

AN EMPIRICAL STUDY OF THE DETERMINANTS OF INCOME INEQUALITY IN TRANSITIONAL ECONOMIES USING PANEL DATA ANALYSIS METHODS

Kunofiwa Tsauroi, University of South Africa

ABSTRACT

The paper's main objective was to explore the determinants of income inequality in transitional economies using panel data analysis [(fixed effects, random effects, pooled ordinary least squares (OLS), dynamic generalized methods of moments (GMM)] with data ranging from 2003 to 2016. The study observed that human capital development is not a significant determinant of income inequality under all the econometric estimation methods used. The dynamic GMM noted that the lag of income inequality had a significant positive impact on income inequality. All the econometric estimation methods produced results which show that economic growth had a significant deleterious effect on income inequality, in line with most theoretical predictions. Transitional economies are therefore urged to implement economic growth spurring policies to reduce income inequality. On the other hand, the dynamic GMM method shows that unemployment reduced income inequality, a finding which contradicts theory. Fixed effects, random effects and pooled OLS approaches noted that the interaction between economic growth and unemployment had a significant positive effect on unemployment, a finding which shows that if economic growth does not enhance employment, income inequality grows. Transitional economies are therefore urged to development and implement concurrent economic growth and employment enhancement policies to reduce income inequality. Other variables which were found to have a significant positive impact on income inequality include information and communication technology (fixed effects, random effects), financial development (fixed effects, random effects, pooled OLS), foreign direct investment (random effects, pooled OLS, dynamic OLS), infrastructural development (fixed effects) and trade openness (fixed effects, random effects, pooled OLS, dynamic GMM).

Keywords: Income Inequality, Transitional Economies, Panel Data.

INTRODUCTION

Background of the Study

Income inequality has been a problem affecting not only transitional economies, developing countries, African continent but the whole world at large in the past decades (Allison et al. 2014). Although the most validated theoretical prediction (the wealth hypothesis) says that economic growth reduces income inequality, consistent with Rubin & Segal (2015), most countries (transitional economies included) that have been experiencing economic growth has not received a corresponding decline in income inequality gap. This is a question that empirical literature on the subject matter has failed to address.

Theoretical literature on the determinants of income inequality exists and leading lights on the subject matter include Ayala et al (2001); Rubin & Segal (2015); Kaplan & Rauh (2010); Balassa (1978); Jacoby (2000); Stiglitz (1998) among others. However, majority of these prominent authors only focused on single factor perspective and none of them claimed that the list of income inequality determinants is exhaustive. In fact, none of these authors in their theoretical literature perspectives came up with a single list of determinants of income inequality or agree on a list of income inequality determinants. One of the gaps in the literature in that these authors on the causes on income inequality wrongly assumed that there exists a linear relationship between different variables and income inequality, something which the current study disputed.

Empirical research on the determinants of income inequality was extensively done (Table 2) by various authors to try to fill in these gaps found in the literature, albeit unsuccessfully. For example, none of the empirical research that the author is aware of, included an interaction term (interaction between economic growth and unemployment) as one of the possible income inequality determinants. None of the empirical researchers on income inequality determinants that the author is aware of considered the dynamic characteristics of income inequality data set and addressed the endogeneity problem. The current study fills all these gaps.

The existing empirical literature on the determinants of income inequality shied away from focusing on transitional economies as a bloc of countries when investigating the subject matter (the determinants of income inequality). It therefore follows that the results of the existing empirical literature on income inequality determinants cannot be generalized on transitional economies. In other words, the story on income inequality determinants in transitional economies remains untold and the current paper seeks to fill in that gap.

Structure of the Paper

The theoretical literature on the determinants of income inequality is in Table 1 Section 2 whilst the determinants of income inequality from an empirical study view point is Section 3. Section 4 is the methodological approach. The section is quite broad such that it includes data description, correlation analysis, descriptive statistics, trend analysis, panel unit root tests, panel co-integration tests, main data analysis, results description, and their interpretation. Section 5 is the conclusion of the paper. Section 6 is the reference list.

DETERMINANTS OF INCOME INEQUALITY - THEORETICAL LITERATURE REVIEW

Table 1			
THEORY INTUITION AND A PRIORI EXPECTATION			
Variable	Proxy used	Theory intuition	Expected sign
Unemployment (UNEMPL)	Unemployment total (% of total labour force)	Ayala et al (2001) observed that the unemployed were the ones who suffered more from income inequality in a study done on OECD group of countries. The same study revealed unemployment exacerbates income inequality because the unemployed are the poor whilst the employed are in most cases the ones who hails from rich backgrounds and received better quality education.	+
Economic growth (GROWTH)	GDP per capita	According to the wealth hypothesis, a small increase in economic growth has got a positive multiplier effect on the value of labour income, GDP per capita and general wealth	+/-

