Is financial integration driver of income inequality? A panel co-integration analysis in Europe

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Abstract: Research on income inequality and finance has become an increasingly popular research area in the post-crisis period. Fully modified (FMOLS) and dynamic OLS (DOLS) co-integrated regression models are employed to empirically explore and estimate the long run co-integration vector for non-stationary panels between 2000 and 2016. The study finds that a NMS-11 with relatively lower integrated international financial flows experience lower levels of income inequality than older EU-15 members that have more integrated international financial flows. These countries experience greater levels of income inequality. Financial development generally leads to decreased income inequality in the whole sample and the NMS-11, whereas the results are mixed for the old EU-15 members. The study recommends government policies, especially in NMS-11 countries and European transition countries, that prioritise further financial market reforms (credit and stock markets) and greater financial freedom and minimise government interference that are vital to development of financial sector and thus economic growth.

Keywords: income inequality; financial integration; panel co-integration; European countries.

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1 Introduction

A renewed interest in economic inequality has led a large body of empirical research over the last two decades. There are at least two reasons for this. The first reason is related to growing belief among scholars that economic convergence is only indirectly linked to inequalities. The second reason relates to more convincing evidence that indicates that inequality has risen in many countries in recent decades, and that in many of these cases, the rise has been quite sharp. Under these circumstances, many researchers have relied on already existing research to support their claims.

The relationship between income equality and growth is largely built around the paradigm of Kuznets (1955) study that showed how economic growth is associated with increased income inequality in pre-industrial societies. Inequality then decreases after these pre-industrial societies transition towards a more modern industrial societies.

In the 1990s and into the early 2000s, there was a renewed interest in re-examining the hypothesis of an inverted-U (or the Kuznets curve) as an economic phenomena. Most of the recent empirical studies are inspired by Kuznets's work that explored the relationship between growth and income inequality (Bigsten and Levin, 2000; Forbes, 2000; Cornia and Court, 2001 and others). Nevertheless, new evidence about the transition process and other research casts doubt on the validity of Kuznets's earlier hypothesis.

This study however does not seek to duplicate existing studies on growth-inequality. On the contrary, this study examines whether income inequality in European countries is a consequence of financial globalisation. More specifically, this study examines whether a level of international financial integration (IFI) and financial growth explain differences in income distribution – something that is much less explored in the recent literature. There are some well known factors that have caused sharp increases in global levels of income inequality. Having in mind that some of these 'traditional causes' of inequality, the focus of further research should be given to the 'new causes' of inequality. Many of these new causes are related to excessive expansion, cross border capital flows, and financial globalisation.

The role of IFI and financial globalisation cannot be ignored in any meaningful discussion about income inequality. Earlier empirical studies have paid little attention to the relationship between IFI and income distribution in Europe. Two studies done by Baiardi and Morana (2018a) and Akan et al. (2017) examined the relationship between financial development and income inequality, but not financial integration.

There are at least two important contributions with regards to the scope of this literature review. First, as will be further shown in the literature review, only a few previous studies have analysed the link between financial integration and inequality in European transition and postransition countries in the context of European Union. Although our findings indicate that deeper financial development is associated with higher levels of income inequality, while less efficient capital markets are associated with lower levels of income inequality, we concluded that financial markets of Europe

transition countries are currently in an early stage of development and financial integration. The European transition countries thus far do not appear to be well-integrated with the rest Europe. Second, it provides possible policy recommendations for the current European transition and post-transition countries by extending the discussion about the relationship between financial integration and inequality. The discussion identifies the characteristics of the market that should be taken into consideration by officials, especially in European transition countries.

To our knowledge, there have not been any studies conducted thus far regarding the above aforementioned countries. This study fills the gap in the academic literature related to European transition and post-transition countries. The existing literature on this important topic is limited, mostly having focused on financial development (see Akan et al., 2017; Larrain, 2013; Halmos, 2011; Buba et al., 2019; Grimalda et al., 2010; Mihaylova, 2015). Indeed, little attention has thus far been paid to the financial integration-income inequality nexus.

2 Literature review

Even though income inequality is seen as a new research area, this review is not an exception. There is an extensive body of literature that investigates the nexus between financial development and income inequality.

In the early 1990s, the first empirical studies emerged regarding the relationship between financial development and income inequality. The U-shaped theory or nonlinear hypothesis was updated by Greenwood and Jovanovic (1990). Their study revealed a negative link between financial development and income inequality, but only in the initial phase of financial deepening. In parallel with this study, two other studies done by Banerjee and Newman (1993), Galor and Zeira (1993) and Demirguc-Kunt and Levine (2009) explained the importance of financial development in reducing the income inequality gap. Mills (2009) discussed how the globalisation effect reduced inequality in developing countries and how it facilitated in the rise of inequality in industrialised countries.

A vast literature has tried to identify the empirical relationship between financial integration and economic growth (Giannetti et al., 2002; Osada and Saito, 2010; Chen and Quang, 2012 and others). However, there has been not much on the potential effect IFI on income inequality, especially in European transition countries.

Most empirical studies (Kunieda et al., 2011; Quinn and Toyoda, 2008; Arteta et al., 2001) have documented the existence of a significant relationship between financial openness and income inequality.

The nexus between financial integration and income inequality has become an increasingly popular research area during the ages of financial globalisation and rising of cross border capital flows. In parallel with this recently observed trend in developed countries, the same trend can be found in emerging markets or developing countries. Nonetheless, these findings have yet to be resolved both from a theoretical and empirical perspective. Beyond the empirical perspective, the findings are not always conclusive.

The recent empirical studies can roughly be divided into two groups: the studies that examined selected regions and the studies that focused on solely one individual country. Among the empirical studies, Jung and Kim (2018) found that in underdeveloped

financial markets, income inequality gets worse as financial markets open while in developed countries it is statistically insignificant. Similarly, Akan et al. (2017) confirmed the validity of the financial Kuznets curve hypothesis for 20 different EU countries between 1992 and 2013. Baiardi and Morana (2018a) did the same thing for 19 euro area countries.

