workers in less developed countries will diminish the inequality in these countries.

There are also studies that empirically examine the effects of trade on inequality, even in a small number of cases. Jalil (2012) utilized the ARDL bound test to investigate the relationship between trade openness and income inequality for China during the period 1952-2009. The results implied that income inequality rises with the increase of openness and then starts to fall after a critical point. Faustino and Vali (2013) examined the correlation between income inequality and economic globalization (measured by trade openness and FDI) for 24 OECD countries for 1995-2007 periods. According to dynamic panel data analysis, trade openness decreases income inequality, but FDI has no significant effect on inequality. Mah (2013) explored the relationship between globalization, decentralization and income inequality in China for 1985-2007 periods. The findings showed that trade liberalization increases income inequality, but financial globalization and decentralization have no effects on inequality. Jaumotte *et al*. (2013) probed the relationship between trade globalization, financial globalization and income equality for 51 countries from 1981 to 2003. The results suggested that trade globalization is associated with a reduction in inequality, while financial globalization is associated with an increase in inequality. Asteriou *et al*. (2014) examined the effect of both trade and foreign direct investment for the period from 1995 to 2009 in European countries by using panel regression and concluded that trade openness reduces

income inequality while foreign direct investment increases inequality in EU-core countries. In addition, their findings argued that foreign direct investment reduces inequality in periphery (Portugal, Ireland, Italy, Greece and Spain) countries. Baek and Shi (2014) probed both the effect of trade liberalization and financial integration on inequality in 26 developed and 52 developing countries for the period 1990-2010 by using panel regression and found that trade liberalization increases inequality in developed countries and decreases it in developing countries. However, financial integration reduces inequality in developed countries and inequality has been positively affected by financial integration in developing countries. Bukhari and Munir (2016) investigated both the effect of trade openness and foreign direct investment on inequality in 11 Asian countries for the period 1990-2014 by using the panel OLS technique. The results suggest that trade openness reduces inequality while foreign direct investment positively affects it. Wong (2016) investigated the relation between globalization (trade liberalization and FDI), government spending (education, welfare and health) and income inequality for 16 countries in Asia and the Pacific for 1960-2012 periods. The empirical results suggested that trade liberalization strongly increases income inequality while FDI has no statistically significant effect on inequality. The detailed previous literature on the effect of economic globalization on income inequality can be seen in Goldberg and Pavcnik (2007).

In the third section of the literature, we review literature that used the globalization index or other dimensions of globalization to observe the impact of globalization on inequality. However, we observe that the theoretical explanations on the effects of social and political globalization on income distribution are limited. In the case of social globalization, Atkinson (1997) argued that integrated social norms between countries may affect inequality by changing union behaviours and bringing inequality to more acceptable levels. As for political globalization, Tsai (2007) argues that international political integration can contribute to the progress of human health, and can contribute to the distribution of income through problems such as outbreak management, human rights problems and global environmental problems. Similar to theoretical arguments, the empirical studies on the effect of these dimensions on inequality are very limited. Dreher and Gaston (2008) probed the nexus between different globalization indices and income inequality for the period from 1970 to 2000 by using the panel GMM and panel fixed effect model in both OECD and non-OECD countries. The results of the study show that economic and political globalization increases inequality while the social globalization index has no statistically significant effect on income inequality. Gaston and Rajaguru (2009) searched the relationship between social globalization index and income inequality in Australia for the period from 1970 to 2001 and found that social globalization increases inequality in Australia. Bergh and Nilsson (2010) investigated the effect of liberalization and different globalization indices (KOF index) on income inequality in 80 countries for the period from 1970 to 2005 by

using GMM methodology. The study concluded that economic freedom and social globalization index increases income inequality mainly in rich countries. Atif *et al*. (2012) examined the economic globalization index and inequality nexus in 68 developing countries for the 1990-2010 periods by using the dynamic panel estimation method and found that economic globalization increases inequality. Ezcurra and Rodriquez-Pose (2013) used KOF index of economic globalization and inequality index measured by Theil (1967) to explore the relationship between economic globalization and regional inequality in a panel of 47 countries over the period 1990-2007. The empirical findings show a positive association between the degree of economic openness and the magnitude of within-country regional disparities. Shahbaz *et al*. (2014) explored the financial development, globalization index and income inequality relation in Iran for the period of 1965-2011 by using ARDL procedure and concluded that financial development and increasing globalization reduce income inequality.

