ECONOMIC FREEDOM AND INCOME INEQUALITY: EVIDENCE FROM A PANEL OF GLOBAL ECONOMIES-A LINEAR AND A NON-LINEAR LONG-RUN ANALYSIS

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Acknowledgements: The authors need to express their profound gratitude to two referees of this journal as well as the Editor for providing substantial significant comments and suggestions that enhanced the merit of this work. Needless to say, the usual disclaimer applies.

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This study employs panel data from 138 countries (with unbalanced time frameworks), to investigate the relationship between economic freedom and income inequality. Both linear and non-linear cointegration methodologies are used to identify a long-run equilibrium relationship between i) the overall economic freedom of the world index and income inequality, and ii) the major areas of the index and income inequality. The linear long-run parameter estimates document that the association turns out to be negative, while the non-linear long-run parameter estimates illustrate that above a threshold point the association between economic freedom and income inequality is negative, while below this threshold point the association turns out to be positive. The empirical findings survive a number of robustness tests, such as alternative measures of income inequality.

JEL Codes: O15, O43

Keywords: economic freedom, income inequality, linear and non-linear cointegration,

138 countries

1 INTRODUCTION

Economic freedom is a multifaceted concept which can have differing relations with income inequality at different stages of economic freedom. A number of studies have investigated cross country differences in economic freedom, finding that it impacts economic factors, such as income inequality, economic growth, democracy, and human development. These studies document that is more prevalent for economic freedom to be substantially associated with ‘good’ outcomes, such as faster growth, better living standards, and more happiness, while evidence of an association of economic freedom with ‘bad’ outcomes, such as increased income inequality is not uncommon. A number of recent and significant survey papers provide detailed evidence about the voluminous works on the impact of economic freedom

on the abovementioned economic variables (Gwartney et al., 2004; Doucouliagos, 2005; De Haan et al., 2006; Gwartney and Lawson, 2008; Rode and Coll, 2012; Hall and Lawson, 2014; Hall et al, 2016; among others).

However, explicit studies undertaken on the role of economic freedom in income inequality are sparse. Grubel (1998) showed that increased economic freedom did not adversely affect income levels, income growth, unemployment rates, and human development. Employing a panel of 39 countries and the EFW index, he argued that higher levels of economic freedom increased income equality by extending income earning prospects. His study also documented that a trade-off between economic freedom and income equality was detected, with the rate of trade-off increasing at higher levels of economic freedom. Scully (2002) examined the role of economic freedom in economic growth and income inequality. By making use of a number of methodological approaches, he concluded that economic freedom led to higher equality, while there was a marginal trade-off between growth and income inequality. In an investigation of economic freedom and income inequality across US states, Ashby and Sobel (2008) found that increases in economic freedom corresponded with higher levels of income and income growth, and lower inequality. Apergis et al. (2013) also examined the relationship between income inequality and economic freedom across the US State. Their findings highlighted the presence of bi-directional causality between economic freedom and income inequality in both the short- and the long-run. By contrast, Murphy (2015) with an international panel of countries documented that there was a negative impact on economic freedom coming from income inequality, while inequality led to higher sizes of government and reduced effects on the rule of law; minimal effects also were supported on the soundness of money and freedom to trade, with ambiguous effects on regulation activities. While these studies have made use of a linear framework to disentangle the relationship between economic freedom and income inequality, two studies by Carter (2006) and Bennett and Vedder (2013) made use of a non-linear framework to examine the relationship between economic freedom and income inequality. Carter (2006) found evidence of the presence of a U-shaped curve between the two variables across an international country set, while Bennett and Vedder (2013) documented the inflection points at which additional increases to economic freedom across the US States resulted in lower income inequality.

This paper comes to add to the relevant literature of the impact of economic freedom on income inequality by accounting for non-linear effects as well as by explicitly considering

the role of the major areas of the economic freedom metric. The contribution of this paper to the literature is: It employs both linear and non-linear panel (Panel Smooth Transition Regression - PSTR) cointegration methods. The non-linear estimations can provide further insight where the relationship between economic freedom and income inequality changes over different stages of economic freedom. We make use of the PSTR method of Gonzalez et al. (2005) to explore potential threshold effects in the relationship between income inequality and economic freedom. The PSTR takes into account heterogeneity by allowing regression coefficients to vary as a function of an exogenous variable and fluctuate between regimes. As the transition variable is individual-specific and time-varying, the regression coefficients for each of the individuals in the panel are changing over time. Additionally, this approach permits smooth changes in country-specific associations, depending on a threshold. In terms of the non-linear approach paper by Carter (2006), our study makes use of a wider country sample, while it explicitly considers how explicit sub-categories of the economic freedom index affect the course of income inequality.

It also employs the Economic Freedom of the World index (EFW) (Version 2011), recommended by Gwartney et al. (2006) to measure economic freedom, as well as the Gini coefficient to measure income inequality. Moreover, certain areas of the EFW index could lead to growth and reduce inequality more than other areas. The previous studies in the literature only investigate the effects of different areas of the EFW on economic growth. In this case, our work additionally investigates the influence of these different areas, namely, the size of government, legal system and security of property rights, sound money, freedom to trade internationally, and regulation, on income inequality.