Despite this, there remains some controversy and ambiguity regarding the link between financial development and economic growth. Some studies (Ang, 2008; Rehman et al., 2008; Law and Tan, 2009; Shahbaz and Islam, 2011; Satti et al., 2015) rejected the validity of the financial Kuznets curve hypothesis (the cases of Iran, Malaysia, Pakistan and Kazakhstan respectively).

Nafziger (1997) found evidence that foreign capital flows reduce income inequality and promote economic development because countries might consume more than they produce and invest more than they save, while Kim et al. (2011) observed that financial development and financial depth decrease income inequality, only if a country exceeds a certain level of financial development.

The results obtained by Adams and Klobodu (2017) also contributed to this line of research revealing that FDI flows increase income inequality in short and long run while remittances and external debt do not have a robust effect on the impact of income inequality. Further, in their study Cornia and Court (2001), Strange (1996) and Jaumotte et al. (2008) revealed that financial liberalisation, financial globalisation, the rise of international financial flows and FDI are associated with an increase of income inequality. The research of Kunieda et al. (2011) and Jauch and Watzka (2016) investigated the relationship between IFI and inequality. Their studies found that if any country is closed to the world financial market, inequality is narrowed. Inequality widens when a country's financial markets develops.

In exploring the effect of capital account liberalisation on income inequality measured by the Gini coefficient, Bumann and Lensink (2016) showed that income distribution is improved in countries with higher financial depth. Some studies have shown otherwise however. For instance, Haan and Sturm (2016) studied the link between financial liberalisation, financial development and income inequality with the purpose of updating the results from the previously done study of Bumann and Lensink (2016). They found opposite results showing that all finance variables increase income inequalities.

The recent studies (Inekwe et al., 2019; Erauskin and Turnovsky, 2019; Kunieda et al., 2011) have shown several statistically significant findings when testing IFI and inequality. In a panel of 37 Sub-Saharan African (SSA) countries, Inekwe et al. (2019) found that financial integration worsens income inequality.

Perhaps the most interesting case was studied by the Erauskin and Turnovsky (2019) who explored the nexus between financial integration and inequality in 96 countries between 1970 and 2015. They documented that higher levels of IFI are positively associated with more inequality. In a sample of 26 developed and 52 developing countries, Baek and Shi (2016) provide mixed evidence regarding the effects of financial integration on developed and developing countries. For instance, the find that financial integration seems to reduce income inequality in developed countries whereas it does the opposite in developing countries.

Table 1 The review of selected empirical studies

Author(s)	*Time span*	*Countries*	*Econometric method*	*Variables*
Jaumotte et al. (2008)	1981–2003	51 countries (20 advanced and 31 developing and emerging countries)	Cross sectional regression models	Gini index, trade openness, total cross-border assets and liabilities over GDP, capital stock and ICT capital, credit to the private sector, education, sectoral employment
Kunieda et al. (2011)	1985 to 2009	119 countries	GMM estimation	Sum of total assets and total liabilities divided by the GDP, Gini coefficient, the ratio of private credit to the GDP, log of per capita real GDP, total schooling index, political risk
Baek and Shi (2016)	1990–2010	26 developed and 52 developing countries	Standard time series-cross sectional regression model	Gini index, export and import as % of GDP, (IIP assets + IIP liabilities) / GDP, internet users per 100 people, corruption index, GDPPC, education
Bumann and Lensink (2016)	1973–2008	106 countries	GMM estimation	Gini coefficient (UNIDO), financial depth, KAOPEN, deposit rate, trade openness, schooling, population growth, per capita GDP growth, inflation, age dependency ratio
Haan and Sturm (2016)	1975–2005	121 countries	Dynamic panel model, GLS and G2SLS estimates	Gini coefficient (SWIID), private credit divided by GDP, financial freedom, banking crisis dummy, KAOPEN, GDP growth (annual %), economic globalisation
Baiardi and Morana (2018a)	1985–2013	19 Euro area countries	GMM estimation, OLS	Gini index, private credit to GDP, market capitalisation to GDP and share of liquid liabilities
Erauskin and Turnovsky (2019)	1970 and 2015	96 countries	Pooled regression fixed effects, GMM estimation	Gini coefficient (SWIID), total external assets and liabilities, GDP per capita, trade openness, ICT capital services, financial liberalisation
Mihaylova (2015)	1990–2012	10 Central and Eastern Europe (CEE)	Fixed effects, regression model	Gini index, FDI, GDPPC, inflation, education and government final consumption
Jung and Kim (2018)	1995–2017	174 countries	GMM estimation	Market income Gini coefficient, disposable income Gini coefficient, KAOPEN, GDP, inflation, enrolment government expenditure education, private credit to GDP
Asteriou et al. (2014)	1995–2009	27 European economies	GMM estimation	Gini index, capital account openness, stock market capitalisation, stock market turnover, FDI, secondary and tertiary education GDP, trade openness, employment
Buba et al. (2019)	1993–2014	31 European economies	The PMG approach	Gini index, GDPPC growth rate, trade liberalisation, rule of law, financial liberalisation, education attainment
Cevik and Carro (2020)	1990–2018	29 European transition economies	GMM estimation and 2SLS	Net Gini (SWIID), real GDP per capita, financial development, tax revenue, government spending, income tax, education and health spending, trade openness

Source: Compiled by the authors

There have only be a few previous studies on the financial integration and inequality nexus in NMS-11 countries. They had mostly been examined as part of the EU countries such as the Baiardi and Morana (2018a), Asteriou et al. (2014), Larrain (2013), Cevik and Carro (2020), Halmos (2011), Buba et al. (2019), Grimalda et al. (2010) and Mihaylova (2015) and for ten Central and Eastern Europe countries (Bruno et al., 2004; Franco and Gerussi, 2010). For instance, Baiardi and Morana (2018a) found that countries with higher levels of financial development stimulate growth and more equal distributions of income in 19 EU countries EU countries between 1985–2013, while Asteriou et al. (2014) found that capital account openness is related to increased income inequality in EU 27 countries; Larrain (2013) found increased wage inequalities in Eastern European countries with high financial needs, while Halmos (2011) found a positive and significant relationship between the rise of income inequality and rises of FDI flows in 15 Eastern European Countries between 1991 and 2006 while Mihaylova (2015) found divergent trends between ten different Central and Eastern Europe countries between 1990–2012. Similarly, Buba et al. (2019) revealed interesting findings for 31 European countries by exploring the effect of financial liberalisation on income inequality. They found that a 1% increase in financial liberalisation lead to a 0.237% increase in income inequality in 17 Northern and Western Europe countries. There was a 0,134% increase in 14 Southern and Eastern Europe countries. On the contrary, there are two empirical studies that could not find any relationship between FDI and income inequality in Central and Eastern European countries (Bruno et al., 2004; Franco and Gerussi, 2010). The sample of post-Soviet Union transition economies was divided into two groups: new EU member states (NMS) and South Eastern European countries. Grimalda et al. (2010) found a stronger FDI-income inequality enhancing effect only in NMS.