Table 1. Summary of the literature survey

Author(s)	Country/Panel	Period	Findings
Economic Globalization Indices and Inequality Nexus			
Herzer *et al*. (2014)	5 Latin American countries	1980-2000	FDI increases INE
Mah (2015)	China	1982-2010	FDI increases INE
Trinh (2016)	Vietnam	2002-2012	FDI reduces INE
Ucal *et al*. (2016)	Turkey	1970-2008	FDI reduces INE
Sharma and Abekah (2017)	71 countries	1970-2014	FDI reduces INE
Choi (2006)	119 countries	1993-2002	FDI increases INE
Wu and Hsu (2012)	54 countries	1980-2005	FDI increases INE
Lin *et al*. (2014)	42 countries	1976-2005	FDI increases INE
Jalil (2012)	China	1952-2009	TO increases INE
Faustino and Vali (2013)	24 OECD countries	1995-2007	TO reduces INE
Mah (2013)	China	1985-2007	TO increases INE
Jaumotte *et al*. (2013)	51 countries	1981-2003	TO reduces INE
Asteriou *et al*. (2014)	European countries	1995-2009	TO reduces INE, FDI increases INE
Baek and Shi (2014)	78 countries	1990-2010	TO increases INE
Bukhari and Munir (2016)	11 Asian countries	1990-2014	TO reduces INE, FDI increases INE
Globalization Indices and Inequality Nexus			
Dreher and Gaston (2008)	OECD and non-OECD countries	1970-2000	EG and PG increases INE, SG has not any effect on INE
Gaston and Rajaguru (2009)	Australia	1970-2001	SG increases INE
Bergh and Nilsson (2010)	80 countries	1970-2005	SG increases INE
Atif *et al*. (2012)	68 developing countries	1990-2010	EG increases inequality

Ezcurra and Rodriquez-Pose (2013)	47 countries	1990-2007	EG increases INE
Shahbaz *et al*. (2014)	Iran	1965-2011	GLO increases INE

Note: FDI: Foreign direct investment, INE: Income inequality, TO: Trade openness, EG: Economic globalization index, SG: Social globalization index, PG: Political globalization index, GLO: Overall globalization index.

As seen in previous studies, they have all ignored the cross-sectional dependence among observed countries. In such situations, the results obtained from panel data may not be reliable for policy implications. In addition, there is no research for transition economies where the effects of globalization can be observed most prominently. Moreover, most of these studies focused on economic indicators proxy for globalization and thus they ignored the social and political dimensions of globalization. Based on these reasons, this study aims to fill in the literature gap on investigating the effects of all dimensions of globalization on income inequality in transition economies by using second generation panel data methodologies which take into account the cross-sectional dependence among countries.

2. Empirical methodology and data

2.1. Empirical model and data

Based on availability[1], the data comprises the annual data for the period from 1991 to 2013 in 11 transition economies with the description of International Monetary Fund; Armenia, Belarus, Bulgaria, China, Georgia, Hungary, Kazakhstan, Moldova, Poland, Romania and Russia. After the Cold War period, the globalization process of these countries started to increase rapidly. According to the database of KOF Globalization Index, the average globalization index of the observed countries in 1991 increased from 27.57 to 35.97 in 2013. Similarly, based on the SWIID database, Gini coefficients of these countries increased from 38.08 in 1991 to 68.31. Therefore, it is important to measure how much the growing inequality for selected countries is related to globalization. Based on the above explanations, the empirical model of the panel version can be written as follows;

$$lnINE_{it} = \beta_0 + \beta_1 lnGDP_{it} + \beta_2 lnECO_{it} + \beta_3 SOC_{it} + \beta_4 POL_{it} + \mu_{it} \quad (1)$$

where *t* refers to time period; *i* refers to cross-section; μ_{it} refers to residual term. *INE* is the Gini coefficient that indicates income inequality, *GDP* is the real gross domestic product per capita, *ECO* is the economic globalization, *SOC* is the social globalization and *POL* is the political globalization. All variables are used in natural

[1] Although the globalization data is available for 2014, inequality data is existing for 2013 as a last year. To utilize with balanced panel model, we use the period of 1991-2013.

logarithm. The gross domestic product per capita is measured in 2005 in US dollars and the data of real GDP is retrieved from *World Development Indicators*. The data on economic, social and political globalization are obtained from *KOF Globalization Index* which was first developed by Dreher (2006). In addition, the data of income inequality is sourced from SWIID database of Solt (2016). In the context of KOF Globalization Index, the economic globalization index consists of actual flows and restrictions. The sub-factors of actual flows are trade, foreign direct investment stocks, portfolio investment, income payments to foreign nationals and the sub-factors of restrictions are hidden import barriers, mean tariff rate, taxes on international trade, capital account restrictions. In addition, the social globalization index covers three main indicators. The first indicator is data on personal contact and this indicator consists of telephone traffic, transfers, international tourism, foreign population and international letters. The second indicator is data on information flows and this indicator covers internet users, television and trade in newspapers. The third indicator of social globalization is cultural proximity and the number of McDonald's, Ikea restaurants and trade in books constitute this indicator. Finally, the political globalization index covers embassies, membership in international organizations, participation in U.N. Security Council Missions and international treaties.

2.2. Methodology

Cross-sectional dependence and homogeneity

Investigating the cross-sectional dependence across countries is an important issue in panel data analysis because a shock in a country may be easily transmitted to other countries. The high degree of globalization and increasing economic and financial integration leads to cross-sectional dependence in the world economy (Nazlioglu *et al*., 2011; Wolde-Rufael, 2014). Therefore, the first step of the analysis in this study is to examine the cross-section dependency across countries. Breusch and Pagan (1980) developed the Lagrange Multiplier (LM) test in order to examine the cross-sectional dependence. The LM test is computed with the use of the following equation;

$$y_{it} = a_i + \beta_i x_{it} + \varepsilon_{it} \quad \text{for } i = 1 \ldots, N \text{ and } t = 1 \ldots, T, \qquad (2)$$