		levels of the people (Rubin and Segal. 2015: 259). This consequently reduces income inequality levels of the community. Economic growth can increase income inequality if it causes more sensitivity to wealth than labour income (Kaplan and Rauh. 2010).	
Information and Communication Technology (ICT)	Individuals using internet (% of population)	Richmond and Triplett (2017) argued that improvements in ICT may exacerbate income equality because of the differences it creates in the access and skills possessed by the people depending on existing income class of an individual.	+
Trade openness (OPEN)	Total of exports and imports (% of GDP)	High level of trade openness enhances economic growth through allowing local firms an opportunity to easily compete effectively in international markets thus boosting their expansion capacity, ability to create employment and reducing income inequality gaps among the people (Balassa. 1978).	-
Human capital development (HCAP)	Human capital development index	According to Becker and Chiswick (1966), high human capital development reduces the levels of income inequality at workplace and society in general. Education enhances the skills and competencies of individuals as well as their productivity and improves the income they receive at the workplace and in general life (Johansen. 2014:21). Castello-Climent and Domenech (2014) produced results which shows that human capital development was not enough to have a significant reduction in income inequality.	-
Foreign direct investment (FDI)	Net FDI inflows (% of GDP)	Jaumotte et al (2013) argued that FDI aggravates wage differentials and consequently income inequalities in the host countries because the greater portion that foreign investors make is not used for the benefit of the local community but repatriated back to the home country. On the other hand, FDI empowers the host country citizens with skills, give them jobs, improves their productivity levels and enhances overall growth of the host country's economy' all of which benefits the people and consequently narrow income inequality differentials (Boakye-Hyasi and Li. 2015).	+/-
Infrastructural development (INFR)	Fixed telephone subscriptions (per 100 people)	According to Jacoby (2000), infrastructural development benefits the previously disadvantaged and the poor as they can now be able to easily gain access to productive opportunities that connects them to essential economic activities. A key determinant of income convergence for the poor has been found to be improved infrastructure as the poor can now enjoy low transportation and production costs through easily accessing better road infrastructure (Estache and Fay. 1995). However, Tsaurai and Nyoka (2019:116) argued that infrastructural development may increase income inequality because resources that could have been used to boost the labour income of the citizens through small loans provision would have to be diverted towards long term infrastructural projects.	+
Financial development (FIN)	Market capitalization of listed domestic companies (% of GDP)	Financial development increases the income inequality gap as the rich becomes more richer because of their ability to access credit for their income generating projects as the financial sector becomes more developed (Dhrifi. 2013). On the other hand, Stiglitz (1998) and the World Bank (2001) noted that developed financial markets enables the poor to	+/-

		have better access to financial products that enable their standard of living to rise thus reducing income inequality.	
Source: Author compilation			

DETERMINANTS OF INCOME INEQUALITY - EMPIRICAL LITERATURE REVIEW

Author	Country/Countries of study	Period	Methodology	Results
Tridico (2018)	OECD countries	1990-2013	Panel data analysis	Retrenchment of the welfare state, weakening of trade unions, deepening of labour flexibility and an increase in financialization were found to have increased income inequality during the period under study.
Furceri and Ostry (2019)	A sample of 108 countries across the globe	1980-2013	Weighted average least squares	Demographics, unemployment, level of development and trade integration were the key drivers of income inequality. Financial globalization increased income inequality whilst trade integration lowered down income inequality.
Crespo et al (2012)	Portugal	2005/2006 survey data	Logit regression model	Number of households in the residence, socio-economic characteristics of the household and the dimension and composition of the household were the key factors that influenced income inequality.
Bahmani-Oskooee et al (2008)	Evidence from 16 countries	1963-1999	Time series data analysis	The study revealed that trade openness's impact on income inequality varied from country to country.
Malerba and Spreafico (2014)	European Union	1995-2010	Panel data analysis	Social spending and economic growth were found to be significant determinants on income inequality in the European Union. Among the structural determinants of income inequality in the European Union include labour market institutions, social mobility and loan repayment stages of the household.
Marsh (2015)	142 developing, transitional and developed countries	2000-2009 and 1995-2000	Panel data analysis	Population growth increased income inequality whilst educational inequality had more impact on income inequality than educational attainment. Government income transfers and liberal democracy were found not to have any significant influence on income inequality.
Munir and Sultan (2017)	India and Pakistan	1973-2015	Fixed effect model	Globalization, urbanization, fertility rate, GDP per capita, government consumption expenditure, arable land per capita and agricultural sector value addition were the significant factors which were found to be key determinants of income inequality.

Paweenawat and McNown (2014)	Thailand	1992-2011	Synthetic cohort data analysis	Gender differences of the head of the household, variation in access to finance, differences in household composition and GDP per capita were found to be related with income inequality in the form of a U-shape.
Roine et al (2009)	16 countries	Different for each country studied	Descriptive statistics	Economic growth, financial development, trade openness and government spending were found to be key variables influencing income inequality during the period under study.
Ganaie et al (2018)	India	1963-2007	Autoregressive Distributive Lag (ARDL)	In the long run, trade openness and government expenditure had a significant positive influence on the distribution of income in India. Income inequality increased in response to price level increases whilst economic growth reduced income inequality.
Bratoeva-Manoleva (2017)	Bulgaria	1990-2015	Multiple linear regression model	Government expenditure reduced income inequality whilst FDI, education and inflation's influence on income inequality were found to be negligible.
Mengesha (2019)	Ethiopia	2015/2016 survey data	Regression decomposition approach	Income inequality was reduced by better education, age of the household head, residency of the household head and performance of the agricultural sector whilst someone's employment, occupation and race were also determining factors on income inequality.
Naschold (2009)	Pakistan	Survey data between 1986 and 1991	Regression decomposition approach	Land ownership explained most of the income inequality in most rural parts of Pakistan. Better quality education was found to have reduced income inequality in the rural areas of Pakistan.
Afandi et al (2017)	Indonesia (32 provinces)	2007-2013	Panel data analysis	An increased share of the manufacturing sector was found not to have any significant impact on income inequality whilst decreasing poverty levels were found not to be enough to reduce income inequality. College education had no meaningful correlation with income inequality across all the provinces of Indonesia. Increased share of the service sectors and agriculture were found to have reduced income inequality.
Stjepanovic (2018)	Croatia	2001-2017	Multiple regression analysis	Wages differentials, inflation and government consumption were the main variables which were found to be major determinants of income inequality in Croatia.
Akin-Olagunju and Omonona (2013)	Nigeria	Survey data	Regression analysis	The study revealed that there was high income inequality among rural households of Ibadan, Oyo State. Education was also found to have