3 Methodology and data

Unlike the other recent empirical studies listed in the literature review section that focused on the nexus between IFI, financial development and income inequality, our research explores the long run relationship between these variables. As discussed earlier, there are various econometric models used to calculate IFI, financial development and income inequality. Most recent studies, have focused on cross section and dynamic panel data analysis. There are a limited number of empirical studies that have explored the long run relationship between countries with relatively lower (higher) levels of IFI and income inequality using the panel co-integration technique.

This study employs an unbalanced panel dataset that covers the following 36 national economies: the old EU-15 members (Austria, Belgium, Greece, Germany, Finland, France, Denmark, Ireland, Italy, Luxemburg, Netherlands, Portugal, Sweden, Spain, the UK), new EU member states – the so-called 'NMS-11' (countries that joined the EU after 2000: Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Hungary, Slovenia, Bulgaria, Romania, Croatia) and ten the European transition countries (Albania, Armenia, Moldova, Bosnia and Herzegovina, Serbia, Georgia, Ukraine, Montenegro, Belarus, and FYR Macedonia) between 2000 and 2016. Data gathered from these cases were then separated into subsamples. The specification of our model is based on previous research initiated by Kunieda et al. (2011) and Jung and Kim (2018) in order to test our hypothesis that IFI widens inequality if a country is highly open to world financial

markets. On the other hand, inequality is narrowed if a country is strongly closed to the world financial markets.

The following set of variables shown in equation (1) determines our model:

$$\text{Inequality} = f(\text{Financial integration, Finance development, Financial openness, Gdppc, infl}) \quad (1)$$

The dependent variable, market income inequality, refers to the Gini coefficient employed pre-tax and pre-transfer income of household in each country (SWIID) developed by Solt (2009, 2019). This variable was also used in the study done by Kunieda et al. (2011), Inekwe et al. (2019) and Erauskin and Turnovsky (2019) amongst others, and might be a good candidate to measure the income (in)equality.

Other variables employed in this study are mostly used in any form in the recent empirical studies as follows: the variable 'IFI' is measured by total foreign assets (Lane and Milesi-Ferretti, 2007) divided by GDP and is related to the literature that explores the link between financial integration and income inequality. This explanatory variable is also a good candidate for the being the reason of income (in)equality because some recent studies Jaumotte et al. (2008), Kunieda et al. (2011), Baek and Shi (2016) and Erauskin and Turnovsky (2019) utilised a similar variables. Those explanatory variables (total cross border assets and liabilities to GDP and TA + TL / GDP) were initially included in our model, but their effects were not robustly estimated. Accordingly, we included a variable 'total foreign asset' divided by GDP (Lane and Milesi-Ferretti, 2007) – later updated and extended to measure levels of financial integration.

Our research relies on the variable 'financial freedom' from the heritage index of economic freedom to measure financial openness. Although in some countries or regions the impact of financial openness is ambiguous [Furceri and Loungani (2015) stand in contrast to the findings of Kunieda et al. (2011), Quinn and Toyoda (2008), Arteta et al. (2001) and Buba et al. (2019)] we include a new variable, 'financial freedom' (measure a country's banking efficiency and independence from government control and interference in the financial sector), as done similarly (Haan and Sturm, 2016).

Financial development is proxied by the ratio of domestic credit to GDP and stock market capitalisation to GDP to measure the level of financial development in the selected countries. These two variables are included in our model because some recent studies, Jung and Kim (2018), Jaumotte et al. (2008), Law and Tan (2009), Asteriou et al. (2014), Cevik and Carro (2020), Bumann and Lensink (2016) and Baiardi and Morana (2018b) also utilised them in their models to determine the impact of financial development on income inequality.

We also included a some control variables (GDP per capita and inflation) in order to control the effect of economic development on inequality. This will help us in determinating inequality changes across the countries over time used in previous studies (Law and Tan, 2009; Jung and Kim, 2018; Kunieda et al., 2011; Asteriou et al., 2014; Mihaylova, 2015; Buba et al., 2019; Cevik and Carro, 2020). Some other possible explanatory variables (capital openness – the Chinn-Ito index, IFI as TA + TL / GDP) were initially included in our model, but their effects were not robustly estimated.

Before continuing with our analysis, the stationary of all variables used in our analysis should be established. As noted by Granger and Newbold (1974) and Phillips (1986), the use of non-stationary variables can result in spurious regression. There are several methods for testing unit roots in panel data. Based on Maddala and Wu (1999),

we employ augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests and Im, Pesaran and Shin (IPS) tests as proposed by Im et al. (2003) with the aim to ensure robustness of our results. As such, if non-stationary data are identified, the next step is to examine the presence of co-integration. Kao (1999) spurious regression and residual-based tests for co-integration in panel data is applied.

For the purpose of further analysis, two panel co-integration tests (Pedroni, 2004, 1999; Kao, 1999) based on the Engle-Granger 2 steps co-integration procedure (1987) are used. Pedroni (1999) uses seven different residual panel co-integration tests. The first four are within dimension-based and the rest are between dimensions of residual-based panel statistics. The within dimension-based co-integration tests for the testing of the null hypothesis can be expressed as follows:

$$H_0: \gamma_i = \gamma < 1 \tag{2}$$

Co-integration regression residuals are taken from the general case:

$$Y_{i,t} = \alpha_i + \delta_i t + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \cdots \beta_{Mi} x_{Mi,t} + \varepsilon_{i,t} \tag{3}$$

The Kao (1999) test refers to residuals from static regression with fixed effects, which include potentially co-integrated variables, retrieves residuals to test whether a unit root exists via the ADF test. The starting point of the Kao (1999) panel co-integration tests are expressed as follows:

$$Y_{i,t} = X'_{it}\beta + Z'_{it}\gamma + \varepsilon_{i,t} \tag{4}$$

where variables $Y_{i,t}$ i X'_{it} are integrated I(1), and suggested to employ DF and ADF tests to check the stationarity of residuals $\hat{e}_{i,t}$ from co-integration regression I(1) for ρ-panel and ρ-group statistics as follow:

$$\hat{e}_{i,t} = \rho e_{i,t-1} + \varepsilon_{i,t} \tag{5}$$

where i denotes country and t times, $\hat{e}_{i,t}$ is the estimated residual from regression, while $\varepsilon_{i,t}$ is error term.