To foreshadow the empirical findings, the results highlight the negative association between income inequality and all five disaggregated components of the freedom index. They clearly support that the highest impact on income inequality comes from the regulation part, while the findings with respect to the legal system and property rights also provide strong evidence on the impact of these two components on income inequality. In other words, increasing the regulatory supervision over the economy leads to lower income inequality, given that such regulatory activities are in relevance to labour market regulations, banking regulations, legal activity and government activity regulations.

The paper is structured as follows. Section 2 discusses the data, while Section 3 presents the empirical results for the linear model, as well as robustness tests across the major

areas of the EFW and across regions. Section 4 presents the non-linear results and, finally, Section 5 concludes.

2 DATA

Annual observations for an unbalanced panel of 138 countries are obtained. The list of countries is provided in the Appendix along with their time span of data availability. Inequality data on the Gini coefficient come from the Standardized World Income Inequality Database (SWIID) produced by Solt (2013). The dependent variable is the Gini coefficient (GINI), a proxy for inequality. The Gini Coefficient can vary with ranges from 0 (perfect income equality) to 1 (perfect income inequality). Gini coefficient data are based on both gross (GGINI) and net income (NGINI). The primary independent variable of interest is the Economic Freedom of the World (EFW) index provided by the Fraser Institute, compiled by Gwartney et al. (2006). The EFW measures the degree of economic freedom in five main areas: [1] Size of Government; [2] Legal System and Security of Property Rights; [3] Sound Money; [4] Freedom to Trade Internationally; [5] Regulation of business, credit and labour. Each component is measured from 0 (i.e., no economic freedom) to 10 (i.e., full economic freedom)[1]. We examine the effects not only of the overall index, but also of all five major areas of the index which are important for creating greater equality in income. These areas include: the size of government (GOVSIZE), legal system and security of property rights (PROP), sound money (MONEY), freedom to trade internationally (TRADE), and regulation (REG). Other control variables used are based upon the previous literature. In particular, we include per capita income (CAPINC) to capture the level of development of a country, the unemployment rate (UN), the college attainment rates (COL) to measure literacy, the share of the labour force in the manufacturing sector (LABMFG); the dependency ratio (DEP); the share of women in the labour force (WOMEN), and population density (POPDEN). These data series are from the World Bank database. Table 1 reports descriptive statistics for all of the variables used in this study for the entire sample along with data sources.

[Insert Table 1 about here]

1 The index is calculated using arithmetic averages (see Gwartney et al. 2012 for greater details).

3 EMPIRICAL RESULTS

3.1 Baseline Panel Cointegration Tests

After confirming that the respective variables are integrated of order one (the unit root test results are available upon request), the analysis implements Pedroni's (1999) heterogeneous panel cointegration tests to determine whether a long-run equilibrium relationship is present. The baseline results are based on the net income version of the Gini coefficient with the modelling approach yielding:

$$GINI_{it} = \alpha_i + \delta_i t + \beta_{1i} EFW_{it} + \beta_{2i} CAPINC_{it} + \beta_{3i} UN_{it} + \beta_{4i} COL_{it} + \beta_{5i} LABMFG_{it} + \beta_{6i} DEP_{it} + \beta_{7i} WOMEN_{it} + \beta_{8i} POPDEN_{it} + \varepsilon_{it} \quad (1)$$

where studies i = 1,...,N for each country in the panel and t = 1,...,T refers to the time period. The parameters α_i and δ_i allow for the possibility of country-specific fixed effects and deterministic trends, respectively. Following Pedroni (1999), both within and between dimension approaches to panel cointegration tests are performed. The results are reported in Panel A of Table 2 and they reject the null hypothesis of no cointegration at the 1% significance level.

[Insert Table 2 about here]

3.2 Long-Run Baseline Panel Parameter Estimates

With the presence of cointegration, we employ fully modified OLS (FMOLS) approaches to arrive at the long-run parameter estimates. Panel B of Table 2 reports the long-run estimates of Equation (1). The Economic Freedom Index yields a statistically significant negative impact on income inequality with the net income Gini index. Increases in economic freedom by a single point have a net income Gini measure 0.046 lower than a country with the same initial level of economic freedom, all else equal. Moreover, both per capita income and the unemployment rate render a statistically significant positive effect on income inequality, while the college attainment rate renders a statistically significant negative effect on it. The findings are consistent with certain previous studies in the relevant literature (Scully, 2002; Ashby and Sobel, 2008; Clark and Lawson, 2008), but opposite to those provide by Bergh and Nilsson (2010) and Sturm and De Haan (2015). They suggest that increases in economic

freedom over the time span under study are associated with lower income inequality and are close to those provided by Sturm and De Haan (2015), though they made use of a different country sample as well as different control variables. Our findings lie within the range of estimates other studies generated, i.e. the distribution of the economic freedom estimates ranges from -0.030 to 0.471, depending on the methodological approach followed, as well as on the country sample.

The positive estimates associated with per capita income illustrate that per capita income contributes to higher income inequality, implying a trade-off between higher per capita income and greater income equality. A positive relationship between income and inequality is supported in the studies by Forbes (2000) and Voitchovsky (2005), while Deininger and Squire (1996) do not record a strong relationship between these two variables. The results also indicate a negative coefficient on college attainment, implying that a better educated population leads to lower income inequality. The findings also illustrate a positive association between income inequality and unemployment. Finally, in terms of the remaining control variables, the findings illustrate that there exists a negative association between income inequality and the share of labour force in manufacturing, the dependency ratio and the share of women in the labour force, while there is a positive relationship between income inequality and the density ratio.

