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Does globalization drive long-run inequality within OECD countries? A guide to policy making

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Abstract

We analyse around four decades of annual time-series data revisiting the long-run relationship between globalization and income inequality for 24 OECD member countries across different geographical regions, applying the Yamamoto-Kurozumi multivariate vector autoregression (VAR) framework. We observe that rapid globalization is not the key cause of rising long-run intra country inequality. This result is obtained by controlling for growth, terms of trade, minimum wage legislation, and unionization and found robust by further controlling education. Most of the countries in our study with a long-run relationship reveal the robust reverse causal impact of rising globalization on reducing inequality. Our impulse response breakdown across various sub-components of globalization suggests that economic globalization is not a primary contributor to long-run inequality for developed industrialized countries. Our framework guides future research to concentrate more on country-specific relationships, with policy guidance tailored for each country based on their level of economic development and institutional quality.

JEL Classification: C32; O57; F60

Keywords: Globalization; Inequality; Granger non-causality; OECD countries

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1. Introduction

The rise in income inequality has often been perceived to be associated with the faster pace of globalization in the last few decades, which is challenging for policymakers and economists alike (Salvatore, 2007; 2004). A consequence of this is a political backlash against globalization in many developed countries. Such negative sentiments have intensified in recent years with disruptions to the global economy.[1] This has raised serious challenges for governments in terms of effective implementation of policies that reduce income disparities, while continuing to reap the benefits of being integrated with the global economy.

A body of recent empirical work (see, for example, Sethi et al., 2021, Bittencourt et al., 2019, Tridico, 2018, Cabral et al., 2016 and Asteriou et al., 2014) points to several dimensions of globalization that are affecting income disproportionately and thereby contributing to the rise in inequality. These include trade and market integration, along with financial development encompassing foreign direct investment (FDI)/equity flows, and other financial indicators such as bank credit and stock market volatility.

While inequality among countries have reduced in the last quarter of a century, the same within countries have risen, with considerable variations among countries and regions. According to the Organisation for Economic Co-operation and Development (OECD 2020a), the ratio of average income (after taxes) of the richest 20% of the population to the poorest 20% was 5.4 to 1, with considerable variation across countries and regions.[2] Benchmarked against the OECD average, Chile, Mexico, US, and Turkey have seen substantial rises in income inequality. In contrast, Australia and New Zealand in the Oceania region witnessed a much smaller increase. Newer EU members such as Czech Republic, Slovakia, and Hungary, as well as established members such as France, Netherlands, Ireland, Poland, and Belgium, closed the inequality gap by increasing the share of the bottom 20% incomes to above OECD averages.[3] The above-mentioned variation in inequalities have further escalated due to the global recession triggered by the global financial crisis (GFC) of 2008.

While it may be tempting for policymakers to point towards rapid pace of globalization over the past decades as a key causal reason behind increasing income inequality across countries, Helpman (2018) comprehensively analyses this complex relationship and finds that forces other than globalization have more to do with rising income inequality. A reasonable body of literature prior to this cautions against blaming only globalization for rising within- and cross-country income inequality in developed economies (see, for instance, Ravallion, 2018, Coyle, 2016, Rodrik, 2018, Bourguignon, 2016, Milanovic, 2016, Gozgor and Ranjan, 2017). Many argue that globalization through trade liberalization and increased financial integration has in fact improved overall incomes, in relative and absolute terms, narrowing the inequality gap worldwide. Keefer and Knack (2002), Berg et al. (2012), Jaumotte et al. (2013) subscribe to the school of thought that suggests that even though globalization raises income, inequality emerges from an unfair system. The absence of pre-requisite social, economic, and political conditions in the policymaking process prevents the benefits of growth from being distributed more equally.

[1] Examples would include events such as Brexit, global trade tensions, and the ongoing COVID-19 pandemic.

[2] It is much lower than the OECD average in European countries but reaches between 6.2 and 7 to 1 in Asia, around 8.3 to 1 in the United States (US), and about 10.3 to 1 in Mexico and Chile (OECD, 2020).

[3] Helpman (2018) observes during 1980–2013, income inequality has on average been on the rise in OECD economies, with few experiencing little or no decline during this period, such as Belgium, Netherlands, and France.

Clearly, the predicted impact of globalization on long-run intra-country income inequality remains mixed in the existing literature. These varying results often depend on several factors such as the driving mechanism, the level of economic development and country-specific characteristics within both industrialized and developing economies, and the methodologies adopted to evaluate them. One key missing aspect among the body of studies so far on this subject is that all studies are either cross country or panel data based. This implies that the policy advisories based on such earlier methods cannot identify country-specific factors. As an example, cross-country studies on the EU have not been able to identify whether there exist differential impacts of globalization on income inequality in the long run in case of UK and France. If it does exist, the policy advisories for dealing with the same would be different too. This gap in existing empirical work provides us with the impetus to examine further the long-run relationship between these two key economic variables whose interactions are complex and multi-dimensional.

In contrast to the sizeable body of existing empirical work on this topic, with the latest being a meta regression analysis by Heimberger (2020), we apply the Yamamoto and Kurozumi (2006) technique in a multivariate cointegrating framework. This is our preferred choice on two counts. First, this framework can estimate in one step the multilateral relationships between all the variables being studied. This allows us to examine the long-run block non-causality between the variables, which justifies our choice of this methodology compared to other econometric tools explored in recent studies.[4] Second, this approach ensures that results and policy recommendations are country-specific and not affected by homogeneity assumption issues which can occur if a panel framework such as Tridico (2018) is adopted instead.[5] Nolan et al. (2019), specifically highlights the importance of complementing aggregate cross-country econometric analysis with in-depth investigation of individual countries while analyzing drivers of income inequality through a common analytic framework.