				reduced income inequality whilst marital status, agricultural credit and land size increased income inequality.
Su and Heshmati (2013)	China	2000-2009	Ordinary least squares, conditional quantile regression and decomposition methods	Occupation and education were the two key factors that were found to be determinants income inequality. Skills were found to be more beneficial to the rural people whilst general education was more useful to people in the urban areas of China.
Epo and Baye (2013)	Cameroon	2007 household consumption survey data	Regression based decomposition approach	Education, health, household size, portion of active household members working in the formal sector, household size, urban residency were the key determinants of income inequality in Cameroon.
Carmen et al (2018)	Latin America	2004-2013	Panel data analysis	Variables which were found to be statistically significant factors determining income inequality include economic growth, tax pressure, literacy rate, years of schooling and health spending per capita.
Meena et al (2017)	Jharkhand state of India	Survey data based on 160 rural household survey data	Linear regression models	Income inequality was found to be highest among labour households whilst access to non-farm income opportunities, adoption of high yielding varieties and education were the most dominant determinants of income inequality.
Ming-Hsuan (2016)	China	2005-2010 provincial panel data	Dynamic panel data analysis	Provinces which were relying on energy resources were characterized by high income inequality.
Nebebe and Rao (2016)	Ethiopia	Survey data (November-December 2014)	Ordinary least squares and quantile regression analysis	Across all quantiles distribution, the role of education in consumption expenditures, house quality, income sources, employment status, household energy sources, water and sanitation and the place of residence were found to be the key determinant variables affecting income inequality.
Fambon (2017)	Cameroon	2007 survey data	Ordinary least squares and quantile regression analysis	The OLS procedure show that social and human resources was a key determinant in the improvement of welfare (reducing income inequality). The quantile regression approach show that household headed by older people are better off in upper quantiles in the distribution of income.
Naseer and Ahmed (2016)	Pakistan	2005-2006 and 2010-2011 survey data	Regression based decomposition approach	Professional categories of occupation, education, share of gender and age were the critical factors that influenced income inequality in Pakistan.

Canavire-Bacarreza and Rios-Avila (2015)	Bolivia	2011 survey data	Regression based decomposition approach	Labour market characteristics and demographic factors only explained a small portion of income inequality in Bolivia. The faster wage growth explained a bigger portion of less income inequality in Bolivia.
Source: Author compilation				

RESEARCH METHODOLOGY

Data Used in the Study

The paper used panel data of 14 transitional economies as defined by International Monetary Fund (2015) ranging from year 2003 to year 2016 which was extracted from publicly viewable databases such as the World Development Indicators, International Monetary Fund, United Nations Development Programme, African Development Bank and International Financial Statistic. The list of transitional economies used in the study include Argentina, Brazil, China, Colombia, Czech Republic, Greece, Indonesia, Mexico, Peru, Poland, Portugal, Russia, Thailand, and Turkey. The choice of these transitional economies is mainly based on International Monetary Fund (2015) and data availability considerations.

Pre-estimation Diagnostics

Correlation analysis, descriptive statistics and trend analysis are the three pre-estimation diagnostics covered under this sub-section. According to Table 3, variables which were found to have a significant relationship with income inequality include economic growth, ICT, HCAP, INFR and trade openness. These results are backed by literature which says that these variables reduce income inequality. Unemployment and income inequality were found to be negatively but insignificantly related, contrary to theoretical predictions. As supported by literature, financial development and income inequality were found to be positively but significantly related whilst a non-significant positive relationship between FDI and income inequality was detected. In line with Stead (1996), there is no multi-collinearity problem in the dataset as the maximum size of the correlation is 76% (between economic growth and infrastructural development) Table 4.

	INEQ	GROWTH	UNEMPL	ICT	HCAP	FIN	DI	NFR	PEN
INEQ	1.00								
GROWTH	-0.50***	1.00							
UNEMPL	-0.05	0.38***	1.00						
ICT	-0.27***	0.60***	0.23***	1.00					
HCAP	-0.41***	0.68***	0.39***	0.43***	1.00				
FIN	0.17**	-0.26***	-0.35***	-0.35***	-0.25***	1.00			
FDI	0.08	-0.09	-0.14*	-0.01	-0.03	0.10	.00		
INFR	-0.33***	0.76***	0.60***	0.25***	0.63***	-0.16**	0.11	.00	
OPEN	-0.65***	0.21***	-0.25***	0.12	0.26***	0.08	.16**	0.07	.00
Note: ***/**/* denotes statistical significance at the 1%/5%/10% level respectively.									
Source: Author compilation from E-Views									