The null hypothesis of no integration is expressed as follows:

$$H_0: = 1 \text{ for all i, while alternative hypothesis is defined as } H_1: \rho < 1 \tag{6}$$

So, the null hypothesis of no integration (the residuals from the estimated regression are non-stationary-they have a unit root), is tested against the alternative hypothesis (H1 – the residuals from the estimated regression are stationary).

To produce consistent estimations, we follow Kao and Chiang (2001) and use the dynamic OLS (DOLS) estimator and FMOLS estimator as shown below:

$$\widehat{\beta_{DOLS}} = \sum_{i=1}^{N}\left[\sum_{t=1}^{T} Z_{it} \cdot Z'_{it}\right]^{-1}\left[\sum_{t=1}^{T} Z_{it} Z^{\wedge}_{it}\right] \tag{7}$$

$$\widehat{\beta_{FMOLS}} = \left[\sum_{i=1}^{N}\sum_{t=1}^{T}\left(x_{it} - \overline{X_{lt}}\right)'\right]^{-1}\left[\sum_{i=1}^{N}\left(\sum_{t=1}^{T}\left(x_{it} - \overline{X_{lt}}\right)Y_{it}^{2}\right) + Ty_{\hat{i}}\right] \tag{8}$$

where $Y_{\hat{i}}$ refers to the serial correlation term, while Y_{it}^2 represents the transformation of Y_{it} in order to eliminate any endogeneity problems. In line with previous models, a model used in this study is:

$$Y_{i,t} = \beta_0 + \beta X_{i,t} + \sum_{j=-q}^{p} C_{i,j} \Delta X_{i,t-j} + \varepsilon_{i,t} \tag{9}$$

where in i = 1, …, 36 and refers to sample countries and t = 1, ..., 17, the sample years. Y is the dependent variable. β_0 is the fixed effects and β is the long run effect a change in X on Y. X represents the explanatory variables. The first difference lags and lead are represented by p and q respectively, and $C_{i,j}$ represents the lag or lead coefficient of explanatory variable at first difference. Finally, $\varepsilon_{i,t}$ is the error term.

4 Empirical findings

The results of unit root tests for several types of different tests (IPS, ADF-Fisher, and PP-Fisher, Levin, Lin and Chu) at level and the first difference are shown in Table 2. Our findings suggest that for the whole sample and NMS-11 all variables are integrated at I(1). Interestingly, the results of unit root tests suggests that at 1% and 5% significance levels except for gini mkt ln for the European transition countries in level under ADF-Fisher and IPS statistics. Other statistics for the European transition countries (PP-Fisher and LLC) confirm the presence of a panel unit root. Further, we check whether there is a long run relationship to control the econometric specification.

Following these results, we confirmed the existence of co-integration between the time series of panels and estimate a co-integration regression equation. Table 3 shows results of both Pedroni's co-integration and Kao tests.

The Pedroni's test employs within and between group tests to examine whether the panel data are co-integrated, while the Kao test is based on the assumption that the individual units are homogeneous. The results of the Pedroni and Kao test statistics suggest that the null hypothesis of no co-integration is rejected for the whole sample of old EU-15 members and NMS-11, while the variables for European transition countries are not shown to be co-integrated.

In fact, our two panel co-integration tests provided strong evidence of a co-integrating relationship among the test variables for the whole sample, old EU-15 members and NMS-11 at 1% and 5% significance levels thus satisfying the preconditions for applying of the co-integration model estimation. In the case of European transition countries, Pedroni's within and between group test statistics imply that the variables are not integrated. Also, the findings of Kao's residual co-integration test provides strong evidence that the null hypothesis of non-existence of co-integration can be rejected in favour of the alternative hypothesis (panels in the data are co-integrated with the exception of European transition countries).

Table 2 Panel unit root tests

	Whole sample							
	Level				*First difference*			
	ADF-Fisher	*PP-Fisher*	*LLC*	*IPS*	*ADF-Fisher*	*PP-Fisher*	*LLC*	*IPS*
gini_mkt ln	130.506***	407.389***	–8.573***	–4.285***	103.116***	136.840***	–4.430***	–2.769***
IFI	48.354	70.952	–3.059***	2.273	362.158***	627.022***	–16.881***	–16.013***
FINFREED	64.121**	54.244*	–4.961***	–2.793***	49.106***	60.590***	–3.077***	–3.665***
STCAP	119.849***	120.903***	–4.3128***	–3.892***	188.004***	200.995***	–11.882***	–8.108***
DCREDIT	98.32**	77.542	–6.702***	–2.092**	125.551***	224.724***	–4.39174***	–3.886***
INFL	143.473***	205.616***	–15.670***	–6.442***	378.063***	697.768***	–21.338***	17.234***
lnGDP	129.045***	176.914***	–9.533***	–4.633***	110.462***	176.165***	–6.0196***	–3.593***
	Old EU-15 countries							
	Level				*First difference*			
	ADF-Fisher	*PP-Fisher*	*LLC*	*IPS*	*ADF-Fisher*	*PP-Fisher*	*LLC*	*IPS*
gini_mark ln	53.762***	314.255***	–5.258***	–2.508***	43.874***	67.222**	–3.176***	–2.252**
IFI	25.894	27.840	–3.107***	0.424	191.856***	275.119***	–12.606***	–13.259***
FINFREED	4.196	4.258	–0.056	–0.027	23.692***	17.463***	–5.644****	–3.770***
STCAP	72.203***	83.446***	–3.872***	–4.2813***	115.192***	119.817***	–10.610***	–7.805***
DCREDIT	48.348**	43.098*	–1.129	–2.292**	44.556**	125.223***	–5.382***	–1.864**
INFL	51.844***	52.945***	–4.258***	–2.384***	136.405***	309.323***	–11.791***	–9.315***
lnGDP	6.499	1.318	–2.181	3.695	151.025***	230.964***	–12.460***	–11.204***