Therefore, we contribute to the empirical literature in the following ways. First, we address the causal impact between globalization and inequality while accounting for endogeneity, hitherto not extensively elaborated in the literature for OECD members, except for Gaston and Rajaguru (2009) in the Australian context. Second, our analysis concentrates on OECD countries and further classifies them across different geographical regions over the period 1980–2017, which has not previously been attempted in a multivariate framework.

Guided by recent empirical work, country specific long- and short-run causal relationships are examined. We utilize the within country Gini coefficient, the KOF globalization index,[6] real GDP per capita, terms of trade (*ToT*), minimum wages, and union density as key variables in our empirical analysis.[7] Our dataset covers 24 OECD countries over nearly four decades, with available time-series data for all variables.

[4] This technique circumvents the problem of singularity of the covariance matrix associated with the usual Wald-type test using a generalized inverse procedure. The simulation exercise in Yamamoto and Kurozumi (2006) indicates that the proposed technique performs reasonably well in finite samples. Unlike earlier procedures, there is no need to repeatedly re-estimate the model by restricting each variable's beta coefficient to one. The sign rule proposed by Rajaguru and Abeysinghe (2008) is further used to establish the genuine long-run causal relationships between the variables of interest. Mamingi (2017) highlights that the promising research by Rajaguru and Abeysinghe (2008) on designing a rule that can "enable" the uncovering of the "true" relationship in lower frequency data is a way forward to solving Granger causality distortion due to temporally aggregated data.

[5] This study also analyses determinants of income inequality for 25 OECD countries but adopts a panel data econometric framework.

[6] The nomenclature is based on this index being developed by researchers at KOF Swiss Economic Institute, Zurich.

[7] See Section 3 for a detailed discussion on the choice of these variables for our study and their relationship with income inequality.

Because different sub-components of globalization affect income inequality differently, we also analyze impulse response shocks to these different sub-components to gauge the varying impacts of economic, social, or political globalization on income inequality.[8] Furthermore, we analyze whether these shocks, responding to uncertainties from rising globalization, is uniform for a specific sub-component across a geographical region.[9] Our key objective is to ascertain whether forces of globalization have caused long-run income inequality in developed countries and which sub-component of it, if any, drives this empirical link.

Our results inform policymakers in developed countries that first, there is no clear evidence that rapid globalization over past decades is the key cause of rising long-run inequality. Second, most countries in our sample that do have a long-run relationship seem to have achieved the reverse causal impact of globalization, reducing inequality. Finally, contrary to existing empirical work, our impulse response (IR) breakdown across the sub-components of globalization suggests economic globalization, which also subsumes financial globalization, is not a primary contributor to long-run inequality for developed countries.

The rest of the paper is organized as follows. In the next section, we review the key determinants of income inequality as analyzed in the literature. Section 3 outlines the data and methodological framework used in our empirical analysis. We conduct our empirical analysis by applying the Yamamoto and Kurozumi (2006) approach to test for the presence of long-run Granger non-causality between our chosen variables. Section 4 discusses results and reports the key findings of our paper. Section 5 summarizes suggested policy implications. Section 6 concludes.

2. The issue: does globalization cause high income inequality within country?

From a policy perspective, responding to a multi-dimensional phenomenon of globalization, brought about by rapid technological changes, and increased economic integration through trade, while ensuring that income disparities between the lower and higher income are not widened further, is challenging. This is primarily on two counts. First, greater participation in international trade is traditionally viewed as impacting adversely on income distribution through its labour market impact. Second, adapting to rapid technological changes requires investments in human capital and education to keep up with its pace, so as not to widen the income gap in the labour market. Both these strands have been explored extensively in the existing literature.

Tamasauskiene and Žičkienė (2021), Heimberger (2020), Dorn et al. (2018), and Cabral et al. (2016) have recently revisited the link between globalization and income inequality, although none has dwelled on an analysis of the long-run causal impact. Tamasauskiene and Žičkienė (2021) examine separately the specific impacts of all three dimensions of globalization on income inequality in the context of EU-27 as a group — rather than focusing on individual countries — using a much narrower timeframe of 1998–2017 in a panel framework. Their findings reveal that economic and political globalization dimensions have had a significant impact on increasing overall income inequality within the EU compared to social globalization. The findings imply that it is important to disaggregate the contribution of these dimensions of

[8] See Dreher et al. (2008) and Gygli et al. (2019) for a detailed description of these sub-components of globalization and their weightage in the overall calculation.

[9] Sethi et al. (2021) recently analysed the impact of globalization on inequality using each of the sub-component indices, but in the context of a single country (i.e., India). For reasons of brevity, in a multi-country framework we first analyse the long-run relationship using an overall globalization measure, and then drill down further to the sub-components only for the impulse response.

globalization in any analysis of their long-run impact on inequality. No country specific policy advisories can be ascertained from their analysis.

Dorn et al. (2018) analyze the above-mentioned relationship for 140 countries for the period 1970–2014 using an instrumental variable (IV) econometric approach. For a sub-sample of advanced countries, they confirm the absence of any systematic effect of globalization on income inequality. They assert that the moderated effect observed in developed countries could be due to established transfer systems, stable political and democratic institutions, and education opportunities compared to developing countries. The above view has been corroborated using meta-analysis and meta-regression methods run for both developed and developing countries in Heimberger (2020). The study further observed that the effect of financial globalization dominates that of trade globalization when controlled for technology and education levels. It was found that the dividends of stock and asset price rise accumulation played a bigger role in driving income inequalities in the case of the US from 1991 until the Global Financial Crisis (GFC) (Favilukis, 2013; Hungerford, 2013). This finding is corroborated by Cabral et al. (2016), using systems GMM framework over the period 1970–2004 for both developing and developed economies. Financial globalization was found to be skewing income distribution to the top 10% of the population.