Table 4

DESCRIPTIVE STATISTICS									
	INEQ	GROWT H	NEMPL	CT	CAP	IN	DI	NFR	PEN
Mean	41.26	10097	7.73	39.3	0.78	40.4	2.88	22.9	63.1
Median	40.2	8593	7.28	38.3	0.78	36.02	2.72	21.31	53.75
Maximum	57.6	31997	27.5	90.6	0.94	127.1	10.7	56.4	160.9
Minimum	25.9	1065.7	0.49	2.39	0.60	5.67	0.15	3.65	22.1
Standard deviation	7.69	6761.2	4.60	21.2	0.07	22.04	1.58	11.7	32.3
Skewness	0.10	0.94	1.59	0.27	0.06	1.24	1.00	0.96	1.31
Kurtosis	2.41	3.19	7.16	2.24	2.39	4.76	5.66	3.49	3.92
Jarque-Bera	3.19	29.3	224.1	7.19	3.20	75.7	90.6	31.9	63.2
Probability	0.20	0.00	0.00	0.03	0.20	0.00	0.00	0.00	0.00
Observations	196	196	196	196	196	196	196	196	196
Note: ***/**/* denotes statistical significance at the 1%/5%/10% level respectively.									
Source: Author compilation from E-Views									

Calculating the range values which exceeds 100, it is evident that there exist outliers in the economic growth, financial development, and trade openness data. It is also evident that there exist extreme values in the economic growth data set given the fact that its standard deviation far much exceeded 100. All the data set is skewed to the right, evidence that it is not normally distributed across all the variables. Except for ICT and HCAP, all the other data set is not normally distributed because the probabilities of their Jarque-Bera criterion is equal to zero.

Table 5 MEAN INCOME INEQUALITY TRENDS IN TRANSITIONAL ECONOMIES (2003-2016)									
	INEQ	GROWTH	UNEMPL	ICT	HCAP	FIN	FDI	INFR	OPEN
Argentina	48.51	10 186.45	10.51	68.46	0.88	15.37	1.93	24.76	35.43
Brazil	58.20	8 708.29	9.03	39.59	0.81	54.25	3.10	22.86	27.61
China	43.99	4 627.14	4.84	29.77	0.78	55.53	3.58	22.97	53.55
Colombia	57.21	5 634.85	11.92	33.50	0.79	44.46	4.13	17.73	39.15
Czech Republic	28.40	18 225.48	6.95	62.11	0.93	21.78	4.59	26.49	139.60
Greece	37.08	24 783.99	16.56	45.48	0.94	41.04	0.87	54.52	60.44
Indonesia	38.76	2 625.33	6.42	10.95	0.73	39.45	1.81	9.89	55.34
Mexico	52.74	9 309.67	4.55	32.66	0.83	34.60	2.84	17.76	64.67
Peru	50.75	4 784.40	4.25	31.03	0.80	45.00	4.66	10.30	50.72
Poland	36.74	11 702.24	12.65	55.71	0.90	33.15	3.58	26.84	87.77
Portugal	38.94	21 796.16	10.69	51.64	0.91	36.99	4.09	44.85	75.14
Russia	42.92	9 600.15	7.12	41.18	0.84	56.77	2.78	30.24	56.73
Thailand	42.36	4 749.47	1.08	24.37	0.79	79.66	3.00	10.44	138.32
Turkey	43.48	9 418.04	10.68	36.34	0.81	30.30	1.92	24.30	54.93
Overall mean	44.29	10 439.4	8.37	40.2	0.84	42.03	3.06	24.57	67.1
Source: Author's calculations based on the World Development Database									

Carefully looking at Table 5, countries whose mean income inequality exceeded the overall mean GINI co-efficient of 44.29 include Argentina, Brazil, Colombia, Mexico and Peru. The remainder had their mean GINI co-efficient lower than the overall mean value. Regarding income inequality, countries which can be regarded to as outliers are Brazil, Colombia, Czech Republic,

Greece, Mexico, Peru, Poland, and Portugal because their mean GINI co-efficient deviated from the overall mean GINI co-efficient value of 44.29 by a wider margin.

Using the same reasoning, Brazil, China, Colombia, Czech Republic, Greece, Indonesia, Peru, Portugal, and Thailand are outliers in terms of economic growth data. China, Czech Republic, Greece, Indonesia, Mexico, Peru, Poland and Thailand are outlier countries, in terms of unemployment data set. Argentina, China, Colombia, Czech Republic, Indonesia, Mexico, Peru, Poland, Thailand and Turkey are also outlier countries, in terms of ICT.

In terms of human capital development, Greece, Indonesia, Poland and Thailand are outliers whilst Argentina, Brazil, China, Czech Republic, Mexico, Poland, Portugal, Russia, Thailand and Turkey fall under the category of outlier countries when financial development is being considered. For FDI, Czech Republic, Greece, Indonesia, Peru and Turkey might be taken as outliers. Colombia, Greece, Indonesia, Peru, Portugal and Thailand can be referred to as outliers, in terms of infrastructural development whilst Argentina, Brazil, China, Colombia, Czech Republic, Indonesia, Peru, Poland, Portugal, Thailand and Turkey are outlier countries using trade openness data considerations. Following Aye & Edoja (2017), all the data sets were transformed into natural logarithms before being used for main data analysis to address some of these econometric problems which can affect the quality of the overall results.