3.3 Robustness Tests: The Gross Income Version of the Gini Coefficient

This part of the analysis makes use of gross income Gini coefficients, as we are interested in the income inequality resulting from market processes. The new results are reported in Table 3 and they signify the similarities to those reported in Table 2. The variables included in the long-run vector retain not only their expected theoretical signs, but also their statistical significance. However, they turned out to be lower. In particular, the new estimates illustrate that a country which increases economic freedom by a single point has a gross income Gini measure 0.039 lower than a country with the same initial level of economic freedom, all else equal.

[Insert Table 3 about here]

Moreover, Sturm and De Haan (2015) argue that employing the aggregate EFW index leads to biased estimates as the aggregate index includes income redistribution via the government

sector, where redistribution is measured by the share of transfers and subsidies to GDP. A substantial part of transfers and subsidies is not aimed at redistribution. Thus, this part of the analysis makes use of a new EFW index (NEFW) which has been constructed from the original data and which decreases the contribution of the size of government component by ignoring the transfers and subsidies items. We measure the Gini coefficient through its gross income variant. The new results are reported in Table 4.

As we can clearly see, they depict a similar picture as before. The impact of economic freedom on income inequality is still negative and statistically significant, albeit its quantitative impact has been reduced. In particular, a country which increases economic freedom by a single point has a net income gross Gini measure 0.028 lower than a country with the same initial level of economic freedom, all else equal.

[Insert Table 4 about here]

3.4 Robustness Tests: A Disaggregated Approach-The Areas of the EFW Index

While Tables 2 and 3 present the long-run parameter estimates for the overall index, this part of the analysis follows Bergh and Nilsson (2010) and presents the long-run parameter estimates across all five major areas of the EFW index, i.e. size of government, legal system and property rights, sound money, freedom to trade internationally, and regulation. The results are reported in Table 5.

Panel A documents the presence of cointegration between income inequality (with the Gini coefficient being measured through its net version) and each component of the EFW index, while Panel B reports the long-run estimates. The new findings highlight the negative association between income inequality and all five major areas of the EFW index, while the remaining control variables coefficients retain their expected sign. We can clearly support that the highest (negative) impact on income inequality comes from the regulation part. The results with respect to the legal system and property rights receive statistical support by Bennett (2014) who also derived the importance of the regulatory component for income inequality.

The empirical findings imply that increasing (quantitatively and/or qualitatively) the regulatory supervision over the economy leads to lower income inequality, i.e. tighter

supervision decreases income inequality. The results point out to the need for more and better supervision over a number of regulatory dimensions, such as labour market regulations, banking regulations, legal activity and government activity regulations. Finally, all five estimated equations satisfy a number of diagnostic criteria (i.e., residual correlation and modelling specification), rendering higher validity to our estimates.

[Insert Table 5 about here]

3.5 Robustness Tests: An Alternative Definition of Inequality

Bennett (2014) argues that the investigation of the economic freedom and income inequality nexus is highly sensitive to the choice of inequality measure. This part of the robust empirical analysis makes use of an alternative definition of income inequality, such as the Theil index (THEIL). A Theil index of 0 indicates perfect equality. Data on the Theil index are obtained from the United Nations Industrial Development Organization (UNIDO) Industrial Statistics. Table 5 reports the new cointegration results along with the corresponding estimations. The results in Panel A validate the presence of cointegration, while those presented in Panel B indicate that, once again, economic freedom exerts a statistically significant negative effect on income inequality. These findings indicate that a country which increased economic freedom by a single point has a net income Theil measure 0.040 lower than a country with the same initial level of economic freedom, all else equal.

[Insert Table 6 about here]

4 A NON-LINEAR APPROACH

There is a particular strand in the literature that supports the argument that changes in the background of an economic freedom index take time to find their way to change the course of income inequality (Carter, 2006; Bennett and Vedder, 2013). According to this literature, the employment of a linear methodological framework is not able to capture the exact form of the relationship under scrutiny. Kuznets (1955) hypothesized that as economic growth occurs, income inequality may initially increase with structural change, and then decrease in the long run, beyond a certain point. This proposition known as the inverted-U hypothesis has relevance for the relationship between economic freedom and income inequality. At the early

stages of economic freedom, income inequality can increase due to market allocation benefiting high income groups, however, in later stages, as income rises and the standard of living overall improves, income inequality can fall. Additionally, the economies included in our sample are at different stages of development, while they run different economic institutions and policies and, therefore, experience income inequality patterns. Within this framework, it is expected that initially the benefits coming from the growth process are reaped off by the upper part of the income inequality, while beyond a threshold growth point these benefits can reach the lower part of the same distribution (Bennett and Vedder, 2013). Hopkins and Blythe (2012) find evidence in favour of a non-linear effect of regulatory freedom on inequality.