where *i* and *t* state the cross-section dimension and the time period respectively. In this procedure, the null hypothesis of $H_0: \mathrm{Cov}(\varepsilon_{it}, \varepsilon_{jt}) = 0$, there is no dependency between the cross-sections tested against the alternative hypothesis of $H_1: \mathrm{Cov}(\varepsilon_{it}, \varepsilon_{jt}) \neq 0$, the dependency between at least one pair of cross-sections. And the computation of the LM test is as follows;

$$LM = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}^{2} \sim \chi^{2}_{N(N-1)/2} \qquad (3)$$

where $\hat{\rho}_{ij}$ is the sample of the pair-wise correlation of the residuals from ordinary least squares estimation of Eq. (1) for each cross section. While the LM test is suitable for panels providing the condition of small N and sufficiently large T, for situations where $T \to \infty$ and $N \to \infty$, the scaled LM version developed by Pesaran (2004) is as follows;

$$CD_{LM} = \left(\frac{1}{N(N-1)}\right)^{1/2}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\left(T\hat{\rho}_{ij}^{2}-1\right) \sim N(0,1) \qquad (4)$$

Due to CD_{LM} test tends to failure in case of large N and small T, Pesaran (2004) developed a more comprehensible test. The calculation of the CD test is as follows:

$$CD = \sqrt{\left(\frac{2T}{N(N-1)}\right)}\ \sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\left(\hat{\rho}_{ij}-1\right) \sim N(0,1) \qquad (5)$$

However the CD test will lack power in certain situations where the population average pair-wise correlations are zero (Pesaran *et al*., 2008). Therefore, Pesaran *et al*. (2008) suggest a bias-adjusted test which is a modified version of the LM test.

The bias-adjusted LM test is:

$$LM_{adj} = \sqrt{\left(\frac{2}{N(N-1)}\right)}\ \sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\frac{(T-k)\hat{\rho}_{ij}^{2}-\mu_{Tij}}{\sqrt{v_{Tij}^{2}}}\ N(0,1) \qquad (6)$$

where k, μ_{Tij} and v_{Tij}^{2} are the number of regressors, exact mean and variance of $(T-k)\hat{\rho}_{ij}^{2}$ (Pesaran *et al*. 2008).

Another important thing that should be determined is the homogeneity of the slope because assuming homogeneity in the causal relationship between income inequality and globalization for transition economies may be misleading. Pesaran and Yamagata (2008) developed the revised version of the Swamy test (which is called $\tilde{\Delta}$ test) in order to determine the slope homogeneity in large panels. In this test, particularly the revised version of the Swamy (1970) test is calculated as follows:

$$\tilde{S} = \sum_{i=1}^{N}\left(\hat{\beta}_{i}-\tilde{\beta}_{WFE}\right)'\frac{x_{i}'M_{T}x_{i}}{\tilde{\sigma}_{i}^{2}}\left(\hat{\beta}_{i}-\tilde{\beta}_{WFE}\right) \qquad (7)$$

where β_i and $\tilde{\beta}_{WFE}$ are the pooled OLS and the weighted fixed effect pooled estimation of Eq. (1) respectively. $\tilde{\sigma}_i^2$ is the estimator of σ_i^2 and M_T is an identity matrix of order T. The modified statistic is:

$$\widetilde{\Delta} = \sqrt{\mathrm{N}}\left(\frac{\mathrm{N}^{-1}\tilde{\mathrm{S}}-\mathrm{k}}{\sqrt{2\mathrm{k}}}\right) \qquad (8)$$

where k is the number of explanatory variables. Under the null hypothesis with the condition of *(N,T)* $\rightarrow \infty$ *as* long as $\sqrt{N}/T \rightarrow \infty$. The small sample properties of the $\widetilde{\Delta}$ test can be improved under normally distributed errors by using the following bias-adjusted version;

$$\tilde{\Delta}_{\mathrm{adj}} = \sqrt{\mathrm{N}}\left(\frac{\mathrm{N}^{-1}\tilde{\mathrm{S}}-\mathrm{E}(\tilde{\mathrm{z}}_{\mathrm{it}})}{\sqrt{\mathrm{var}(\tilde{\mathrm{z}}_{\mathrm{it}})}}\right) \qquad (9)$$

where the mean $E(\tilde{z}_{it}) = k$ and the variance $var(\tilde{z}_{it}) = 2k(T-k-1)/T+1$.

CIPS unit root test

In order to take into account, the cross-sectional dependence, we used the well-known and frequently used unit root test developed by Pesaran (2007). Pesaran (2007) computes the following cross-sectional ADF (*CADF*) regression:

$$\Delta y_{it} = a_i + \rho_i y_{it-1} + \beta_i \bar{y}_{t-1} + \sum_{j=0}^{k} \gamma_{ij} \Delta \bar{y}_{it-1} + \sum_{j=0}^{k} \delta_{ij} y_{it-1} + \varepsilon_{it} \qquad (10)$$

where a_i is deterministic term, k is the lag order, $\bar{y}_t$ is the cross-sectional mean of time *t*. Following the above equation, *t*-statistics are obtained with the computation of individual *ADF* statistics. Furthermore, *CIPS* is retrieved from the average of *CADF* statistic for each *i* as follows:

$$CIPS = \left(\frac{1}{N}\right)\sum_{i=1}^{N} t_i\,(N,T) \qquad (11)$$

The critical values of *CIPS* for different deterministic terms are given by Pesaran (2007).