Panel Unit Root Tests

The results of panel unit root tests show that all the variables were integrated of order 1 yet at level, the evidence that not all variables were stable is clear.

	Level				First difference			
	LLC	PS	DF	P	LC	PS	DF	P
NEQ	-2.2778**	0.6965	3.7261	45.6359***	-6.1284***	-4.1669***	35.5815***	85.2108***
ROWTH	-5.7097***	-2.9666***	50.9933***	112.476***	-2.2872**	-7.2312***	103.931***	54.0895***
NEMPL	-3.5912***	-1.5118*	37.4992	29.2698	-3.6641***	-2.1702**	44.5714**	59.7954***
CT	-9.8032***	-3.8113***	65.8202***	124.112***	-2.3808***	-1.4115*	102.023***	87.1088***
CAP	-9.2113***	-5.8058***	85.0009***	87.4627***	-18.3312***	-12.4999	168.046***	229.666***
IN	-4.1735***	-1.9833**	41.5015**	84.6438***	-10.3156***	-7.4946***	106.543***	238.571***
DI	-4.7064***	-2.9274***	55.0792***	73.6813***	-9.3678***	-8.1364***	113.502***	200.153***
NFR	2.4789	2.4104	16.0521	20.2742	-3.1365***	-1.6815***	45.8576***	62.319***
PEN	-0.4027	0.7575	25.8273	32.289	-7.4736***	-5.2868***	78.4021***	173.691

Note: LLC, IPS, ADF and PP stands for Levin, Lin and Chu (2002); Im, Pesaran and Shin (2013); ADF Fisher Chi Square and PP Fisher Chi Square tests respectively. *, ** and *** denote 1%, 5% and 10% levels of significance, respectively.

Source: Author's compilation from E-Views

Panel Co-Integration Tests

	T-statistic	Probability
Augmented Dickey-Fuller (ADF)	-4.1394***	0.0008

Source: Author's compilation from E-Views

The Kao (1999) method produced results which show that the null hypothesis which says that the variables are not co-integrated cannot be accepted at 1% significance level see results in Table 7.

General Model Description

$$INEQ = f(GROWTH, UNEMPL, ICT, HCAP, FIN, FDI, INFR, OPEN) \quad (1)$$

Literature on determinants of income inequality (see Section 2 and 3) played an influencing role in coming up with the general model description (equation 1), which is then transformed into econometric model 2 (equation 2).

$$INEQ_{it} = \beta_0 + \beta_1 GROWTH_{it} + \beta_2 UNEMPL_{it} + \beta_3 ICT_{it} + \beta_4 HCAP_{it} + \beta_5 FIN_{it} + \beta_6 FDI_{it} + \beta_7 INFR_{it} + \beta_8 OPEN_{it} + \epsilon_{it} \quad (2)$$

Econometric terminology is then explained in Table 8 to make it easy to interpret econometric model 2.

INEQ_{it}	Income inequality in country i at time t
GROWTH_{it}	Economic growth in country i at time t
UNEMPL_{it}	Unemployment in country i at time t
ICT_{it}	Information and communication technology in country i at time t
HCAP_{it}	Human capital development in country i at time t
FIN_{it}	Financial development in country i at time t
FDI_{it}	Foreign direct investment in country i at time t
INFR_{it}	Infrastructural development in country i at time t
OPEN_{it}	Trade openness in country i at time t
β₀	Intercept term
β₁ to β₈	Co-efficient of the independent variables
i	country
t	time
ε_{it}	Error term
Source: Author compilation	

$$INEQ_{it} = \beta_0 + \beta_1 GROWTH_{it} + \beta_2 UNEMPL_{it} + \beta_3 (GROWTH_{it} \cdot UNEMPL_{it}) + \beta_4 ICT_{it} + \beta_5 HCAP_{it} + \beta_6 FIN_{it} + \beta_7 FDI_{it} + \beta_8 INFR_{it} + \beta_9 OPEN_{it} + \epsilon_{it} \quad (3)$$

Econometric model 3 captures the fact that one of the determinants of income inequality is the interaction between economic growth and unemployment (GROWTH_{it}. UNEMPL_{it}), in line with Ayala et al’s (2001) reasoning that the poor are the most affected by unemployment. Table 9 presents the panel data results, as interpreted in econometric Model 3.

	Fixed effects	Random effects	Pooled OLS
GROWTH	-0.0802**	-0.0973***	-0.0881*
UNEMPL	0.0030	-0.0033	-0.2574
GROWTH.UNEMPL	0.0023*	0.0021*	0.0238*

ICT	0.0373**	0.0449***	0.0220
HCAP	-0.0815	-0.1169	-0.0490
FIN	0.0181*	0.0195**	0.0425**
FDI	0.0113	0.0141**	0.0503***
INFR	0.0299*	0.0247	0.0140
OPEN	-0.0734**	-0.1092***	-0.3223***
Number of countries	14	14	14
Number of observations	196	196	196
Adjusted R-squared	0.9423	0.6548	0.6605
F-statistic	145.73	75.12	53.15
Prob (F-statistic)	0.00	0.00	0.00
***, ** and * denote 1%, 5% and 10% levels of significance, respectively.			
Source: Author's compilation from E-Views			

The fixed effects, random effects and pooled OLS noted that economic growth had a significant negative effect on income inequality (reduced income inequality), a finding which resonates with the wealth hypothesis which says that a small economic growth increase has got a multiplier effect on the GDP per capita, labour income and general wealth levels of people in the economy thereby contributing to income inequality reduction (Rubin & Segal, 2015). Following Ayala et al (2001)'s argument that unemployment exacerbates income inequality because it is the poor who are out of work, the fixed effects show that unemployment had a non-significant positive effect on income inequality. However, the results from the random effects and pooled OLS which shows an insignificant negative impact of unemployment on income inequality is a stark contradiction to theory and empirical research work that exists.