Apart from the above, it is worth noting that the literature on the key determinants of income inequality is vast and encompasses four key strands: trade, technology, labour market interactions, and globalization impacts that together form the key basis for inclusion as variables in our modelling. The standard trade theory argument — consistent with the Stolper-Samuelson trade model — predicts that gains from trade will lead to a lowering of income inequality in developing countries, but to rising inequality in developed countries.[10] Much of the recent success in reducing trade barriers has occurred in skill-intensive sectors, causing relative wages for high-skilled workers to rise in rich and poor countries alike (see Berman and Machin, 2000 and Beaulieu et al., 2011).

A more potent factor driving the rise in income inequality stems from technological change and innovation. There is growing evidence of increased inequality originating within domestic firms and industries across developed countries (Basco and Mesiteri 2019).[11] Several studies, including Dorn et al. (2018), explain how these long-term differences are arising partly due to technological advancement and innovation. This has resulted in a growing mismatch between the demand for and supply of upskilled workers, creating an even higher wage skill premium over time.[12]

To what extent does skill-biased technological change (SBTC) impact labour market outcomes in a globalized world? This question has largely remained unexplored due to complexities in separating the specific effect of SBTC. Empirical studies do observe that investment

[10] A few studies document empirical evidence on their continued validity from the perspective of imports from low wage developing countries (e.g., Krugman, 2000, Acemoglu, 2002, Roser and Cuaresma, 2016). The theoretical prediction of such models (Stolper-Samuelson trade model) has been questioned considering the reallocation within sectors that is more likely to occur with the rising share of trade observed in intermediate goods. This phenomenon provides increasing evidence over years that international trade, while being an essential driver of globalization, does not seem to contribute primarily to increased income inequality among developed countries in the long run, despite some short-term adjustment costs (Richardson, 1995; Irwin, 2015).

[11] Basco and Mestieri (2019) argue that trade in intermediates also increases within-country inequality, and the relationship is U-shaped in the aggregate productivity level of the country.

[12] This phenomenon was first mirrored by Kuznets (1955) in his income inequality inverted-U hypothesis.

in training and skill development, as well as knowledge diffusion, is a crucial driver of income inequality. Gaston and Rajaguru (2009) argue that globalization lowers technology diffusion costs and encourages SBTC by substituting capital for labour or skilled for unskilled labour. In a similar vein, Lopez Gonzalez et al. (2015) analyze the implications for wage-income inequality from increased global value chain (GVC) participation in international trade. They observe that skill-upgrading of low-skilled labour and promoting tertiary education reduce inequality in both developed and emerging economies and enhance the benefits of GVC participation.

Besides international trade and investment, there are other prime drivers related to institutional changes and political factors that have affected the dynamics of income inequality (Tinbergen, 1975). For instance, in a comprehensive empirical analysis utilizing dynamic panel regression for 32 developed countries over four decades, Roser and Cuaresma (2016) observe that apart from low-wage imports (i.e., the trade channel), several other explanatory factors contribute to an understanding of income inequality in these countries. These include the size of the government, political regime switches, unionization, employment or welfare policies, and interaction between education and technological change. There are two competing views on the relationship between globalization, welfare state policies, and the impact on income inequality: the race to the bottom hypothesis and the compensation hypothesis. The former view (Sinn, 2003, Stiglitz, 2002) argues that globalization puts downward pressure on tax rates and regulations for mobile factors, thereby increasing income inequality after taxes and transfers and reducing redistributive transfers. The latter, due to Rodrik (1998), argues that those who lose from globalization will demand compensation, and that will increase the role of government intervention through redistribution.

Further, the social impact of globalization — mainly in terms of labour markets becoming less unionized — is an important factor to consider in any empirical analysis (see Dreher and Gaston, 2007). Gaston and Rajaguru (2009) note that higher unionization rates and collective bargaining are associated with less income inequality in the Australian context. They point to the fact that the increasing income inequality between skilled and unskilled workers is also related to changes in the demand for welfare state provisions, including minimum wage laws. There is growing evidence that, in general, higher levels of income inequality led to more substantial political pressures for increasing the minimum wage as seen, for example, in the case of New Zealand since 2017, although its effectiveness remains questionable.[13] Farber et al. (2021), using distributional decompositions and various regression methods, find consistent evidence of a reduction in income inequality due to unionization in the US. Tridico (2018) also confirms that de-unionization worsened inequality for OECD members over the period 1990–2013.

Given such counteracting views in the literature, the key empirical issues for us to analyze are: i) whether there exists a long-run relationship between globalization and income inequality individually for these 24 OECD countries by controlling for growth, terms of trade, minimum wage legislation, and unionization; ii) whether there exists any systematic pattern in this relationship across different geographical regions; iii) whether the results are robust when we control them for education; and iv) whether one dimension of globalization, such as economic, drives the overall relationship with long-run income inequality across all the countries.

[13] See Alinaghi et al. (2019).

3. Data and methodological framework

3.1. Data

We rely on the Gini coefficient as a proxy for income inequality based on pre-tax income,[14] which we label as *Gini*.[15] The Gini coefficient is taken from the UNU-WIDER World Income Inequality Database. Gini values range between zero and 1, where value zero corresponds to perfect equality and moving towards 1 indicates a higher level of income inequality.

Previous empirical work guides us in our choice of the variables described below to control for different income levels across countries, the extent of globalization, trade competitiveness, labour market legislation, and unionization dynamics affecting income inequality.[16] The data are on an annual basis and available for the period 1980–2017.

When compared to conventional measures of globalization that look at simple ratios or shares such as trade openness capturing the flow of goods and services across countries, we use the composite KOF measure of globalization (henceforth referred to as KOF) that looks at the whole gamut of policy interactions at economic, social, and political levels to measure the extent to which production processes have become globalized in recent years.