Source: Author's calculation

Table 2 Panel unit root tests (continued)

	European transition countries							
	Level				*First difference*			
	ADF-Fisher	*PP-Fisher*	*LLC*	*IPS*	*ADF-Fisher*	*PP-Fisher*	*LLC*	*IPS*
gini_mark ln	35.319**	47.405***	–5.809***	–2.48626***	25.742	47.690***	–2.146***	–0.781
IFI	7.6034	24.118	0.467	2.23766	70.046***	160.936***	–6.469***	–5.807***
FINFREED	26.109*	27.291**	–4.003**	–1.72501***	12.606**	13.989**	–1.825**	–1.698**
STCAP	19.367	25.496*	–0.610	–0.79897	27.165**	40.938***	–1.949**	–1.915**
DCREDIT	25.816	11.478	–3.029***	–0.61156	33.334**	48.455***	–2.816***	–2.194**
INFL	57.178***	90.265***	–17.035***	–6.89357***	131.177***	194.938***	–14.253***	–11.771***
lnGDP	26.825	56.067***	–5.545***	–1.48751*	–1.296	–0.576***	21.129*	47.053
	NMS 11							
	Level				*First difference*			
	ADF-Fisher	*PP-Fisher*	*LLC*	*IPS*	*ADF-Fisher*	*PP-Fisher*	*LLC*	*IPS*
gini_mark ln	44.875***	43.610***	–5.168***	–2.818***	37.951**	39.020**	–2.968***	–2.247**
IFI	14.856	18.993	–1.336*	1.479	100.255***	190.968***	–8.417***	–7.960***
FINFREED	55.608***	22.695	–5.896***	–5.923***	36.499***	46.601***	–2.496***	–3.269***
STCAP	27.397	15.576	–2.413***	–1.183	53.645**	50.699***	–6.316**	–4.086**
DCREDIT	43.316***	22.971	–5.804***	–2.641***	49.743***	51.046***	–5.293***	–3.320***
INFL	61.356***	62.405***	–9.407***	–4.605***	127.688***	193.507***	–11.596***	–10.523***
lnGDP	27.558	56.370***	–5.628***	–1.515*	62.034***	59.458***	–7.579***	–4.999***

Source: Author's calculation

Table 3 Panel co-integration tests

	Whole sample		*Old EU-15*		*European transition countries*		*NMS-11*	
	Within-dimension	*Between-dimension*	*Within-dimension*	*Between-dimension*	*Within-dimension*	*Between-dimension*	*Within-dimension*	*Between-dimension*
ADF statistics	−2.575***	−3.069***	−2.672***	2.176**	0.099	0.339	−2.994***	−3.261***
PP statistics	−2.273**	−6.958***	−5.161***	−6.639***	0.121	0.111	−3.660***	−7.659***
Kao test	Test statistics		Test statistics		Test statistics		Test statistics	
t-statistic	−1.885295**		−1.988642**		−1.236953		−2.393025***	

Notes: ***, ** and * indicates rejection of the null hypothesis at 1%, 5% and 10% respectively.

Source: Author's calculation

Thus, the results of the Pedroni and Kao test statistics confirm the long run relationship amongst tested variables (income inequality, domestic credit, stock market capitalisation, financial openness, financial integration, GDP per capita and inflation) and they move together in the long run. The results of DOLS and FMOLS estimations shown in Table 4 are quite mixed for three sub-panels while the size of the coefficients is very similar.

The findings of the research reveal that the variables DCREDIT and STCAP appear to have an inverse effect on inequality in NMS-11 while it does the opposite in the case of old EU-15 countries. While private credit seems to decrease inequality in the whole sample and new EU-11 members, estimation results for the panel old EU-15 members seem to indicate an increase in inequality. It can be explained by the fact that it represents the different levels of financial development and financial deepening in the country sub-samples. At the level of NMS-11, the variables: DCREDIT and STCAP are found to be significant at the 10% significance level (according to the panel DOLS model) and the 5% significance level (according to the panel FMOLS model) while at the level of the whole sample 1% in determination of income inequalities. When examining panel group statistics for the whole sample, we found that the estimated results for the both models are not in agreement. For instance, the coefficient of DCREDIT obtained through the panel DOLS is 0.0095, while through the panel FMOLS model, it is –0.0033. It suggests that ten units of DCREDIT increase lead to an increase of income inequality for 0.0958 units (DOLS model) and a decrease of income inequality for 0.0335 units (FMOLS model).

Table 4 DOLS and FOLS models

	Whole sample		*Old EU-15 members*		*NMS-11*	
	DOLS	*FMOLS*	*DOLS*	*FMOLS*	*DOLS*	*FMOLS*
DCREDIT	0.0095***	–0.0034***	0.0007**	0.0002**	–0.1228*	–0.0212**
STCAP	–0.0033***	–0.0119***	–0.0001	0.0001	–0.3976*	–0.0405**
FINFREED	0.0019***	0.0024***	–0.0024***	–0.0025***	0.3268***	0.0344***
IFI	–0.0263	0.0309	0.0423***	0.0287***	–20.2507***	–0.8812
lnGDP	–0.1555***	0.3997***	0.0134	0.0450***	5.6342***	4.4217***
INFL	0.0005	–0.0006	–0.0025	–0.0038***	0.5208***	0.0169

Notes: The value of t-statistics *, **, and *** indicate statistical significance at 1%, 5% and 10% levels, respectively.

Source: Author's calculation

In addition, it can be seen that there is a negative and highly significant coefficient of the variable STCAP for the whole dataset and NMS-11 at the 1% significance level. In fact, a ten unit increase in STCAP leads to a decrease of income inequality by 0.0335 units (DOLS model) and 0.1194 units (FMOLS model).