Across the three econometric estimation methods used (fixed effects, random effects, pooled OLS), the interaction between economic growth and unemployment had a significant positive influence on income inequality means that if economic growth does not result in unemployment reduction, there is no way income inequality gap might be narrowed. The finding quite well resonates with Ayala et al. (2001) that it is the poor people who suffer most from the brunt of unemployment because in most cases they did not acquire quality education and are not well skilled because of their economic backgrounds.

Fixed and random effects show a significant positive relationship running from ICT towards income inequality whilst ICT had a non-significant positive influence on income inequality under the pooled OLS approach. The results resonate with Richmond and Triplett (2017) whose study argued that ICT improvements may exacerbate income equality because of the differences it creates in the access and skills possessed by the people. Human capital development was however found to have had an insignificant deleterious effect on income inequality, in line with Becker & Chiswick (1966) argument that an increase in human capital development enhances people's skills and their chances of not only securing jobs but of getting better salaries at a workplace.

Across all the three methods, financial development was found to have had a significant positive impact on income inequality, results which concur with Dhrifi (2013) perspective that financial development pushes up the income inequality gap as the rich becomes more richer because of their ability to access credit for their income generating projects as they can easily provide collateral security required. According to the fixed effects, FDI had a non-significant positive effect on income inequality whilst random effects and pooled OLS had a significant positive influence on income inequality, both set of findings which are in line with Jaumotte et al's

(2013) view that foreign investors increases wage differentials and consequently income inequalities in the host countries.

A significant positive impact of infrastructural development on income inequality was observed under the fixed effects yet random effects and pooled effects show a non-significant positive relationship running from infrastructural development towards income inequality. Both sets of findings confirm Tsaurai & Nyoka (2019)'s views that infrastructural development may increase income inequality because resources that could have been used to boost the labour income of the citizens through small loans provision would have to be diverted towards long term infrastructural projects. Lastly, trade openness had a significant negative effect on income inequality, a finding which is in line with Balassa (1978)'s perspective on the relationship between openness of the economy to international players, economic growth and job creation.

$$INEQ_{it} = \beta_0 + \beta_1 INEQLAG_{it} + \beta_2 GROWTH_{it} + \beta_3 UNEMPL_{it} + \beta_4 (GROWTH_{it} \cdot UNEMPL_{it}) + \beta_5 ICT_{it} + \beta_6 HCAP_{it} + \beta_7 FIN_{it} + \beta_8 FDI_{it} + \beta_9 INFR_{it} + \beta_{10} OPEN_{it} + \varepsilon_{it} \quad (4)$$

	Co-efficient	Standard Error	t-Statistic
INEQLAG	0.3138***	0.0323	9.7188
GROWTH	-0.1095***	0.0392	-2.7936
UNEMPL	-0.2984*	0.1573	-1.8963
GROWTH.UNEMPL	-0.0292	0.0178	1.6410
ICT	0.0115	0.0174	0.6632
HCAP	-0.0125	0.1111	0.1121
FIN	0.0205	0.0138	1.4875
FDI	0.0370***	0.0104	3.5613
INFR	0.0151	0.0220	0.6857
OPEN	-0.22408**	0.0214	-10.4475
Adjusted R-squared	0.7740		
J-statistic	185.00		
Prob (J-statistic)	0.00		
***, ** and * denote 1%, 5% and 10% levels of significance, respectively.			
Source: Author's compilation from E-Views			

According to the dynamic GMM approach (Arellano & Bond, 1991), the lag of income inequality had a significant positive influence on income inequality, in support of Azher (1995) view that poverty leads to more poverty, unemployment produces more unemployment and the existence of income inequality gap is more likely to widen the income inequality between the rich and the poor people.

Economic growth had a significant negative effect on income inequality under the dynamic GMM, in line with Rubin & Segal (2015)'s view that the growth of the economy reduces income inequality especially if it leads to unemployment reduction. Unemployment was found to have had a significant negative effect on income inequality (reduced income inequality), a finding which contradicts the available literature supported by Ayala et al. (2001). The interaction between economic growth and unemployment had a non-significant deleterious effect on income inequality.

Under the dynamic GMM, ICT had a non-significant positive impact on income inequality in agreement with Richmond and Triplett (2017) view earlier on elucidated. The same approach noted that human capital development had a non-significant negative influence on income inequality, in line with Johansen (2014) view that human capital development enhances the

productivity of employees and their labour income hence reducing the income inequality gap. In support of Dhrifi (2013), the dynamic GMM observed that financial development had an insignificant positive influence on income inequality.

The dynamic GMM approach also produced results which shows that FDI had a significant positive influence on income inequality, in support Jaumotte et al. (2013)'s argument that foreign investors increase wage differentials and consequently income inequalities in the host countries especially if they decide to repatriate profits back to the home country and not venture more on projects that benefits the local people. A non-significant positive relationship running from infrastructural development towards income inequality was observed under the dynamic GMM, a finding that generally agrees with Tsauroi & Nyoka (2019)'s perspectives. In support of Balassa (1978), the dynamic GMM method observed that trade openness had a significant negative influence on income inequality.