We utilize the overall KOF substantially revised since 2018 by Gygli et al. (2019) to ascertain whether the developed countries in our chosen sample are more (or less) globalized, following Heimberger (2020) and Sethi et al. (2021). The latest version of this index consists of 43 variables grouped into Economic, Social, and Political Globalization, providing a composite index measure.[17] The overall KOF is a weighted average of twelve sub-indices distinguishing between de facto and de jure dimensions of each component of globalization.[18] This measure provides one single composite statistic incorporating all dimensions of globalization and provides an ideal way of drawing cross-country comparisons[19] following Dreher et al. (2008) and more recently, Gygli et al. (2019).

Any changes in the overall KOF index captures the global flow of trade, investments, and information, which also partially proxy for the effects of SBTC. This is largely captured by the

[14] In the inequality literature the pre-tax income is customarily used in developing policies to enhance equity in the society. In this way any possible distortionary effect on income distribution, which is evident in post-tax income, can be avoided. A further issue with the post-tax income Gini is that it is not consistently available for the sample countries over the time-period covered in this study.

[15] This indicator is utilized for a consistent measure of income inequality across countries. Data availability across all countries and over time presents a limitation in constructing other comparable inequality measures as these are often based on micro-survey and might suffer some consistency issues. Note that these data fail to capture sufficiently the volatility in capital income when gauging the income inequality in a country and that it may not be a good approximation to represent an aggregate income distribution (Gailbraith & Kum, 2005) The caveat is important to bear in mind while interpreting results as changes in income distribution occur from both changes in wage income and changes in capital income accruing to income recipients across different levels of income thresholds.

[16] See Balan et al. (2015) and Gaston and Rajaguru (2009).

[17] The economic dimension separates itself into trade and financial globalization, while social dimension separates itself into interpersonal, information and cultural globalization.

[18] See Dreher et al. (2008) and Gygli et al. (2019) for complete details on the structure of the KOF Globalization index including its de-facto and de-jure sub-components.

[19] The use of indices provides reliability in making comparisons rather than employing separate variables such as trade, FDI, or immigration. This avoids the potential problem of mismeasurement and misinterpretation of variables (see Gaston and Rajaguru, 2009).

inclusion of trade in high technology goods and internet use as part of the interpersonal and informational dimensions of social globalization in the calculation of this index.

To capture the dependence of our selected developed countries on the external sector and the growing economic linkages with developing countries, the variable 'terms of trade adjustment' (*ToT*) is used from the World Development Indicators (WDI) database. The *ToT* adjustment (constant LCU) is defined by the WDI as a country's capacity to import less exports of goods and services in constant prices.[20] This variable captures the impact of trade on the distribution of earnings via the Stolper–Samuelson theorem. An increasing *ToT* moves labour and capital to the sector with a relative comparative advantage resulting in more unequal income distribution for developed economies. The *Union* variable refers to union membership expressed as a percentage of the total labour force. The usual prediction is that de-unionization worsens earnings and increases income inequality. The minimum wage is converted to real terms using the consumer price index (CPI) and then logged for the econometric work as the logarithm of real minimum wage (*LRMW*) for all countries other than Italy.[21] This measure captures the response of the welfare state to increased global uncertainty and the perceived plight of low-income workers. Finally, we include the natural logarithm of per capita real GDP, *LRGDPpc*. We include this variable to capture the nonlinear relationship between per capita income and income inequality, reflecting the Kuznets hypothesis.

To estimate the long-run relationship between these six variables, we first analyze the time-series properties of the data to avoid spurious results generated by unbounded variances of parameter estimates due to the presence of unit roots in the data. We then proceed to analyze cointegration in the data and apply the Yamamoto and Kurozumi (2006) framework to analyze Granger non-causality across the 24 countries modelled in our paper.

3.2. Unit roots

To ensure the robustness of the unit root test results, we utilize the three commonly applied unit root tests on the relevant variables for all our chosen developed countries. These are the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and KPSS unit root tests. The tests are structured so that the null hypothesis for the ADF and PP tests (presence of unit root) is the alternative hypothesis for the KPSS unit root test. The results show that not all variables are stationary for all countries at the 5% level of significance.[22] The non-rejection of the unit-root hypothesis leads to testing for the second unit root, that is, a unit root in the first differences. The summary results are reported in Table 1. It is noted that for all chosen countries, not all the series are I (1).[23]

[20] This variable is measured in constant local currency units (LCU) in billions. A greater capacity to import reflects a country's ability to command higher export earnings compared to what it pays for imports, which also represents an improved *ToT*.

[21] There is no statutory minimum wage legislation for Italy. Minimum wages in Italy are set through collective bargaining agreements at the sectoral level. Around half of the employees in the country are covered by a collective agreement in which wages are set. See https://wageindicator.org/salary/minimum-wage.

[22] The detailed test results can be made available upon request.

[23] Gini is only found to be a non-stationary process for 17 countries in our chosen sample, with 7 of them being stationary. Even for other variables including *KOF*, the test results suggest that *LRMW, ToT, Union* variables are observed to be non-stationary but not across all countries modelled, with no consistency in country pattern with respect to stationarity of these variables.

Table 1
Summary of unit root test results.

Variables	I (1)
LRGDPpc	All countries except Belgium (BEL)
Gini	All except 5 countries: Spain (ESP), Estonia (EST), Greece (GRC), Hungary (HUN), and Ireland (IRL)
KOF	All except Luxembourg (LUX)
LRMW	All except Belgium (BEL) and Luxembourg (LUX)
ToT	All except Ireland (IRL)
Union	All except Hungary (HUN), Korea (KOR), and Slovakia (SVK)
Summary of cointegration test results	
Countries with one cointegrating relationship	US, Canada, Mexico, Chile, Australia, New Zealand, Japan, Italy, UK, France, Portugal, and Turkey
Countries with two cointegrating relationship	Korea
Countries with no-cointegrating relationship	Belgium, Czech Republic, Spain, Estonoa, Greece, Hungary, Ireland, Luxemburg, Poland, Slovakia

Source: Author's own calculations. The detailed test statistics for each variable by country can be made available upon request.