Common correlated effects (CCE) estimator

Pesaran (2006) developed a new estimator that takes into account the cross-sectional dependence. If we combined our main panel models (Eq. 1) as follows:

$$Y_{it} = \delta_0 + \delta_1 X_{it} + e_{it} \qquad (12)$$

where Y_{it} is the income inequality, $X_{i,t}$ is the vector of explanatory variables and the residual term (e_{it}) is a multifactor residual term. The multifactor residual terms is constructed as follows:

$$e_{it} = \lambda_i' UF_t + u_{it} \qquad (13)$$

where UF_t is the $m\ x\ 1$ vector of unobserved common factors. In addition, Pesaran (2006) uses cross-sectional averages, $\bar{Y}_t = \frac{1}{N}\sum_{i=1}^{N} Y_{it}$ and $\bar{X}_t = \frac{1}{N}\sum_{i=1}^{N} X_{it}$ to deal with cross-sectional dependence of residuals as observable proxies for common factors. In the next step, slope coefficients and their cross-sectional averages are consistently regressed as follows:

$$Y_{it} = \delta_0 + \delta_1 X_{it} + a\bar{Y}_t + c\bar{X}_t + \varepsilon_{it} \qquad (14)$$

Pesaran (2006) refers to the computed OLS estimator $\hat{B}_{i,CCE}$ of the individual slope coefficients $B_i = (\delta_1, .., \delta_n)$ as the "Common Factor Correlated Effect" estimator:

$$\hat{B}_{i,CCE} = (Z_i' \bar{D} Z_i) Z_i' \bar{D} Y_i, \qquad (15)$$

where $Z_i = (z_{i1}, z_{i2}, \dots, z_{iT})'$, $z_{it} = (X_{it})'$, $Y_i = (Y_{i1}, Y_{i2}, \dots, Y_{it})'$, $\bar{D} = I_T - \bar{H}(\bar{H}'\bar{H})^{-1}\bar{H}$, $\bar{H} = (h_1, h_2, \dots, h_T)'$, $h_t = (1, \bar{Y}_t, \bar{X}_t)$ as the CCE estimators. The CCE-Mean Group estimator is obtained with the average of the individual CCE estimators as follows:

$$\hat{B}_{CCEMG} = \sum_{i=1}^{N} \hat{B}_{i,CCE}. \qquad (16)$$

Panel bootstrap causality test

In the situations of both cross-sectional dependency and country specific heterogeneity, the most suitable method is the panel bootstrap causality method developed by Konya (2006) which is based on the estimation of seemingly unrelated regression (SUR) estimation of the set of equations with individual cross-section specific bootstrap critical values. The panel causality method of Konya (2006) is also robust to the unit root and cointegration properties of the variables and therefore the testing procedure does not require any pre-testing for panel unit root and cointegration (Kar *et al*., 2011). Following Konya (2006), in order to solve the problem of determining the optimal lag length, the model is estimated for each possible lag by assuming from 1 lag to 4 lags. Then, the optimal lag length which minimizes the Schwarz Bayesian Criterion is chosen. The system can be written as follows:

$$y_{1t} = a_{11} + \sum_{i=1}^{p_1} \beta_{11i} y_{1t-i} + \sum_{i=1}^{p_1} \delta_{11i} x_{1t-i} + \varepsilon_{11t} \quad (17)$$

$$y_{Nt} = a_{1N} + \sum_{i=1}^{p_1} \beta_{1Ni} y_{Nt-i} + \sum_{i=1}^{p_1} \delta_{1Ni} x_{Nt-i} + \varepsilon_{1Nt}$$

$$x_{1t} = a_{21} + \sum_{i=1}^{p_2} \beta_{21i} y_{1t-i} + \sum_{i=1}^{p_2} \delta_{21i} x_{1t-i} + \varepsilon_{21t} \quad (18)$$

$$x_{Nt} = a_{2N} + \sum_{i=1}^{p_2} \beta_{2Ni} y_{Nt-i} + \sum_{i=1}^{p_2} \delta_{2Ni} x_{Nt-i} + \varepsilon_{2Nt}$$

where *y* denotes income inequality and *x* denotes the control variables (real GDP, economic globalization, social globalization and political globalization). In addition, *N* implies the number of cross-sections, *t* implies the time period and *i* refers to optimal lag length.

In the bootstrap panel causality testing procedure, alternative causal relations can be found. For instance, there is one-way Granger causality from *x* to *y* if not all δ_{1i} are zero, but all β_{2i} are zero. Similarly, there is one-way Granger causality from *y* to *x* if all δ_{1i} are zero, but not all β_{2i} are zero; there is two-way Granger causality between *y* and *x* if neither δ_{1i} nor β_{2i} is zero and there is no causal relation between *y* and *x* if both δ_{1i} and β_{2i} is zero.