The findings for these two samples are in line with some previous studies such as Jaumotte et al. (2008), Jauch and Watzka (2016) and Kim et al. (2011) which all highlighted how lower levels of financial development measured by private credit narrows income inequality while higher levels of financial development widens income inequality. Interestingly, the study finds that stock market capitalisation has a very weak and statistically insignificant impact on income inequality in the old EU-15 countries. This is consistent with the findings Law and Tan (2009) that transpired during the same period.

Note, however, that our main explanatory variable IFI is found to be a significant determinant of income inequality at the level of the old EU-15 members and NMS-11 (DOLS model). It implies that a ten unit increase of IFI in old EU-15 members leads to 0.42384 increase of income inequality (according to the panel DOLS model) and 0.028757 units (according to the panel FMOLS model). However, the panel DOLS and panel FMOLS estimated results are not in agreement for new 11 EU members because only the panel DOLS results are statistically significant.

These findings for the old EU-15 members and NMS-11 (DOLS models) seem to be consistent with the initial hypothesis that the rise of IFI tends to increase income inequality as found in the studies done by Kunieda et al. (2011), Erauskin and Turnovsky (2017) and Inekwe et al. (2019). The findings from the whole sample related to the IFI variable indicates an insignificant relationship because the sample also covers European transition countries with limited levels of IFI. Thus, the main explanatory variable is shown as statistically significant in the DOLS model at the 1% level for the old EU-15 members and NMS-11 and insignificant according to the FMOLS model (NMS-11).

Similarly, as in the whole sample and NMS-11, two variables, financial openness and GDP per capita, in the both models (FMOLS and DOLS) are shown at the 1% significance level when determining income inequalities. When more closely examining estimation results, one will note that the variable financial openness has a positive relationship with variations in income inequality and GDP per capita in the whole sample and a negative relationship in the old EU-15 members at the 1% significance level. Here we see that high financial freedom (in old EU-15 members) tends to reduce income inequality (though not so significant) and increase income inequality in the whole sample while the findings are quite mixed and ambiguous for new 11 EU members. This is consistent with the earlier findings of Bumann and Lensink (2016).

At the level of the whole dataset, the lnGDP control variable was found to be significant in determining income inequality at 1% as well as for the NMS-11 and the old EU-15 members (DOLS). This is consistent with some of the earlier studies by Law and Tan (2009), Jung and Kim (2018), Mihaylova (2015), Buba et al. (2019) and Kunieda et al. (2011). The findings for the control variable INFL are somewhat mixed and unclear. For instance, at the level of the whole dataset, the variable of INFL is not shown as statistically significant while interestingly, at the same time, it does show a negative relationship.

There are a few conclusions that one can reach from our findings. First, one can conclude that income inequality is determined by the growth of domestic credit and stock-exchange markets and that generally their increases lead to an increase of income inequality (growth of domestic credit) and a decrease of income inequality (stock-exchange markets). It appears these realities have an inverse effect on NMS-11 countries and positive effect on old EU-15 countries. This is consistent with some of the previous that conducted studies (Banerjee and Newman, 1993; Galor and Zeira, 1993) that financial development decreases income inequality in the long-term with some exceptions in earlier stages of development (Greenwood and Jovanovic, 1990). Secondly, financial freedom tends to decrease income inequality, and thirdly, increases in levels of IFI lead to widened income inequality and/or higher income disparity.

Also, the study provides evidence that European transition countries show no signs of significant progress regarding levels of financial integration and financial development. They have been found to not be well integrated with the rest Europe. One possible

explanation for this is related to the fact that the financial markets of the European transition countries are strongly dominated by the banking sector. Therefore, one can argue that these countries should strive for the type of development that would move them to a more market-oriented phase as similarly found in the works of Asteriou et al. (2014) and Cevik and Carro (2020). This phase is characterised by the development of stock-exchange markets while the banking sector nonetheless remains the most dominant source of capital. In order to determine how far from reaching this level of financial development the European transition countries actually are, this study focused on the inter-relationships between financial integration and income inequality that have been less explored in NMS-11 countries and European transition countries. Although the European transition countries are not all at the same level in term of overall development, we found that they are all very similar in terms of their levels of financial development and the early stage of financial integration and financial development.

5 Conclusions

This study explored the financial integration-inequality nexus in Europe. It pointed out some of the most important issues related to their financial development and offered possible solutions and policy recommendations for the respective officials. This research focused on the complex market of European transition and post-transition countries and includes old EU-15 countries in order to better understand the financial integration-inequality nexus in European transition and post-transition markets. The research results indicate that income inequality is related to levels of financial development across the analysed countries. However, it is important to note here that this implication is restrained by the limited levels of financial development and integration in European transition countries. The study found that a country with relatively lower levels of IFI (NMS-11) experience less income inequality while a country more integrated in international financial flows experiences great inequality in long-run (old EU-15 countries). The results also confirm that the growth of private credit and financial integration raise inequality which has already been established in previous research.

The impact of financial development on income inequality is generally statistically significant but also economically very small as well as for financial openness. This is because it analyses countries with high, middle and low levels of financial development and IFI. Although European transition countries also were included in our research, we found no econometric evidence that it does not necessarily benefit them.

It can be concluded that European transition countries failed to reach a certain level of financial development with limited progress in IFI. The results of this study also confirm that real GDP growth is the most robust conventional determinant of income inequality.

Based on all of this, we concluded that European transition countries' financial markets (credit and stock markets) are still in their rudimentary stages in comparison to those in the old EU-15 countries. As one would expect, both operate at significantly different levels of efficiency.

To summarise: our main conclusion is that government policies, especially in NMS-11 countries and European transition countries, should continue to prioritise further financial market (credit and stock markets) reforms and that financial institutions that are vital to development of a country's financial sector and ultimately economic growth. The focus of possible reform should be given to support of financial and capital market

development, reduce government influence on the allocation credit, increase openness to foreign competition, reduce the level of government intervention in banks and other financial firms through direct and indirect ownership, support wider access to financial services and towards the poor in society and income equality. Additionally, further financial openness in European transition countries and NMS-11 countries is necessary because this has been shown to have a positive effect on reducing income inequality.