Following the above discussion posed by the relevant references, this part of the study makes use of the Panel Smooth Transition Regression (PSTR) model, proposed by Gonzàlez et al. (2005) and Fok et al. (2005). This approach authorizes a smooth transition, for a weak number of thresholds. It presents two main advantages: first, a PSTR specification allows the income inequality-economic freedom coefficient to vary not only across countries, but also over time. Second, this approach allows for a smooth change in country-specific correlation, depending upon the threshold variables.

Table 7 presents the empirical findings of income inequality-economic freedom relationship, with the Gini coefficient being measured by its net income variant. As PSTR starts with defining the degree of non-linearity and the number of thresholds (no remaining heterogeneity), the preliminary findings guide us to select the number of transition functions. In our case the residual sum of squares and the criteria of information lead us to choose one threshold level and one transition function. The economic freedom threshold with respect to the aggregate index appears at 5.428. The EFW effect below this level is positive and statistically significant, while above this level it turns out to be negative and statistically significant. Under the regime of strong increases in economic freedom (>5.428), other things being equal, an increase of one unit in economic freedom reduces income inequality by 0.029, whereas in the other regime (<5.428) the effect of the index turns out to be positive and statistically significant, 0.035. The empirical findings indicate that in countries with an economic freedom index below this threshold level, higher inequality is the norm (provided that economic freedom is on the rise), whereas in countries with an economic freedom index above this threshold level, reductions in income inequality are recorded for additional degrees

in economic freedom. Finally, the statistical significance of the LMF statistic leads to the rejection of the linear 'income inequality–economic freedom' relationship.

Similar results are obtained in terms of the major areas of the EFW index, with the stronger results coming from the regulation component. In particular, with respect to the size of the government, legal system and property rights, sound money, the freedom to trade internationally, and regulation, the thresholds appear at 5.236, 4.435, 3.873, 4.908 and 5.819, respectively. The corresponding effects below these levels are positive and statistically significant, while above them they turn to be negative and statistically significant. Across both regimes (i.e., below and above the threshold), the strongest effect appears in relevance to regulation, indicating that regulatory actions should be stricter for high levels of income inequalities.

[Insert Table 7 about here]

5 CONCLUSIONS

This study employed both a linear and a non-linear panel cointegration modelling approach to identify the long-run equilibrium relationship between economic freedom and income inequality for an expanded worldwide country sample (i.e., 138 countries) as well as both the aggregate and the major areas of an economic freedom index. The linear long-run parameter estimates documented that the association under study was negative, while the non-linear long-run parameter estimates illustrated that above a threshold point the association between economic freedom and income inequality retained its negative sign, while below this threshold point the association turned out to be positive. It is worth pointing out here, that our results receive empirical support from those reported by Bennett and Vedder (2013) in the case of the U.S., but are different from those provided by Carter (2006). The presence of homogeneity in the results could probably explain the differentiation of the findings due to the absence of variation across countries in macrolevel economic institutions as Bennett and Vedder (2013) recommend and which could be explored in future research venues. The findings remained robust to the disaggregated areas of the economic freedom index.

Despite the quantity of the empirical findings obtained, it is still not easy to provide rational policy implications. Higher economic freedom seems to recommend lower government sizes, but this could also imply lower government expenses, such as transfer

programmes by the government to support social benefits, eventually leading to higher taxes, which seems to be contradictory to lower governmental sizes. However, further research is needed to reach solid conclusions in relevance to the above arguments.

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TABLE 1

DESCRIPTIVE STATISTICS

Variables	Mean	SD	Min	Max	Data sources
NGINI	37.2	9.2	21.1	62.4	SWIID
GGINI	49.6	9.6	26.9	81.5	SWIID
EFW	4.9	2.1	2.3	6.9	FreetheWorld
GOVSIZE	4.4	1.8	1.6	9.2	FreetheWorld
PROP	5.9	2.1	1.2	9.9	FreetheWorld
MONEY	6.9	2.0	0.1	9.8	FreetheWorld
TRADE	6.1	1.4	1.3	9.8	FreetheWorld
REG	5.8	1.4	2.6	8.9	FreetheWorld
CAPINC	7.8	1.5	4.2	10.6	World Bank
UN	8.9	5.1	0.6	38.8	World Bank
COL	5.0	5.3	0.1	32.5	World Bank
LABMFG	23.4	7.8	2.1	39.5	World Bank
DEP	0.6	0.2	0.3	1.3	World Bank
WOMEN	28.7	3.6	15.6	53.5	World Bank
POPDEN	53.5	18.5	4.2	97.6	World Bank
Theil	22.4	8.3	13.4	57.2	UNIDO
NEFW	4.6	3.8	1.9	6.7	Own calculations

Notes: The inequality coefficients have been multiplied by 100.

TABLE 2

BASELINE PANEL COINTEGRATION TESTS AND FMOLS ESTIMATES (THE GINI COEFFICIENT IS BASED NET INCOME)

Panel A: Panel cointegration tests

Panel Test Statistics:	**Group Mean Panel Test Statistics**:
Panel v-statistic 46.58931*	Group ρ-statistic -45.83295*
Panel ρ-statistic -44.36592*	Group PP-statistic -44.94398*
Panel PP-statistic -43.60957*	Group ADF-statistic -9.26409*
Panel ADF-statistic -9.31286*	

Notes: Both the panel and group mean panel tests are distributed asymptotically as standard normal. Of the seven tests, the panel v-statistic is a one-sided test in which large positive values reject the null hypothesis of no cointegration. For the remaining test statistics, large negative values reject the null hypothesis of no cointegration. Statistical significance at the 1% significance level is denoted by "*".