3. Empirical results

First, the descriptive statistics of the variables are reported in Table 2. In addition, to investigate the cross-sectional dependence, we apply four different tests i.e., LM, CD_{LM}, CD and LM_{adj} and in order to examine the country-specific heterogeneity we use two tests i.e., Δ and Δ_{adj} which are shown in Table 3. The results reveal that the null of no cross-sectional dependence across transition economies is strongly rejected. This means a shock occurred in a transition country is transmitted to the other countries.

Table 2. Descriptive statistics of variables

	INE	GDP	ECO	SOC	POL
Mean	3.504	7.914	4.005	3.903	4.019
Median	3.497	7.987	3.991	3.956	4.280
Maximum	3.981	9.375	4.501	4.407	4.545
Minimum	3.118	6.217	3.129	2.972	1.834
Std. Dev.	0.184	0.835	0.261	0.345	0.590
Skewness	0.408	-0.204	-0.378	-0.695	-1.338
Kurtosis	2.757	2.094	3.025	3.022	4.321

Note: INE: Natural log of Gini coefficient, GDP: Natural log of gross domestic product per capita measured in 2010 constant US dollar, ECO: Natural log of Economic Globalization Index, SOC: Natural log of Social Globalization Index, POL: Natural log of Political Globalization Index.

Table 3 also illustrates that the null of slope homogeneity is rejected and therefore, country specific heterogeneity is confirmed for transition countries.

Table 3. Cross-sectional dependence and homogeneity

	lnINE	lnGDP	lnECO	lnSOC	lnPOL
Cross-sectional dependence					
LM	113.260***	85.248***	78.928**	85.996***	85.814***
CD_{LM}	5.555***	2.884***	2.281**	2.955***	2.938***
CD	-2.509**	-1.684**	-2.298**	-2.204**	-2.107**
LM_{adj}	12.133***	1.627**	1.465*	2.088**	2.040**
Homogeneity					
$\hat{\Delta}$	4.585***	9.613***	14.748***	5.438***	14.359***
$\hat{\Delta}_{adj}$	4.917***	10.309***	15.815***	5.831***	15.399***

Note: *, **, *** indicate significance at 10. 5 and 1 percent level respectively.
Source: own calculation.

Next, we employ Pesaran' (2007) CIPS unit root test. Table 4 illustrates the results of Pesaran's (2007) CIPS unit root test for the variables in our model for 11 transition countries from 1991 to 2013 for lag orders from 0 to 3. According to the results, lnINE, lnECO, lnSOC and lnPOL are nonstationary while lnGDP is stationary in the CADF regression. Therefore, we have a mixture of I(0) and I(1) variables. Fortunately, both the CCE estimator and the bootstrap Granger causality test of Konya (2006) are robust to lack of cointegration (Kar *et al*., 2011; Ozbugday and Erbas, 2015).

Table 4. Results of panel unit root test

Panel A: Variables in level					
Lags	lnINE	lnGDP	lnECO	lnSOC	lnPOL
1	-2.313	-3.614***	-1.914	-2.507	-2.624
2	-2.058	-3.306***	-1.874	-2.682	-2.520
3	-2.174	-3.336***	-1.951	-2.537	-2.464
Panel B: Variables in first differences					
Lags					
1	-2.889**	-3.222***	-3.154***	-4.018***	-4.592***
2	-3.192***	-3.227***	-3.154***	-3.463***	-4.525***
3	-2.977**	-3.019**	-3.153***	-3.316***	-4.229***

Note: *, **, *** indicate significance at 10. 5 and 1 percent level respectively.
Source: own calculation.

Table 5 reports the results of CCE estimator. The findings show that the increase in real GDP by 1% will increase income inequality by 0.222% and 0.458% in Kazakhstan and Romania while the increase in real GDP by 1% will decrease income inequality by 0.701% and 0.787% in Bulgaria and Russia. In addition, the results show that economic growth has no statistically significant effect on income inequality in Armenia, Belarus, China, Georgia, Hungary, Moldova and Poland. In the case of economic globalization, the increase in economic globalization by 1% will increase income inequality by 0.546%, 0.616% 0.283%, 0.401% and 0.175% in Bulgaria, Hungary, Moldova, Poland and Romania while the increase in economic globalization by 1% will decrease income inequality by 0.385% and 0.384% in China and Russia, respectively.

Table 5. Results of common correlated effects (CCE) estimator

Country	lnGDP		lnECO		lnSOC		lnPOL	
	Coefficient	Std.Err.	Coefficient	Std.Err.	Coefficient	Std.Err.	Coefficient	Std.Err.
Armenia	-0.029	0.216	0.104	0.288	-0.199	0.156	0.083	0.073
Belarus	-0.210	0.228	0.297	0.240	-0.450**	0.204	-0.293	0.204
Bulgaria	-0.701**	0.340	0.546***	0.114	-0.152	0.124	-0.137	0.099
China	-0.124	0.108	-0.385*	0.219	-0.156	0.112	0.530	0.747
Georgia	-0.045	0.044	-0.031	0.032	-0.012	0.021	0.116	0.085
Hungary	-0.112	0.147	0.616**	0.298	-0.602	0.776	0.056	0.565
Kazakhstan	0.222***	0.073	0.028	0.085	0.423***	0.138	-0.115***	0.025
Moldova	0.254	0.195	0.283***	0.075	0.391	0.266	0.120**	0.059
Poland	-0.041	0.071	0.401***	0.076	-0.451***	0.098	-0.491***	0.209
Romania	0.458***	0.080	0.175***	0.052	0.021	0.019	-0.078	0.160
Russia	-0.787***	0.140	-0.384***	0.121	0.317*	0.173	-0.796***	0.272

Note: *, **, *** indicate significance at 10. 5 and 1 percent level respectively.
Source: own calculation.