In this step, the outcome of the stationary alternative (ADF and PP) and non-stationary alternative (KPSS) tests confirm that the results are robust and unaffected by the weak power of selected standard unit root test procedures. Therefore, these results raise the possibility that there may not be a long-run relationship between globalization and inequality in some of our chosen countries. The results are more heterogeneous across Europe compared to other geographic regions. In Asia, America, and Oceania, all variables for all developed countries chosen are I (1) except for *Union* in the case of Korea.

3.3. Cointegration

The cointegration test is the next step in exploring the long-run relationships between these variables. Since all six variables are found to be integrated processes of order one, that is I (1) for some countries in our chosen sample, we expect the linear combination of one or more of these series to exhibit a long-run relationship. We apply the multivariate cointegration test based on the Johansen and Juselius (1990) method to test these relationships. The long-run Granger non-causality test is established through Yamamoto and Kurozumi's (2006) technique. This procedure involves estimating the following *n*-variate, *p*th-order Gaussian vector autoregression (VAR) process:

$$z_t = \mu + \sum_{i=1}^{p} \Pi_i z_{t-i} + \sum_{i=1}^{k} \Phi_i w_{t-i} + \xi_t,\ t = 1, 2, ..., T,$$

where μ is a vector of constants, $z_t = (Gini_t, KOF_t, ToT_t, LRGDPpc_t, Union_t, LRMW_t)$, and ξ_t is a normally and independently distributed *n*-dimensional vector (in our case, $n = 6$) of innovations with a zero mean non-singular covariance matrix Σ. The Schwartz criteria determine the optimal lag length. The vectors z_t and w_t are composed of endogenous and exogenous variables,

respectively. The stationary variables can be treated as a component w_t. For example, *KOF, Gini,* and *LRMW* are stationary for the case of Luxembourg.

The inclusion of these variables as a component z_t will result in at least three cointegrating vectors. The stationary variables form a trivial cointegrating vector within the cointegration framework. CUSUM tests are applied to examine the validity of structural change in the model. The results do not indicate any significant structural break during our sample period, including in the post-GFC period.[24]

The summary of unit root test and cointegration test results are presented [25] in Table 1 and suggest that all six variables are non-stationary in 14 countries.[26] The long-run relationship exists if at least one cointegrating vector is established between the six variables. The results based on the Johansen–Juselius procedure suggest that the null of no cointegrating relationship is rejected at the 5% level of significance for the above 13 out of 14 countries. That is, one cointegrating vector exists in all countries in our sample in America[27] and Oceania and six countries in Europe (France, UK, Netherlands, Italy, Portugal, and Turkey). The sequential testing procedure fails to reject the null hypothesis for these countries; that the number of cointegrating vectors is at most one at the 5% level of significance.

The unit root test results reported in Table 1 also suggest that five out of our six variables are non-stationary in eight countries.[28] Since one of the variables is stationary, we expect there to be at least two cointegrating vectors to establish the long-run equilibrium relationship. The cointegrating relationship establishes itself in Korea with two cointegrating vectors, with one of these vectors representing the stationary variable. The remaining seven countries have exactly one cointegrating vector at the 5% level of significance. This observation suggests that these countries exhibit only a short-run relationship between the variables of interest.

On the other hand, two variables are stationary in Hungary and Ireland. To establish the long-run relationship for these two countries, we expect at least three cointegrating vectors, with two of them representing the stationary variables. The cointegration test results show exactly two cointegrating vectors for both countries. The results imply that the variables demonstrate no long-run relationship between them for these two countries. Three variables are stationary with three cointegrating vectors for Luxembourg, indicating the absence of a long-run relationship.

In summary, the results show 14 out of 24 countries having a long-run equilibrium relationship between the variables. Notably, these include all countries chosen in America, Oceania, and Asia. Only six countries out of 17 in Europe (France, UK, Italy, Netherlands, Portugal, and Turkey) demonstrate this relationship. For these countries, we test for Granger non-causality,[29] and analyze their impulse response shocks in Section 4.

[24] We do not report these results here for the sake of brevity. They are available from authors upon request.
[25] The detailed unit root test and cointegration test results are available from authors upon request.
[26] The fourteen countries include all six countries in our sample in America and Oceania, one in Asia (Japan) and six in Europe (Netherlands, UK, France, Italy, Portugal, and Turkey).
[27] These include Canada, Chile, Mexico, and the US.
[28] These include one country in Asia (Korea) and the rest in Europe (Belgium, Spain, Estonia, Hungary, Greece, Ireland, and Slovakia).
[29] For brevity, we only report and analyse long-run results here. Detailed long- and short-run results are available from the authors on request.

3.4. Long-run Granger non-causality

To determine the long-run Granger non-causality from the i^{th} component of z_t to the j^{th} component of z_t, we define two 1×6 matrices, $R_L = [r_1 \ r_2 \ . \ . \ . \ r_6]$ and $R_R^* = [r_1^* \ r_2^* \ . \ . \ . \ r_6^*]$, such that

$$r_k = \begin{cases} 1 \text{ if } k = j \\ 0 \text{ otherwise} \end{cases}$$

and

$$r_k^* = \begin{cases} 1 \text{ if } k = i \\ 0 \text{ otherwise} \end{cases}.$$

For example, to test long-run Granger non-causality from *LRGDPpc* to *Gini*, $R_L = [1 \ 0 \ 0 \ 0 \ 0 \ 0]$ and $R_R^* = [0 \ 0 \ 0 \ 1 \ 0 \ 0]$, we establish Long-run Granger non-causality from i^{th} component of z_t to the j^{th} component z_t by testing the null H_0: $R_L \overline{B} R_R' = 0$.