CONCLUSION

The paper's main objective was to explore the determinants of income inequality in transitional economies using panel data analysis (fixed effects, random effects, pooled OLS, dynamic GMM) with data ranging from 2003 to 2016. The study observed that human capital development is not a significant determinant of income inequality under all the econometric estimation methods used. The dynamic GMM noted that the lag of income inequality had a significant positive impact on income inequality. All the econometric estimation methods produced results which show that economic growth had a significant deleterious effect on income inequality, in line with most theoretical predictions. Transitional economies are therefore urged to implement economic growth spurring policies to reduce income inequality. On the other hand, the dynamic GMM method shows that unemployment reduced income inequality, a finding which contradicts theory.

Fixed effects, random effects and pooled OLS approaches noted that the interaction between economic growth and unemployment had a significant positive effect on unemployment, a finding which shows that if economic growth does not enhance employment, income inequality grows. Transitional economies are therefore urged to development and implement concurrent economic growth and employment enhancement policies to reduce income inequality. Other variables which were found to have a significant positive impact on income inequality include ICT (fixed effects, random effects), financial development (fixed effects, random effects, pooled OLS), FDI (random effects, pooled OLS, dynamic OLS), infrastructural development (fixed effects) and trade openness (fixed effects, random effects, pooled OLS, dynamic GMM).

REFERENCES

- Afandi, A., Rantung, V.P., & Marashdeh, H. (2017). Determinants of income inequality. *Economic Journal of Emerging Markets*, 9(2), 159-171.
- Akin-Olagunju, O.A., & Omonona, B.T. (2013). Determinants of income inequality among rural households of Ibadan, Oyo State, Nigeria. *Nigerian Journal of Rural Sociology*, 13(3), 27-37.
- Allison, C., Fleisje, E., Glevey, W., & Johannes, W.L. (2014). *Trends and key drivers of income inequality*. Working Paper, Marshal Society, Cambridge.
- Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2), 277-297.
- Ayala, L. Carbonell, J.R., & Martinez, R. (2001). The impact of unemployment on inequality and poverty in OECD countries. *Economics of Transition*, 9(2), 417-447.

- Aye, G.C., & Edoja, P.E. (2017). Effect of economic growth on CO2 emission in developing countries: Evidence from a dynamic panel threshold model. *Cogent Economics and Finance*, 5(1), 1-22.
- Azher, B.A. (1995). Rural savings: Their magnitude, determinants, and mobilization. *Pakistan Development Review*, 34(4), 779-786.
- Bahmani-Oskooee, M., Hegerty, S.W., & Wilmeth, H. (2008). Short run and long run determinants of income inequality: Evidence from 16 countries. *Journal of Post Keynesian Economics*, 30(3), 463-484.
- Balassa, B. (1978). Exports and economic growth: further evidence. *Journal of Development Economics*, 5(2), 181-189.
- Becker, G.S., & Chiswick, B.R. (1966). Education and the distribution of earnings. *American Economic Review*, 56(1/2), 358-369.
- Boakye-Gyasi, K., & Li, Y. (2015). The impact of Chinese FDI on employment generation in the building and construction sector of Ghana. *Eurasian Journal of Social Sciences*, 3(2), 1-15.
- Bratoeva-Manoleva, S. (2017). *Macroeconomic Determinants of Income Inequality in Bulgaria (No. bep-2017-07)*. St Kliment Ohridski University of Sofia, Faculty of Economics and Business Administration/Center for Economic Theories and Policies.
- Canavire-Bacarreza, G., & Rios-Avila, F. (2015). On the determinants of changes in wage inequality in Bolivia. Working Paper Number, 835.
- Carmen, R.C., Mercedes, A.R., & Blanca, M.C. (2018). Determinants of income inequality reduction in the Latin American countries. *CEPAL Review*, 126, 79-98.
- Castello-Climent, A., & Domenech, R. (2014). *Human capital and income inequality: Some facts and some puzzles*. BBVA, Madrid Research Working Papers Number, 12/28.
- Crespo, N., Simoes, N., & Diogo, A.P. (2012). Determinant factors of income inequality: Evidence from a Portuguese region. *Economics Bulletin*, 32(3), 2056-2064.
- Dhrifi, A. (2013). Financial development and the growth-inequality-poverty triangle: A comparative study between developed and developing countries. *International Journal of Economics, Finance and Management*, 2(7), 472-481.
- Epo, B.N., & Baye, F.M. (2013). Determinants of inequality in Cameroon: A regression-based decomposition analysis. *Botswana Journal of Economics*, 11(15), 2-20.
- Estache, A., & Fay, M. (1995). *Regional growth in Argentina and Brazil: Determinants and policy options*. Washington DC: The World Bank, Mimeo, 1995.
- Fambon, S. (2017). The determinants of inequality and income gap between urban and rural areas in Cameroon: Evidence from the ECAM3 household survey. *Advances in Economics and Business*, 5(7), 394-410.
- Furceri, D., & Ostry, J.D. (2019). Robust determinants of income inequality. *Oxford Review of Economic Policy*, 35(3), 490-517.
- Ganaie, A.A., Ahmad, S. & Kamaiah, B. (2018). Macro-determinants of income inequality: An empirical analysis in case of India. *Economics Bulletin*, 38(1), 309-325.
- Im, K.S., Pesaran, M.H., & Shin, Y. (2003). Testing unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), 53-74.
- International Monetary Fund. (2015). *World Economic Outlook: Adjusting to Lower Commodity Prices*. Washington (October). Retrieved from <https://www.imf.org/en/Publications/WEO/Issues/2016/12/31/World-Economic-Outlook-October-2015-Adjusting-to-Lower-Commodity-Prices-43229>.
- Jacoby, H. (2000). Access to rural markets and the benefits of rural roads. *Economic Journal*, 110(465), 713-737.
- Jaumotte, F., Lall, S., & Papageorgiou, C. (2013). Rising income inequality: Technology or trade and financial globalization?. *IMF Economic Review*, 61(2), 271-309.
- Johansen, A.L. (2014). *The effect of human capital on income inequality: An econometric analysis*. Unpublished Master's Thesis- Department of Applied Economics, Copenhagen Business School.
- Kao, C. (1999). Spurious regression and residual-based tests for co-integration in panel data. *Journal of Econometrics*, 90, 247-259.
- Kaplan, S., & Rauh, J. (2010). Wall street and Main street: What contributes to the rise in the highest incomes?. *Revised Financial Studies*, 23, 1004-1050.
- Levin, A., Lin, C.F., & Chu, C.S.J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, 108(1), 1-24.
- Malerba, G. & Spreafico, M. (2014). Structural determinants of income inequality in the European Union: Evidence from a panel analysis. *Rivista Internazionale di Scienze Sociali*. 122(1), 37-83.
- Marsh, R.M. (2015). Determinants of income inequality in the early twenty first century: A cross national study. *Comparative Sociology*, 14(2), 219-251.