In the situation of social globalization, the increase in social globalization by 1% will increase income inequality by 0.423% and 0.317% in Kazakhstan and Russia. On the other hand, the increase in social globalization by 1% will decrease income inequality by 0.450% and 0.451% in Belarus and Poland. Finally, when the effect of political globalization on income inequality is analysed, the increase in political globalization by 1% will decrease income inequality by 0.115%, 0.796% and 0.491% in Kazakhstan, Poland and Russia. The positive correlation between political globalization and income inequality is found only for Moldova.

The results obtained from CCE estimation only shows the possible correlation between variables. However, the correlation does not show the causal connection between variables. For instance, the correlation of economic globalization and income inequality may be due to the fact that these two variables appear as a result of the same phenomenon and they act together. Therefore, we should examine the causal relationship between variables to robustness of the findings.

Table 6. Results of causality between GDP and INE

	Null Hypothesis: Causality from GDP to INE				Null Hypothesis: Causality from INE to GDP			
		Bootstrap Critical Values				Bootstrap Critical Values		
Country	Wald Stat.	%1	%5	%10	Wald Stat.	%1	%5	%10
Armenia	2.9038	24.1299	12.0536	8.3672	15.9933*	40.1282	22.2446	15.7253
Belarus	3.6724	18.3608	9.6943	6.3236	14.6894*	53.0186	21.6548	13.2829
Bulgaria	23.8848**	30.9577	15.6587	10.7853	7.3985	34.4892	18.7463	13.4137
China	1.0920	31.4535	17.5152	12.2391	15.6760*	43.2014	17.9475	11.0003
Georgia	2.2695	20.2532	10.1418	6.7305	91.6642***	44.0230	17.8071	11.0453
Hungary	2.4223	31.9438	16.0061	10.5951	1.2014	35.2086	19.5829	12.7924
Kazakhstan	55.5180***	23.5501	11.2662	7.5277	15.7516*	35.3364	20.6949	13.9987
Moldova	4.0695	20.4424	10.8344	7.2826	2.2292	27.5784	14.2176	10.2612
Poland	0.6504	19.6510	10.5345	6.9675	31.9716***	27.3380	15.7246	10.5855
Romania	0.2219	28.9256	14.2942	9.3324	0.3982	34.9460	18.5427	12.9668
Russia	9.2346*	17.6320	9.5904	6.6124	8.8159	57.7048	26.1760	16.6190

Note: *, **, *** indicate significance at 10. 5 and 1 percent level respectively.

In this stage, we investigate the causal relationship between variables by using the panel bootstrap Granger causality of Konya (2006). Table 6 shows the results of causality between real GDP and income inequality. The result reveals that there is unidirectional causality from real GDP to income inequality in Bulgaria and Russia. In addition, there is bidirectional causal relationship between real GDP and income inequality in Kazakhstan and there is unidirectional causality from income inequality to real GDP in Armenia, Belarus, China, Georgia and Poland. When the findings from the causality test are evaluated with the results of CCE estimation, the correlation between real GDP and inequality seems to be supported by the causal relation from economic growth to income inequality in Bulgaria, Kazakhstan and Russia. On the other hand, despite evidence of a statistically significant correlation between real GDP and inequality, there is no cause-effect relationship for Romania.

Table 7 also illustrates the causal relationship between economic globalization and income inequality. According to results, there is unidirectional causality from economic globalization to income inequality in Hungary while there is unidirectional causality from income inequality to economic globalization in Romania. Furthermore, the bidirectional causality between economic globalization and income inequality is confirmed in China, Moldova and Russia. If the findings are compared with correlation results, it can be said that the inequality increasing (reducing) effect of economic globalization is also confirmed with regard to causality for Hungary and Moldova (China and Russia).

Table 7. Results of causality between ECO and INE

	Null Hypothesis: Causality from ECO to INE				Null Hypothesis: Causality from INE to ECO			
		Bootstrap Critical Values				Bootstrap Critical Values		
Country	Wald Stat.	%1	%5	%10	Wald Stat.	%1	%5	%10
Armenia	1.7511	19.4513	13.3880	9.0199	1.8411	30.8673	16.2112	10.6882
Belarus	8.5525	27.5630	13.8006	8.9321	2.8352	27.2380	12.0382	8.4638
Bulgaria	0.6223	42.1586	23.1425	14.8647	0.9063	23.3837	13.6851	8.8715
China	14.7326*	43.5614	19.2692	13.0872	15.3179**	26.9834	15.1340	9.4903

Georgia	2.9921	22.7904	12.2817	8.6590	5.2466	30.7533	12.7013	7.8233
Hungary	13.5400*	26.3692	15.8375	11.9503	2.7860	35.1966	18.4721	11.5864
Kazakhstan	11.1946	47.4514	22.7242	15.5059	6.3323	19.0028	10.5295	6.7705
Moldova	14.9512*	38.6058	18.4303	11.7388	12.5170*	28.8331	16.7043	10.9061
Poland	0.1768	21.4637	11.6264	7.5741	0.2063	30.8672	15.7769	10.4397
Romania	0.9375	42.5092	18.5617	13.2433	21.9624**	40.0713	19.0093	12.4077
Russia	9.5404*	19.8459	11.1150	7.0353	21.8740**	34.3764	13.4562	8.5060

Note: *, **, *** indicate significance at 10. 5 and 1 percent level respectively.