We then construct the Wald-type statistic using the generalized inverse given by

$$W^- = Tvec(R_L \hat{\overline{B}} R_R')'(R_L \hat{C}\hat{\Sigma}\hat{C}' R_L' \otimes \ R_R \hat{P}\hat{\Sigma}\hat{P}' R_R')^{-g} vec(R_L \hat{\overline{B}} R_R') \xrightarrow{d} \chi_s^2 \tag{1}$$

where T is the sample size, *vec* denotes the vectorization of a matrix by constructing a column vector and appending each column of a matrix, and $\hat{\Sigma}$ is a consistent estimator of Σ, given by $\hat{\Sigma} = T^{-1}\sum_{t=1}^{T} \hat{\varepsilon}_t(\hat{\beta})\hat{\varepsilon}_t'(\hat{\beta})$, where $\hat{\varepsilon}_t(\hat{\beta}) = [(\hat{\beta}' z_{t-1})', \Delta z_{t-1}']'$. Also, $\overline{B} = \beta_\perp \beta_\perp' M' + \beta_\perp E_{12}(I - E_{22})^{-1} L' G' K^{-1}$, where $\beta_\perp$ is a 6×5 matrix such that

$$\beta_\perp' \beta = 0 M = \begin{bmatrix} I_6 \\ 0 \end{bmatrix}, E = G' D G = \begin{bmatrix} I_5 & \beta_\perp' \alpha & \beta_\perp' \Gamma_1 H \\ 0 & 1 + \beta' \alpha & \beta' \Gamma_1 H \end{bmatrix}$$

$$= \begin{bmatrix} I_5 & E_{12} \\ 0 & E_{22} \end{bmatrix},$$

$$G = I_2 \otimes \ HD = \begin{bmatrix} I_6 + \beta'\alpha & \Gamma_1 \\ \alpha\beta' & \Gamma_1 \end{bmatrix} H = \begin{bmatrix} \beta_\perp, \beta \end{bmatrix} L$$

$$= \begin{bmatrix} 0 \\ I_7 \end{bmatrix} \text{ and } K$$

$$= \begin{bmatrix} I_6 & 0 \\ I_6 & -I_6 \end{bmatrix} \text{Define the long−run impact matrix}$$

$$C = \beta_\perp \left(\alpha_\perp' \Gamma \beta_\perp \right)^{-1} \alpha_\perp', \tag{2}$$

where $\alpha_{\perp}$ is a 6×5 matrix such that $\alpha_{\perp}'\alpha = 0$ and $\Gamma = -(I + \Pi_2)$ and $P = K'^{-1}GL(I_7 - E_{22}')^{-1}\begin{bmatrix} I & 0 \\ 0 & I \otimes H' \end{bmatrix}$. Note that Q^{-g} denotes the generalized inverse of matrix Q and $s = rank(R_L\beta_{\perp}) \times \{rank(R_R^*\beta) + 1\}$.

Rajaguru (2004) and Rajaguru and Abeysinghe (2008) show that temporal aggregation and systematic sampling create contemporaneous correlations, alter dynamic links, and may distort causality inference. In other words, one could obtain conflicting inferences between the variables when the Granger causality test is examined at different frequencies (for example, annual vs. quarterly data). They further demonstrate that the cointegration property is invariant to temporal aggregation and systematic sampling. Based on this property, Rajaguru and Abeysinghe (2008) present a sign rule for causal inference and contemporaneous conditioning in regression models to establish the genuine causal relationship between the variables. They show that the genuine long-run equilibrium holds if the sign of the error correction coefficient is opposite to that of the sign of β_i in the cointegrating vector. In our exercise, we find that the sign of the error correction coefficient is opposite to β_i, thereby establishing that long-run causal relationships are non-spurious and are invariant to the frequency of the data.[30]

4. Results and discussion

4.1. Long-run relationships

The estimated multivariate models satisfy standard assumptions on the behaviour of residuals including normality, and constant variance at the 5% level of significance. We discuss next the standardized beta coefficient (β) results for the long-run relationship, focusing on the inequality measure of *Gini* in Table 2. The columns represent the countries by geographical region, and the data in rows represent the key variables that affect *Gini* (inequality).

These results suggest that the effect of globalization on income inequality is positive and statistically significant for only five countries, in which the rise in inequality is observed to be highest and strongest for Portugal, followed by the UK, Mexico, US, and Korea, respectively. Furthermore, we find conclusive evidence of globalization driving income inequality upwards in the long run for both the UK and US (with β positive and significant). The positive impact is much weaker in the US, showing about a 1.85 standard deviation (sd.) increase in inequality for our chosen period, compared to 7.59 sd. for the UK.

Among these five countries we find that higher growth accentuates long-run income inequality only for the UK, supporting the Kuznets hypothesis. US and Mexico provide evidence of a trickle-down effect of growth on inequality, with opposing effects as inequality falls after a certain critical point.[31] The UK is the only country where both higher growth and higher levels of globalization have a positive impact on long-run inequality. In contrast, the impact of higher real minimum wages increases long-run inequality in the US and Mexico, while this impact is reversed for the UK and Portugal. This implies that labour market impacts

[30] For brevity, the results are not reported, but are available from the authors upon request.

[31] This is consistent with Vo et al. (2019) who find that causality between growth-to-income inequality and vice versa existed in a sample of 158 countries for the period 1960–2014, supporting the overall observation that cross-country studies do not find conclusive evidence of a definite relationship between inequality and growth.

Table 2
Standardized beta coefficients (dependent variable: Gini).