Panel B: FMOLS long-run parameter estimates

NGINI = 1.485 – 0.046 EFW + 0.208 CAPINC + 0.176 UN - 0.138 COL – 0.238 LABMFG

(8.36)* (-10.8)* (8.72)* (7.59)* (-7.61)* (-5.36)*

-0.046 DEP – 0.085 WOMEN + 2.138 POPDEN

(-5.41)* (-4.93)* (5.82)*

Adj. R^2 = 0.62 LM = 1.24 RESET = 1.30

[0.37] [0.32]

Notes: t-statistics and probability values are reported in parentheses and brackets, respectively. LM is the Lagrange multiplier test for serial correlation. RESET is Ramsey's regression equation specification error test. Statistical significance at the 1% level is denoted by "*".

TABLE 3

PANEL COINTEGRATION TESTS AND FMOLS ESTIMATES (THE GINI COEFFICIENT IS BASED ON GROSS INCOME)

Panel A: Panel cointegration tests

Panel Test Statistics:	**Group Mean Panel Test Statistics:**
Panel v-statistic 42.08935*	Group ρ-statistic -40.43629*
Panel ρ-statistic -40.25497*	Group PP-statistic -39.84371*
Panel PP-statistic -40.51894*	Group ADF-statistic -7.42971*
Panel ADF-statistic -7.97093*	

Panel B: FMOLS long-run parameter estimates

NGINI = 1.219 – 0.039 EFW + 0.184 CAPINC + 0.148 UN - 0.117 COL – 0.219 LABMFG

(6.71)* (-7.92)* (6.53)* (7.14)* (-6.49)* (-5.63)*

-0.038 DEP – 0.073 WOMEN + 2.028 POPDEN

(-5.16)* (-4.62)* (5.49)*

Adj. R^2 = 0.56 LM = 1.38 RESET = 1.46

[0.31] [0.25]

Notes: Similar to those in Table 2.

TABLE 4

PANEL COINETGRATION TESTS AND FMOLS ESTIMATES (THE GROSS INCOME GINI INDEX AND THE NEW EFW INDEX)

Panel A: Panel cointegration tests

Panel Test Statistics:	**Group Mean Panel Test Statistics:**
Panel v-statistic 34.23875*	Group ρ-statistic -34.21987*
Panel ρ-statistic -32.75504*	Group PP-statistic -33.40025*
Panel PP-statistic -32.86531*	Group ADF-statistic -6.68914*
Panel ADF-statistic -6.84096*	

Panel B: FMOLS long-run parameter estimates

GGINI = 0.815 – 0.028 EFW + 0.162 CAPINC + 0.152 UN - 0.117 COL – 0.239 LABMFG

(3.28)* (-5.62)* (5.81)* (5.96)* (-5.41)* (-5.28)*

-0.046 DEP – 0.094 WOMEN + 2.128 POPDEN

(-5.39)* (-5.14)* (5.36)*

Adj. R^2 = 0.45 LM = 1.48 RESET = 1.36

[0.27] [0.42]

Notes: Similar to those in Table 2.

TABLE 5

PANEL COINTEGRATION TESTS AND FMOLS ESTIMATES (THE AREAS OF THE EFW INDEX AND A NET INCOME AND A NET INCOME GINI COEFFICIENT)

Panel A:

EFW-GOVSIZE

Panel Test Statistics:	**Group Mean Panel Test Statistics:**
Panel v-statistic 43.87405*	Group ρ-statistic -43.28830*
Panel ρ-statistic -42.32841*	Group PP-statistic -42.15482*
Panel PP-statistic -42.45983*	Group ADF-statistic -8.90834*
Panel ADF-statistic -9.15906*	

EFW-PROP

Panel Test Statistics:	**Group Mean Panel Test Statistics:**
Panel v-statistic 40.45872*	Group ρ-statistic -41.23784*
Panel ρ-statistic -38.47630*	Group PP-statistic -38.90635*
Panel PP-statistic -38.82763*	Group ADF-statistic -7.32761*
Panel ADF-statistic -6.98307*	

EFW-MONEY

Panel Test Statistics:	Group Mean Panel Test Statistics:
Panel v-statistic 37.38964*	Group ρ-statistic -37.99632*
Panel ρ-statistic -35.13286*	Group PP-statistic -35.14985*
Panel PP-statistic -35.32785*	Group ADF-statistic -6.20842*
Panel ADF-statistic -6.09841*	

EFW-REG

Panel Test Statistics:	**Group Mean Panel Test Statistics:**
Panel v-statistic 39.36738*	Group ρ-statistic -38.09634*
Panel ρ-statistic -37.62073*	Group PP-statistic -36.45971*
Panel PP-statistic -37.26582*	Group ADF-statistic -6.27831*
Panel ADF-statistic -6.15833*	

EFW-REG

Panel Test Statistics:	**Group Mean Panel Test Statistics:**
Panel v-statistic 46.43872*	Group ρ-statistic -46.38310*
Panel ρ-statistic -45.60771*	Group PP-statistic -45.83507*
Panel PP-statistic -45.53876*	Group ADF-statistic -9.43924*
Panel ADF-statistic -9.81375*	