References

Adams, S. and Klobodu, E.K.M. (2017) 'Capital flows and the distribution of income in Sub-Saharan Africa', *Economic Analysis and Policy*, September, Vol. 55, No. C, pp.169–178, DOI: 10.1016/j.eap.2017.05.006.

Akan, Y., Koksel, B. and Destek, M.A. (2017) 'The financial Kuznets curve in European Union', *EconWorld2017@RomeProceedings*, Rome, Italy, 25–27 January.

Ang, J.B. (2008) *Finance and Inequality: the Case of India*, Discussion Paper No. 8, pp.1–25, Monash University, Department of Economics.

Arteta, C., Eichengreen, B. and Wyplosz, C. (2001) *When Does Capital Account Liberalization Help More Than it Hurts?*, Technical Report, National Bureau of Economic Research.

Asteriou, D., Dimelis, S. and Moudatsou, A. (2014) 'Globalization and income inequality: a panel data econometric approach for the EU-27 countries', *Economic Modelling*, Vol. 36, No. C, pp.592–599.

Baek, I. and Shi, Q. (2016) 'Impact of economic globalization on income inequality: developed economies vs. emerging economies', *Global Economy Journal*, Vol. 16, No. 1, pp.49–61.

Baiardi, D. and Morana, C. (2018a) 'The financial Kuznets curve: evidence for the Euro area', *Journal of Empirical Finance*, December, Part B, Vol. 39, No. C, pp.265–269.

Baiardi, D. and Morana, C. (2018b) 'Financial development and income distribution inequality in the euro area', *Economic Modelling*, Vol. 70, No. C, pp.40–55, Elsevier.

Banerjee, A.V. and Newman, A.F. (1993) 'Occupational choice and the process of development', *J. Polit. Econ.*, April, Vol. 101, No. 2, pp.274–298.

Bigsten, A. and Levin, J. (2000) *Growth, Income Distribution and Poverty: a Review*, Working Paper in Economics No. 32, Department of Economics, Göteborg University [online] http://swopec.hhs.se/gunwpe/papers/gunwpe0032.pdf (accessed 25 October 2019).

Bruno, G., Crinò, R. and Falzoni, A. (2004) *Foreign Direct Investment, Wage Inequality, and Skilled Labor Demand in EU Accession Countries*, WP No. 154, Centre for Knowledge, Internationalization and Technology Studies, Universita' Bocconi.

Buba, S., Ishak, S. and Noor, M.Z. (2019) 'The determinants of income inequality in Europe: do trade liberalisation and financial liberalisation matter?', *Jurnal Ekonomi dan Studi Pembangunan*, Vol. 11, No. 1, pp.40–55.

Bumann, S. and Lensink, R. (2016) 'Capital account liberalization and income inequality', *Journal of International Money and Finance*, March, Vol. 61, No. C, pp.143–162.

Cevik, S. and Carro, C.C. (2020) *Taking Down the Wall: Transition and Inequality*, IMF Working Paper, WP/20/32.

Chen, J. and Quang, T. (2012) 'International financial integration and economic growth: new evidence on threshold effects', *Economic Modelling*, Vol. 42, No. C, pp.475–489, Elsevier, https://doi.org/10.1016/j.econmod.2014.06.011.

Cornia, G.A. and Court, J. (2001) *Inequality, Growth and Poverty in the Era of Liberalization and Globalization*, Policy Brief No. 4, World Institute for Development Economic Research, The United Nations University [online] http://www.wider.unu.edu/publications/policy-briefs/en_GB/pb4/ (accessed 1 December 2012).

Demirguc-Kunt, A. and Levine, R. (2009) *Finance and Inequality: Theory and Evidence*, World Bank Policy Research Working Paper No. 4967, World Bank, Washington, DC.

Erauskin, I. and Turnovsky, S.J. (2019) 'International financial integration and income inequality in a stochastically growing economy', *Journal of International Economics*, Vol. 119, No. C, pp.55–74, Elsevier.

Forbes, K.J. (2000) 'A reassessment of the relationship between inequality and growth', *American Economic Review*, Vol. 90, No. 4, pp.869–880.

Franco, C. and Gerussi, E. (2010) *Trade, FDI and Income Inequality. Empirical Evidence from Transition Countries*, WP No. 15, Department of Economics, University of Bologna.

Furceri, D. and Loungani, P. (2015) *Capital Account Liberalization and Inequality*, IMF Working Paper, WP/15/243.

Galor, O. and Zeira, J. (1993) 'Income distribution and macroeconomics', *Rev. Econ. Stud.*, Vol. 60, No. 1, pp.35–52.

Giannetti, M., Guiso, L., Jappelli, T., Padula, M. and Pagano, M. (2002) *Financial Market Integration, Corporate Financing and Economic Growth*, European Commission, Economic papers No. 179 [online] https://econpapers.repec.org/paper/eufecopap/0179.htm (accessed 25 October 2019).

Granger, C. and Newbold, P. (1974) 'Spurious regressions in econometrics', *Journal of Econometrics*, Vol. 2, No. 2, pp.111–120.

Greenwood, J. and Jovanovic, B. (1990) *Financial Development, Growth, and the Distribution of Income (No. w3189)*, National Bureau of Economic Research.

Grimalda, G., Barlow, D. and Meschi, E. (2010) 'Varieties of capitalisms and varieties of performances: accounting for inequality in post-Soviet Union transition countries', *International Review of Applied Economics*, Vol. 24, No. 3, pp.379–403.

Haan, J. and Sturm, J.E. (2016) *Finance and Income Inequality: a Review and New Evidence*, CESifo Working Paper Series No. 6079, SSRN: https://ssrn.com/abstract=2858830.

Halmos, K. (2011) 'The effect of FDI, exports and GDP on income inequality in 15 Eastern European countries', *Acta Polytechnica Hungarica*, Vol. 8, No. 1, pp.123–136.

Im, K., Pesaran, H. and Shin, Y. (2003) 'Testing for unit roots in heterogeneous panels', *Journal of Econometrics*, Vol. 115, No. 1, pp.53–74.

Inekwe, J., Jin, Y. and Valenzuela, M.R. (2019) 'Income inequality, financial flows and political institution: Sub-Saharan African financial network', *Empirical Economics*, February, Springer, DOI: 10.1007/s00181-019-01634-3.l.