	Americas				Asia		Oceania		Europe					
	US	CAN	MEX	CHL	JPN	KOR	AUS	NZL	FRA	UK	ITA	NLD	PRT	TUR
LRGDPpc	-3.77 **	-0.94 **	-11.17 **	-0.86 **	-15.2 ***	0.00	39.12 **	6.42 **	-7.24 **	4.53 **	-4.65	1.12 **	-3.35	80.27 **
KOF	1.85 **	-1.23 **	4.55 **	-0.91 **	-16.1 **	1.55 **	-24.18 **	1.93	-6.91 **	7.59 **	-19.95 **	-0.19 **	13.82 **	-60.59 **
LRMW	0.87 **	0.08	3.61 **	0.39	23.5 **	0.02	3.35	-2.39 **	19.30 **	-2.18 **	NA	0.11 **	-0.86 **	-11.34 **
TOT	0.13	-0.14 **	0.27	0.52 **	1.52 **	0.61 **	-11.76 **	-0.99 **	-1.19	0.39 **	-7.32 **	0.84 **	-9.14 **	2.90 **
Union	-3.61 **	-0.53	-0.49	-0.20 **	-1.41	-0.35 **	8.81	15.16 **	7.19 **	6.92 **	-30.15 **	-1.19 **	11.56 **	17.68 **

Notes: *** and ** denote statistically significant variables at the 1% and 5% levels of significance, respectively. Refer to NA denotes not available — minimum wages data was unavailable for Italy.

seem to have been among the key drivers of increasing long-run inequality for the US and Mexico. The results show evidence in support of Litwin (2015) who concludes that increases to the minimum wage can cause a decrease in income inequality until the minimum wage reaches a maximum effectiveness value, and then the effect starts to reverse. The study uses a regression analysis on 17 OECD countries for the period 1980–2010; a smaller sample than ours. This result implies that increasing minimum wages may be a short-run, but not a long-run solution to reducing income inequality. We also observe that while Korea points to the Stolper–Samuelson theorem at work (improved *ToT* increasing income inequality[32]), in the case of Portugal, it is unionization that increases long-run income inequality, along with that of increased globalization.

Furthermore, for eight countries in our sample (Australia, Canada, Chile, France, Italy, Japan, Netherlands, and Turkey), increased globalization reduces long-run inequality. This implies that, contrary to popular belief, most developed countries in our sample seem to have experienced lower long-run inequality with rising globalization.

The above result suggests that the predicted benefits of economic integration pursued through deeper trade liberalization and investment openness regime along with other market reforms may not have been uniformly reaped out by all countries. The role of governments in designing policies with an aim to mitigate the growth in income inequality is therefore crucial.

Examining other variables that endogenously interact with inequality in these countries, we find support for the Kuznets hypothesis in the cases of Turkey, Australia, and the Netherlands in ascending order of magnitude. There is a wide variation ranging from a one sd. increase in per capita income to an 80.27 sd. increase in income inequality for Turkey, compared to 1.1 sd. in the case of the Netherlands. The remaining four countries (Canada, Chile, Japan, and France) provide evidence of a trickle-down effect of growth on inequality.

Furthermore, we find that a higher real minimum wage reduces income inequalities only in the case of Turkey, while it puts upward pressure on the same for three countries (France, Netherlands, and Japan), confirming that these impacts are not consistent across geographical regions. Improved *ToT* is found to be equity enhancing for Australia, Italy, and Canada, but contributes to an increase in inequality for Turkey, Chile, Japan, and the Netherlands, which seems to support the Stolper–Samuelson theorem. As expected, unionization is associated with lowering income inequality for three countries (Chile, Italy, and the Netherlands). On the other hand, it turns out to be positive and significant for Turkey and France, suggesting an increase in income inequality. This is to be expected given the Herzer (2014) study that examines the long-run relationship between unionization and income inequality for 20 countries using a heterogeneous panel cointegration method. The results lend support to the presence of long-run causality in both directions, suggesting that, on average, an increase in unionization reduces income inequality and that, in turn, higher inequality leads to lower unionization rates.

[32] Notably in the US, the impact of trade-induced inequality appears insignificant, which is contrary to earlier studies (see OECD, 2011; Milanovic, 2016). The results point to a rise in international production fragmentation taking place in the US and participation along the global value-added supply chains that tend to be associated with reductions in wage inequality. The literature observes opposing effects depending on the relative strengths of trade and financial globalization.

Table 3
Summary of long-run causal impact on Inequality (*Gini*) from other variables.

	Globalization	Growth	Minimum wages	ToT	Union
UK	+	+	-	+	+[†]
Portugal	+	None	-[†]	-	+
US	+	-	+	None	-
Mexico	+	-	+	None	None
Canada	-	-	+[#]	None	-
Japan	-	-	+[†]	+	None
Australia	-	+	None	-	None
France	-	None	+	None	+
Netherlands	-	+	+	+	-
Turkey	-	None	-	+	+

Notes: Korea, Italy, Chile, and New Zealand show no long-run causal impacts on Gini, so not included.
+ and - refer to a positive and negative causal effect, respectively, at the 5% level of significance.
[#] Toda and Yamamoto (1995) but not using Yamamoto and Kurozumi (2006).
[†] Significant using Yamamoto and Kurozumi (2006) but not using Toda and Yamamoto (1995).

After decomposing the results on a regional basis, we find no consistent evidence for globalization increasing or decreasing long-run inequality in line with Helpman (2018). For example, in Europe, Portugal reports a positive and long-run relationship where one sd. increase in globalization leads to a 13.82 sd. increase in *Gini* (inequality). In contrast, the result for Turkey suggests that the same leads to a 60.59 sd. decrease. A similar trend can be observed across Asia and Oceania.[33] We do, however, find a regional pattern of a trickle-down effect of growth on inequality in North America, as well as better Terms of Trade reducing inequality in Oceania.

We focus next on whether these findings remain consistent in a consideration of long- and short-run causal relationships by applying the Yamamoto and Kurozumi (2006) framework in the multi-country context.

4.2. Causal relationships

We first summarize the long-run causal relationships running from all variables to *Gini* in Table 3.