Panel B: FMOLS long-run parameter estimates

EFW-GOVSIZE

NGINI = 1.279– 0.041 EFW + 0.176 CAPINC + 0.139 UN + - 0.157 COL – 0.204 LABMFG
(5.36)*(-6.74)* (6.49)* (6.92)* (-6.70)* (-4.95)*
-0.043 DEP – 0.092 WOMEN + 2.159 POPDEN
(-5.25)* (-5.28)* (5.61)*
Adj. R^2 = 0.54 LM = 1.28 RESET = 1.59
[0.35] [0.22]

EFW-PROP

NGINI = 1.018 – 0.035 EFW + 0.184 CAPINC + 0.145 UN - 0.134 COL – 0.196 LABMFG
(3.24)* (-5.96)* (6.18)* (5.71)* (-5.68)* (5.12)*
-0.049 DEP – 0.114 WOMEN + 2.255 POPDEN
(-5.82)* (-4.96)* (5.67)*

Adj. R^2 = 0.47 LM = 1.41 RESET = 1.36

[0.30] [0.25]

EFW-MONEY

NGINI = 0.984 – 0.031 EFW + 0.168 CAPINC + 0.137 UN - 0.126 COL – 0.159 LABMFG

(3.48)* (-5.39)* (5.52)* (5.41)* (-5.40)* (-4.47)*

-0.026 DEP – 0.055 WOMEN + 1.1673 POPDEN

(-4.68)* (-4.29)* (5.02)*

Adj. R^2 = 0.43 LM = 1.46 RESET = 1.51

[0.29] [0.18]

EFW-TRADE

NGINI = 1.118 – 0.038 EFW + 0.177 CAPINC + 0.151 UN - 0.138 COL – 0.236 LABMFG

(3.74)* (-5.82)* (5.80)* (5.63)* (-5.61)* (-5.31)*

-0.045 DEP – 0.099 WOMEN + 2.147 POPDEN

(-5.73)* (-5.18)* (5.92)*

Adj. R**2** = 0.48 LM = 1.32 RESET = 1.44

[0.38] [0.23]

EFW-REG

NGINI = 1.146 – 0.052 EFW + 0.187 CAPINC + 0.156 UN - 0.138 COL – 0.268 LABMFG

(3.96)* (-6.73)* (5.84)* (5.68)* (-5.79)* (-5.75)*

-0.064 DEP – 0.095 WOMEN + 2.436 POPDEN

(-5.71)* (-5.33)* (5.92)*

Adj. R^2 = 0.57 LM = 1.32 RESET = 1.38

[0.40] [0.29]

Notes: Similar to those in Table 2.

TABLE 6

PANEL COINTEGRATION TESTS AND FMOLS ESTIMATES (INCOME INEQUALITY IS MEASURED AS THE THEIL INDEX)

Panel A: Panel cointegration tests

Panel Test Statistics:	**Group Mean Panel Test Statistics:**
Panel v-statistic 41.08452*	Group ρ-statistic -41.54822*
Panel ρ-statistic -38.23874*	Group PP-statistic -39.70842*
Panel PP-statistic -38.61185*	Group ADF-statistic -8.42861*
Panel ADF-statistic -8.16378*	

Panel B: FMOLS long-run parameter estimates

THEIL = 1.006 – 0.040 EFW + 0.188 CAPINC + 0.163 UN - 0.126 COL – 0.214 LABMFG

(4.72)* (-6.14)* (6.37)* (6.29)* (-6.38)* (-5.47)*

-0.041 DEP – 0.083 WOMEN + 2.095 POPDEN

(-5.28)* (-5.39)* (5.65)*

Adj. R^2 = 0.56 LM = 1.39 RESET = 1.44

[0.32] [0.37]

Notes: Similar to those in Table 2.

TABLE 7

NON-LINEAR ESTIMATES (THE GINI COEFFICIENT IS BASED ON NET INCOME)

Aggregate EFW

$$
\text{GGINI}= \begin{cases} 0.029\ EFW^{b} + 0.203\ CAPINC + 0.119\ UN - 0.185\ COL - 0.146\ LABMFG \\ (5.17)^{*} \quad (5.26)^{*} \quad (5.03)^{*} \quad (-4.81)^{*} \quad (-4.55)^{*} \\ -0.038\ DEP - 0.063\ WOMEN + 1.846\ POPDEN \\ (-5.25)^{*} \quad (-5.03)^{*} \quad (5.27)^{*} \\ \\ -0.035\ EFW^{a} + 0.228\ CAPINC + 0.136\ UN - 0.209\ COL - 0.167\ LABMFG \\ (-5.28)^{*} \quad (5.19)^{*} \quad (5.62)^{*} \quad (-5.30)^{*} \quad (-5.18)^{*} \\ -0.055\ DEP - 0.082\ WOMEN + 2.183\ POPDEN \\ (-5.29)^{*} \quad (-5.46)^{*} \quad (5.42)^{*} \end{cases}
$$