Jauch, S. and Watzka, S. (2016) *Financial Development and Income Inequality: a Panel Data Approach*, No 3687, CESifo Working Paper Series, CESifo Group, Munich.

Jaumotte, M.F., Lall, M.S. and Papageorgiou, C. (2008) *Rising Income Inequality: Technology, or Trade and Financial Globalization?*, No. 8–185, International Monetary Fund.

Jung, J.W. and Kim, K. (2018) *Financial Market Integration and Income Inequality*, 20 July, Working Paper No. 18-02, KIEP Research Paper, SSRN: https://ssrn.com/abstract=3299420 or http://dx.doi.org/10.2139/ssrn.3299420.

Kao, C. (1999) 'Spurious regression and residual-based tests for cointegration in panel data', *Journal of Econometrics*, Vol. 90, No. 1, pp.1–44.

Kao, C. and Chiang, M-H. (2001) 'On the estimation and inference of a cointegrated regression in panel data', in Baltagi, B.H., Fomby, T.B. and Carter Hill, R. (Eds.): *Nonstationary Panels, Panel Cointegration, and Dynamic Panels (Advances in Econometrics)*, Vol. 15, Emerald Group Publishing Limited, Bingley, pp.179–222 [online] https://doi.org/10.1016/S0731-9053(00)15007-8.

Kim, D-H., Lin, S-C. and Suen, Y-B. (2011) 'Nonlinearity between trade openness and economic development', *Review of Development Economics*, Vol. 15, No. 2, pp.279–292.

Kunieda, T., Okada, K. and Shibata, A. (2011) *Finance and Inequality: How Does Globalization Change their Relationship?*, MPRA Paper No. 35358.

Kuznets, S. (1955) 'Economic growth and income inequality', *The American Economic Review*, Vol. 45, No. 1, pp.1–28 [online] http://www.jstor.org/stable/1811581.

Lane, P.R. and Milesi-Ferretti, G.M. (2007) *Europe and Global Imbalances*, IMF Working Papers, pp.1–59 [online] SSRN: https://ssrn.com/abstract=1007893.

Larrain, M. (2013) 'Capital account liberalization and wage inequality', *The Review of Financial Studies*, Vol. 28, No. 6, pp.1555–1587.

Law, S.H. and Tan, H.Y.B. (2009) 'The role of financial development on income inequality in Malaysia', *Journal of Economic Development*, Vol. 34, No. 2, pp.153–168.

Maddala, G.S. and Wu, S. (1999) 'Comparative study of unit root tests with panel data and a new simple test', *Oxford Bulletin of Economics and Statistics*, Vol. 61, pp.631–652.

Mihaylova, S. (2015) 'Foreign direct investment and income inequality in central and eastern Europe', *Theoretical and Applied Economics*, Vol. 22, No. 2(603), pp.23–42.

Mills, M. (2009) 'Globalization and inequality', *Eur. Sociol. Rev.*, Vol. 25, No. 1, pp.1–8.

Nafziger, E.W. (1997) *The Economics of Developing Countries*, Pearson College Division, Upper Saddle River.

Osada, M. and Saito, M. (2010) *Financial Integration and Economic Growth: an Empirical Analysis Using International Panel Data from 1974–2007*, Bank of Japan Working Paper Series 10-E-5, Bank of Japan.

Pedroni, P. (1999) 'Critical values for cointegration tests in heterogeneous panels with multiple regressors', *Oxford Bulletin of Economics and Statistics*, Vol. 61, No S1, pp.653–670.

Pedroni, P. (2004) 'Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis', *Econometric Theory*, Vol. 20, No. 3, pp.597–625, doi:10.1017/S0266466604203073.

Phillips, P.C.B. (1986) 'Understanding spurious regressions in econometrics', *Journal of Econometrics*, Vol. 33, No. 3, pp.311–340, Elsevier.

Quinn, D.P. and Toyoda, M. (2008) 'Does capital account liberalization lead to growth?', *Review of Financial Studies*, Vol. 21, No. 3, pp.1403–1449.

Rehman, H., Khan, S. and Ahmed, I. (2008) 'Income distribution, growth and financial development: a cross-countries analysis', *Pakistan Economic and Social Review*, Vol. 46, No. 1, pp.1–16.

Satti, S.L., Mahalik, M.K., Bhattacharya, M. and Shahbaz, M. (2015) *Dynamics of Income Inequality, Finance and Trade in Kazakhstan: Empirical Evidence from a New Transition Economy with Policy Prescriptions*, Vol. 15, No. 36, Pp.1–40, Discussion paper/Monash University, Department of Economics, Clayton, ZDB-ID 2272750-4.

Shahbaz, M. and Islam, F. (2011) 'Financial development and income inequality in Pakistan: an application of ARDL approach', *Journal of Economic Development*, Vol. 36, No. 1, pp.35–58.

Solt, F. (2009) 'Standardizing the world income inequality database', *Soc. Sci. Quart.*, Vol. 90, No. 2, pp.231–242.

Solt, F. (2019) *Measuring Income Inequality across Countries and Over Time: the Standardized World Income Inequality Database*, SWIID Version 8.1, May.

Strange, S. (1996) *The Retreat of the State: the Diffusion of Power in the World Economy*, Cambridge University Press, Cambridge.

Appendix

Table A1 Summary of variables used in the regression model

Variable	*Measurement*	*Source*
gini mkt ln	Inequality in market (pre-tax, pre-transfer) income	The Standardized World Income Inequality Database (SWIID)
IFI	International financial integration measured by total stocks of external assets divided by GDP [portfolio equity assets (stock) + FDI assets (stock) + debt assets (stock)]	Lane and Milesi-Ferretti, 'The External Wealth of Nations Mark II'
STKCAP	The ratio of stock market capitalisation to GDP	The Global Financial Development Database (the World Bank)
DCREDIT	The ratio of domestic credit to GDP	World Bank's World Development Indicators
FINFREED	Financial freedom, measure a country's banking efficiency and independence from government control and interference in the financial sector	Heritage Foundation, (Index of Financial Freedom)
GDPPC	GDP per capita	World Bank's World Development Indicators
INFL	Inflation, GDP deflator (annual %)	World Bank's World Development Indicators