- Meena, M.S., Singh, K.M., Singh, R.K., Kumar, A., Kumar, A., & Chahal, V. (2017). Inequality and determinants of income among rural households in tribal dominated areas of Jharkhand. *Indian Journal of Agricultural Sciences*, 87(1), 92-96.
- Mengesha, G. (2019). Determinant of income inequality in Ethiopia: Regression based inequality decomposition. *European Business and Management*, 5(3), 42-50.
- Ming-Hsuan, L. (2016). Energy resources and income inequality: Determinants of income inequality in provincial China. *China: An International Journal*, 14(3), 167-189.
- Munir, K., & Sultan, M. (2017). Macroeconomic determinants of income inequality in India and Pakistan. *Theoretical and Applied Economics*, 24(4), 109-120.
- Naschold, F. (2009). Microeconomic determinants of income inequality in rural Pakistan. *The Journal of Development Studies*, 45(5), 746-768.
- Naseer, S., & Ahmed, A.M. (2016). *Determinants of income inequality among the earners in Pakistan*. National University of Sciences and Technology (NUST), School of Social Sciences and Humanities Working Paper Series Number 06-2016.
- Nebebe, A.F., & Rao, C.H.A. (2016). Determinants of income inequality in urban Ethiopia: A study of South Wollo administrative zone, Amhara national regional state. *International Journal of Applied Research*, 2(1), 550-563.
- Nor, N.H.H.M., Ripain, N., & Ahmad, N.W. (2015). Financial development and FDI-Growth nexus: Panel Analysis. *Proceeding of the 2nd International Conference on Management and Muamalah*, 435-446.
- Odhiambo, N.M. (2009). Finance-growth-poverty nexus in South Africa: A dynamic causality linkage. *Journal of Socio-Economics*, 38(2), 320-325.
- Paweenawat, S.W., & McNown, R. (2014). The determinants of income inequality in Thailand: A synthetic cohort analysis. *Journal of Asian Economics*, 31, 10-21.
- Richmond, K., & Triplett, R. (2017). ICT and income inequality: A cross-national perspective. *International Journal of Applied Economics*, 32(2), 1-20.
- Roine, J., Vlachos, J., & Waldenstrom, D. (2009). The long run determinants of inequality: What can we learn from top income data?. *Journal of Public Economics*, 93(7-8), 974-988.
- Rubin, A. & Segal, D. (2015). The effects of economic growth on income inequality in the US. *Journal of Macroeconomics*, 45, 258-273.
- Stead, R., & Wisniewsk M. (1996). *Foundation quantitative methods for business*. Prentice Hall. England.
- Stjepanovic, S. (2018). Income distribution determinants and inequality in Croatia. *34th International Scientific Conference on Economic and Social Development-XVIII International Social Congress*, Moscow, 18-19 October.
- Stiglitz, J.E. (1993). The role of the state in financial markets. *The World Bank Economic Review*, 7(suppl_1), 19-52.
- Su, B., & Heshmati, A. (2013). Analysis of the determinants of income and income gap between urban and rural China. *China Economic Policy Review*, 2(1), 1-29.
- Tridico, P. (2018). The determinants of income inequality in OECD countries. *Cambridge Journal of Economics*, 42(4), 1009-1042.
- Tsaurai, K., & Nyoka, C. (2019). Financial development-income inequality nexus in South Eastern European countries: Does the relationship vary with the level of inflation? *International Journal of Services, Economics and Management*, 10(2), 110-125.
- World Bank (2001). *World Development Report 2000*. Oxford University Press, New York, NY.