$q = 5.428\ LM_F\ [0.00]$

EFW-GOVSIZE

$$
\text{GGINI}= \begin{cases} 0.015\ EFWb + 0.179 CAPINC + 0.107\ UN - 0.182\ COL - 0.157\ LABMFG \\ (4.39)^{*} \quad (5.39)^{*} \quad (4.63)^{*} \quad (-4.81)^{*} \quad (-4.38)^{*} \\ -0.028\ DEP - 0.048\ WOMEN + 1.784\ POPDEN \\ (-4.82)^{*} \quad (-5.16)^{*} \quad (5.36)^{*} \\ \\ -0.029\ EFWa + 0.224\ CAPINC + 0.139\ UN - 0.211\ COL - 0.179\ LABMFG \\ (-5.53)^{*} \quad (5.81)^{*} \quad (5.53)^{*} \quad (-5.84)^{*} \quad (-5.46)^{*} \\ -0.043\ DEP - 0.079\ WOMEN + 1.962\ POPDEN \\ (-5.67)^{*} \quad (-5.66)^{*} \quad (5.61)^{*} \end{cases}
$$

$q = 5.236\ LM_F\ [0.00]$

EFW-PROP

$$
\text{GGINI}= \begin{cases} 0.022\ \text{EFWb} + 0.201\ \text{CAPINC} + 0.125\ \text{UN} - 0.214\ \text{COL} - 0.174\ \text{LABMFG} \\ (4.75)^* \quad (5.38)^* \quad (4.90)^* \quad (-5.06)^* \quad (-5.27)^* \\ -0.038\ \text{DEP} - 0.059\ \text{WOMEN} + 1.892\ \text{POPDEN} \\ (-4.82)^* \quad (-4.80)^* \quad (5.39)^* \\ \\ -0.038\ \text{EFWa} + 0.239\ \text{CAPINC} + 0.163\ \text{UN} - 0.245\ \text{COL} - 0.202\ \text{LABMFG} \\ (-5.28)^* \quad (5.37)^* \quad (5.68)^* \quad (-5.62)^* \quad (-5.39)^* \\ -0.064\ \text{DEP} - 0.075\ \text{WOMEN} + 2.074\ \text{POPDEN} \\ (-5.51)^* \quad (-5.16)^* \quad (5.48)^* \end{cases}
$$

$q = 4.435\ LM_F\ [0.00]$

EFW-MONEY

$$
\text{GGINI} = \begin{cases} 0.014\ \text{EFWb} + 0.153\ \text{CAPINC} + 0.058\ \text{UN} - 0.138\ \text{COL} - 0.137\ \text{LABMFG} \\ (4.38)^* \quad (4.47)^* \quad (4.17)^* \quad (-4.40)^* \quad (-4.29)^* \\ -0.024\ \text{DEP} - 0.041\ \text{WOMEN} + 1.526\ \text{POPDEN} \\ (-4.62)^* \quad (-4.63)^* \quad (4.71)^* \\ \\ -0.022\ \text{EFWa} + 0.172\ \text{CAPINC} + 0.083\ \text{UN} - 0.169\ \text{COL} - 0.160\ \text{LABMFG} \\ (-4.48)^* \quad (5.38)^* \quad (4.62)^* \quad (-4.94)^* \quad (4.41)^* \\ -0.035\ \text{DEP} - 0.062\ \text{WOMEN} + 1.863\ \text{POPDEN} \\ (-5.01)^* \quad (-5.78)^* \quad (5.49)^* \end{cases}
$$

$q = 3.873\ LM_F\ [0.00]$

EFW-TRADE

$$
\text{GGINI} = \begin{cases} 0.024\ \text{EFWb} + 0.219\ \text{CAPINC} + 0.136\ \text{UN} - 0.219\ \text{COL} - 0.163\ \text{LABMFG} \\ (4.28)^* \quad (4.71)^* \quad (4.90)^* \quad (-4.53)^* \quad (-4.82)^* \\ -0.035\ \text{DEP} - 0.056\ \text{WOMEN} + 2.071\ \text{POPDEN} \\ (-5.11)^* \quad (-5.14)^* \quad (4.64)^* \\ \\ -0.041\ \text{EFWa} + 0.248\ \text{CAPINC} + 0.164\ \text{UN} - 0.236\ \text{COL} - 0.185\ \text{LABMFG} \\ (-4.81)^* \quad (5.19)^* \quad (5.05)^* \quad (-4.92)^* \quad (-5.02)^* \\ -0.050\ \text{DEP} - 0.079\ \text{WOMEN} + 2.237\ \text{POPDEN} \\ (-4.84)^* \quad (-5.15)^* \quad (5.48)^* \end{cases}
$$

$q = 4.908\ LM_F\ [0.00]$

EFW-REG

$$
\text{GGINI} = \begin{cases} 0.028\ \text{EFWb} + 0.237\ \text{CAPINC} + 0.129\ \text{UN} - 0.225\ \text{COL} - 0.186\ \text{LABMFG} \\ (4.61)^* \quad (5.14)^* \quad (4.63)^* \quad (-4.92)^* \quad (-5.15)^* \\ -0.032\ \text{DEP} - 0.058\ \text{WOMEN} + 1.938\ \text{POPDEN} \\ (-5.21)^* \quad (-5.06)^* \quad (5.25)^* \\ \\ -0.045\ \text{EFWa} + 0.258\ \text{CAPINC} + 0.155\ \text{UN} - 0.246\ \text{COL} - 0.237\ \text{LABMFG} \\ (-5.21)^* \quad (5.26)^* \quad (4.78)^* \quad (-4.85)^* \quad (-5.64)^* \\ -0.059\ \text{DEP} - 0.073\ \text{WOMEN} + 2.319\ \text{POPDEN} \\ (-4.82)^* \quad (-5.70)^* \quad (5.64)^* \end{cases}
$$

$q = 5.819\ LM_F\ [0.00]$

Notes: b denotes 'below' and a denotes 'above', q is the threshold parameter. Figures in brackets denote p-values, while those in parentheses denote t-statistics. The LMF statistic measures whether the regime switching is significant or not, i.e. the test of linearity versus PSTR in which the null is the validity of the linear model.