Table 8 shows the results of causal connection between social globalization and income inequality. The unidirectional causality from social globalization to income inequality is found in Hungary but the unidirectional causality from income inequality to social globalization is supported in Armenia, Moldova and Romania. Moreover, bidirectional causal relationship between social globalization and income inequality is found in Belarus, Kazakhstan and Poland. We also compare the results of Table 8 with the CCE estimation results and see that the inequality increasing (reducing) impact of social globalization is confirmed with the causality test results for Kazakhstan (Belarus and Poland). However, the inequality reducing effect of social globalization is only validated for correlation and there is no cause-effect relation for Russia.

Table 8. Results of causality between SOC and INE

	Null Hypothesis: Causality from SOC to INE				Null Hypothesis: Causality from INE to SOC			
		Bootstrap Critical Values				Bootstrap Critical Values		
Country	Wald Stat.	%1	%5	%10	Wald Stat.	%1	%5	%10
Armenia	2.1170	24.7461	12.5012	8.5950	13.6056*	33.7106	16.3519	10.7831
Belarus	17.4080***	14.8002	9.5652	6.9248	13.7292**	26.2446	12.0575	8.5575
Bulgaria	1.8704	29.6898	16.8615	12.3047	0.7171	24.8714	13.6271	9.6962
China	7.2701	36.0940	17.7376	11.5586	2.9448	49.3646	18.9594	12.4607
Georgia	1.3215	28.6925	12.3294	8.4347	4.0188	33.4321	15.7769	10.5280
Hungary	25.8117**	30.8703	17.0307	12.2934	0.9481	28.2446	14.8095	9.1462
Kazakhstan	14.2441**	40.4892	25.5023	17.8712	7.6959*	18.8020	10.1951	6.7802
Moldova	13.6065	45.6858	22.9324	16.8831	13.5752**	27.4283	13.0122	8.5901
Poland	8.4526*	22.7078	11.2019	8.0806	14.0677*	24.2657	14.3847	10.1146
Romania	10.3803	47.2289	22.7747	16.5296	29.7427**	38.1026	20.6930	13.7642
Russia	0.9429	18.4458	10.1830	6.8101	4.8288	47.9370	19.6338	10.9113

Note: *, **, *** indicate significance at 10. 5 and 1 percent level respectively.

Table 9. Results of causality between POL and INE

	Null Hypothesis: Causality from POL to INE				Null Hypothesis: Causality from INE to POL			
		Bootstrap Critical Values				Bootstrap Critical Values		
Country	Wald Stat.	%1	%5	%10	Wald Stat.	%1	%5	%10
Armenia	0.3406	21.8769	11.6400	8.3125	0.1267	19.6532	10.7762	7.5577
Belarus	3.2182	20.2744	10.2792	6.7415	0.5519	37.0398	12.6310	7.7090
Bulgaria	0.3613	46.1052	20.0902	11.4424	0.8179	33.5091	16.3137	12.0492
China	10.6843	45.7342	28.5801	20.0134	3.0995	25.4411	12.0201	7.7733
Georgia	1.4700	33.0394	19.1925	13.5005	1.3478	35.2185	20.2301	13.6826
Hungary	5.7946	32.1032	14.2596	10.0771	13.8575*	27.1528	16.6749	9.9620
Kazakhstan	76.7839***	49.9829	24.0285	16.0657	0.8986	23.6568	13.2048	8.5070
Moldova	5.6452	65.1883	32.7637	23.3495	0.1213	24.9989	13.1051	8.4109
Poland	13.1349**	31.6674	12.5118	8.0354	1.1200	35.5491	15.4535	10.5274
Romania	7.5188	40.5109	20.7980	14.4176	3.0497	23.6323	14.6191	9.9810
Russia	13.6428**	49.0838	11.2381	5.5804	47.5652***	30.2360	14.5663	8.6291

Note: *, **, *** indicate significance at 10. 5 and 1 percent level respectively.

Finally, according to the findings in Table 9, the unidirectional causality from political globalization to income inequality is confirmed in Kazakhstan and Poland while there is unidirectional causal relationship from income inequality to political globalization in Hungary. The bidirectional causal relationship between income inequality and political globalization is found in Russia. Similar to the other causality test results, these findings are evaluated with the CCE estimation results and it is concluded that the correlation between political globalization and income inequality is sourced from the cause-effect relation for Kazakhstan, Poland and Russia.