APPENDIX

TABLE A1

LIST OF COUNTRIES (TIME SPAN OF DATA AVAILABILITY IN PARENTHESES

Europe

Albania (1996-2004)

Austria (1964-2010)

Belarus (1981-2007)

Belgium (1974-2010)

Bulgaria (1960-2010)

Croatia (1986-2009)

Cyprus (1990-2009)

Czech Republic (1987-2010)

Denmark (1961-2010)

Estonia (1981-2010)

Finland (1962-2010)

France (1962-2010)

FYROM (1989-2007)

Germany (1964-2010)

Greece (1967-2010)

Hungary (1962-2010)

Iceland (1992-2010)

Ireland (1963-2009)

Norway (1963-2010)

Poland (1960-2010)

Portugal (1973-2010)

Romania (1963-2010)

Russia (1981-2009)

Slovak Republic (1987-2010)

Slovenia (1987-2010)

Spain (1963-2010)

Sweden (1960-2010)

Switzerland (1980-2009)

Ukraine (1972-2007)

U.K. (1960-2010)

America

Argentina (1961-2010)

Bahamas (1970-2004)

Barbados (1970-1997)

Belize (1993-2006)

Italy (1967-2010)

Latvia (1981-2010)

Lithuania (1981-2010)

Luxembourg (1970-2010)

Malta (2000-2010)

Moldova (1981-2010)

Netherlands (1962-2010)

Ecuador (1963-2009)

El Salvador (1965-2008)

Guatemala (1971-2006)

Honduras (1963-2009)

Jamaica (1963-2004)

Mexico (1968-2010)

Nicaragua (1982-2009)

Panama (1960-2009)

Paraguay (1990-2009)

Peru (1970-2009)

Puerto Rico (1977-2010)

Trinidad and Tobago (1966-2005)

Uruguay (1976-2009)

U.S. (19602-1010)

Venezuela (1965-2010)

Asia

Bolivia (1983-2007)

Brazil (1970-2009)

Canada (1961-2009)

Chile (1967-2009)

Colombia (1962-2009)

Costa Rica (1965-2009)

Dominican Republic (1986-2009)

Iran (1963-2004)

Israel (1961-2005)

Japan (1961-2010)

Jordan (1963-2006)

Kazakhstan (1981-2006)

Korea (1963-2010)

Kuwait (1982-2009)

Kyrgy Republic (1981-2007)

Laos (1992-2007)

Malaysia (1968-2005)

Mongolia (1995-2006)

Nepal (1976-2004)

Oman (1981-2010)

Pakistan (1963-2005)

Papua New Guinea (1995-2005)

Armenia (1986-2007)

Azerbaijan (1972-2008)

Bangadesh (1963-2010)

Brunei (1999-2010)

Cambodia (1994-2004)

China (1964-2005)

Georgia (1981-2006)

Guinea (1991-2006)

Haiti (1987-2001)

Hong-Kong (1971-2006)

India (1960-2005)

Indonesia (1964-2010)

Philippines (1961-2009)

Qatar (1981-2009)

Singapore (1963-2009)

Saudi Arabia (1981-2009)

Sri Lanka (1979-2002)

Taiwan (1964-2005)

Tajikistan (1981-2004)

Thailand (1967-2004)

Turkey (1963-2009)

Turkmenistan (1981-2005)

Uzbekistan ((1981-2005)

Vietnam (1992-2006).

Pacific

Australia (1960-2010)

Fiji (1977-1998)

New Zealand (1963-2007)

Africa

Algeria (1967-2005)

Angola (1995-2005)

Botswana (1981-2005)

Burundi (1992-2006)

Cameroon (1983-2002)

Cape Verde (1989-2005)

Nigeria (1963-2004)

Rwanda (1985-2006)

Senegal (1970-2005)

Sierra Leone (1976-2005)

South Africa (1965-2005)

Swaziland (1994-2005)

Central Africa Republic (1992-2003)

Cote d'Ivoire (1966-2002)

Egypt (1964-2008)

Ethiopia (1979-2005)

Ghana (1983-2006)

Kenya (1960-2005)

Lesotho (1986-2005)

Madagascar (1976-2005)

Malawi (1969-2005)

Mali (1989-2006)

Mauritania (1987-2000)

Mauritius (1972-2006)

Moroco (1965-2007)

Mozambique (1996-2005)

Namibia (1993-2005)

Níger (1992-2005)

Tanzania (1964-2001)

Tunisia (1965-2005)

Uganda (1963-2006)

Zambia (1963-2005)

Zimbabwe (1963-1995)