Table 10. Summary of the findings

	GDP-INE		ECO-INE		SOC-INE		POL-INE	
Country	Causality	Coef.	Causality	Coef.	Causality	Coef.	Causality	Coef.
Armenia	INE→GDP	X	X	X	INE→SOC	X	X	X
Belarus	INE→GDP	X	X	X	INE↔SOC	(-)	X	X
Bulgaria	GDP→INE	(-)	X	(+)	X	X	X	X
China	INE→GDP	X	ECO↔INE	(+)	X	X	X	X
Georgia	INE→GDP	X	X	X	X	X	X	X
Hungary	X	X	ECO→INE	(+)	SOC→INE	X	INE→POL	X
Kazakhstan	INE↔GDP	(+)	X	X	SOC↔INE	(+)	POL→INE	(-)
Moldova	X	X	ECO↔INE	(+)	INE→SOC	X	X	(+)
Poland	INE→GDP	X	X	(+)	SOC↔INE	(-)	POL→INE	(-)
Romania	X	(+)	INE→ECO	(+)	INE→SOC	(+)	X	X
Russia	GDP→INE	(-)	ECO↔INE	(-)	X	(+)	POL↔INE	(-)

*Note***:** X indicates the statistical insignificancy, → indicates the unidirectional causality from first variables to second variable, ↔ indicates the bidirectional causality, (+) indicates the significant positive impact of first variable on second variable, (-) indicates the negative impact of first variable on second variable.
Source: own calculation.

Conclusions

This study aims to investigate the effects of real GDP, economic, social and political globalization on income inequality for the period from 1991 to 2013 in 11 transition economies: Armenia, Belarus, Bulgaria, China, Georgia, Hungary, Kazakhstan, Moldova, Poland, Romania and Russia. For this purpose, this study uses the second generation panel data methodology to consider the cross-sectional dependence and country specific heterogeneity across transition economies.

The Common Correlated Effect (CCE) estimator result reveals that an increase in real GDP leads to an increase in income inequality for Kazakhstan and Romania while there is a negative correlation between real GDP and income inequality in Bulgaria and Russia. In addition, an increase in economic globalization leads to an increase in income inequality for Bulgaria, Hungary, Moldova, Poland and Romania. On the other hand, increasing economic globalization leads to a decrease in income inequality in China and Russia. In the case of social globalization, there is a positive correlation between social globalization and income inequality in Kazakhstan and

Russia but the income inequality is negatively affected by social globalization in Belarus and Poland. Furthermore, there is a negative correlation between income inequality and political globalization in Kazakhstan, Poland and Russia. The bootstrap Granger causality test result indicates that real GDP causes income inequality in Bulgaria, Kazakhstan and Russia; income inequality causes real GDP in Armenia, Belarus, China, Georgia, Kazakhstan and Poland. In addition, economic globalization causes income inequality in China, Hungary, Moldova and Russia; income inequality causes economic globalization in China, Moldova, Romania and Russia; social globalization causes income inequality in Hungary, Belarus, Kazakhstan and Poland; income inequality causes social globalization in Armenia, Belarus, Kazakhstan, Moldova, Poland and Romania. Finally, political globalization causes income inequality in Kazakhstan, Poland and Russia; income inequality causes political globalization in Hungary and Russia.

Overall, our findings indicate that economic growth reduces inequality in Bulgaria and Russia while increasing income increases inequality in Kazakhstan. This finding means that inclusive growth is valid only for Bulgaria and Russia. However, high-income segments seem to benefit more from increased wealth than low-income segments in Kazakhstan. In addition, we found that economic globalization reduces income inequality only in China and Russia while income inequality is positively affected by economic globalization in Hungary and Moldova. This finding implies that the inequality reducing effect of economic globalization is only valid for more developed transition countries. In addition, the effect of economic globalization on inequality is explained by the social policy preferences of the government. For instance, Blank and Freeman (1994) argue that globalizing countries reduces the generosity of social programs against the increasing international competition. However, Rodrik (1998) brings arguments in favour of the opposite view, i.e. that governments change the cash transfers and income tax systems in order to support potential losers in globalization. Based on these views, it can be said that the policy-makers of Russia and China chose protection policies for those sectors that might be negatively affected by globalization while the social transfer programs are reduced by the governments of Hungary and Moldova to keep up with the international competition. In the case of social globalization, our results show that social globalization increases inequality in Kazakhstan. The impact of social globalization on income distribution is generally associated with the "unionization". According to this view, social globalization reduces unionization rates and collective bargaining and thus decentralized wage bargaining increases inequality (Blau and Kahn, 1996; Dreher and Gaston, 2007). Moreover, we found evidence of the inequality decreasing effect of political globalization for Kazakhstan, Poland and Russia. This finding is consistent with the argument of Bergh and Nilsson (2010) that international agreements covering epidemic management, human rights issues and global environmental concerns not only the increase in human well-being but also reduces the inequality of the society.

In terms of policy implications, in countries where economic globalization does not have inequality reducing effect, the low-income segments should be made easier to access financial instruments that are becoming widespread as a result of financial globalization. In the case of social globalization, in countries where income distribution is not positively affected by it, policy makers should implement social aid schemes and social transfer programs, which are successfully applied in other countries. In the case of political globalization, the governments should ensure that poor groups in a country benefit from international assistance funds in order to allow them to create their own business opportunities. Overall, this study suggests to policy makers that the economic, social and political accumulations, acquired as a result of globalization, should be used in areas that increase the welfare of low-income people because the inequality reducing effect of globalization is not yet at a sufficient level for transition economies.

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