It can be seen from Table 3 that causality runs positively from higher globalization levels to long-run income inequality for the UK, Mexico, Portugal, and the US, but runs negatively in the case of six countries (Australia, Canada, France, Japan, Netherlands, and Turkey). This strongly suggests that rapid globalization over the past decades has reduced rather than increased long-run inequality across developed countries, contrary to popular perceptions. The Netherlands is

[33] Australia documents a strong negative relationship in the Oceania region, with a 1 sd. increase in globalization leading to a 24.18 sd. decrease in inequality. This is in contrast with the Gaston and Rajaguru (2009) study which only estimates the impact of the social globalization dimension compared to the overall index. The reason for this contrasting finding may be further explained by the fact that Australia was mainly unaffected by the GFC — a clear indication that globalization had a negligible effect on the Australian labour market. Borland and Coelli (2016) further demonstrate that an increase in inequality in the Australian labour market is due more to imperfections in the labour market itself, which justify the result we observe in an extended time period using the updated KOF index.

the only country that shows a bidirectional positive causality between *ToT* and income inequality (Table 4). At the same time, Australia and Portugal report unidirectional causality from improved *ToT* reducing income inequality.

Both positive and negative Granger causality results for all variables are further summarized in Table 4.[34]

A positive Granger causal impact to inequality is observed from rising per capita income, mainly for Australia, the UK, and the Netherlands. The UK is the only country that also demonstrates a reverse causal impact.[35]

A rise in inequality that causes higher unionization is noted for New Zealand, whereas for France, UK, Portugal, and Turkey, a positive unidirectional causality is observed in the reverse direction. A negative causality runs from unionization to income inequality for the Netherlands and the US, and vice versa for Canada and Korea (Table 4), which tends to reflect on the institutional factors that account for the political regime, local culture, and workforce demography, and confirms the heterogeneity in this relationship as per Herzer (2014).

In the case of only two countries in our sample — Portugal and Turkey — we find evidence of the presence of both short- and long-run positive causality running from unionization and *ToT* to income inequality, respectively. In the case of Mexico, we find the same running from *ToT* and minimum wages to unionization (Table 4). There is also evidence of negative causality running from growth, globalization, and unionization to *ToT* in both the short and long-runs for the UK, while globalization and minimum wages cause worsening *ToT* impacts for Korea and Canada (Table 4).

4.3. Generalized impulse response (IR)

To understand the persistence of these shocks and the time taken for adjustment to shock from one variable to another, we plot the generalized IR functions for our model. The generalized IR shows how a one standard deviation (sd.) shock in one variable translates into others. The results are consistent with the causality results summarized in Table 4. In general, each variable appears to respond most strongly to its own shocks compared to those originating from others. The IR function for *Gini* shows that one s.d. shock in *KOF* has a positive, negative, or negligible effect on *Gini* in line with the long-run relationships observed for these countries (Table 2). A shock originating from any variable in the current period is fully realized after approximately 6 years.

To gain further insights on which component of globalization drives the causal impact on long-run inequality, we disaggregate the generalized impulse responses across the three key components of the KOF index (economic, social, and political) for these countries in Figure 1. We analyze the extent to which *Gini* responds to a one s.d. shock in each of these globalization components for the 14 countries where we observed a long-run relationship earlier (Table 3). We find that a shock in economic globalization (that encompasses financial globalization) drives the positive effect on *Gini* for only five countries in our sample (Australia, Canada, UK,

[34] As indicated earlier, these data are based on Yamamoto and Kurozumi (2006). The summarized results of the cointegrating vectors and long-run contemporaneous relationships are available from the authors on request.

[35] A possible explanation for this can be found in research that shows the effect of income inequality on economic growth can be either positive or negative. At a particular level of inequality — at a Gini of about 27% — the direction of the relationship changes; that is, where inequality begins to hurt economic development. See further in https://www.imf.org/en/Publications/WP/Issues/2017/03/28/Inequality-Overhang-44774

Table 4
Country summary results for long-run Granger causality relationships.

Effect (→) Cause (↓)	LRGDPpc	Gini	KOF	LRMW	ToT	Union
LRGDPpc		AUS, UK, NLD, CAN, JPN, MEX, US	AUS, TUR†, CHL	UK, JPN, AUS	AUS, CAN, US, UK, NLD†	AUS, JPN, MEX, NZL
GINI	UK, CHL, JPN†, PRT, US		CAN	JPN, UK, PRT	KOR, NLD, US	NZL, CAN, JPN†, KOR
KOF	CAN, PRT†, TUR, US, UK, JPN	UK, MEX, PRT, US, AUS, CAN, FRA, JPN, NLD, TUR		UK, JPN†, PRT	NLD, PRT, UK, KOR, NLD, US	AUS, CAN, FRA†, KOR, MEX, ITA, JPN†, NZL, PRT
LRMW	UK, JPN, TUR, US, PRT	CAN#, MEX, JPN†, FRA, NLD, US, UK, PRT†, TUR	CHL, FRA#, PRT#, TUR#		UK, TUR#, PRT, US	MEX, JPN, NZL, PRT, ITA, FRA
TOT	AUS#, JPN, UK, PRT†	CHL, UK, JPN, NLD, TUR, AUS, PRT	CHL, AUS	AUS, UK, JPN, PRT	UK	AUS, JPN, KOR†, NZL, PRT
Union	PRT, CAN, UK, JPN, TUR, US	FRA, UK†, PRT, TUR, CAN, NLD, US	ITA, TUR, CHL	UK, JPN, PRT	ITA†, KOR, NLD, PRT, US, UK	

Notes: Negative long-run Granger causality are highlighted in grey; all other cases represent positive long -run Granger causality
Significant using Toda and Yamamoto (1995) but not using Yamamoto and Kurozumi (2006).
† Significant using Yamamoto and Kurozumi (2006) but not using Toda and Yamamoto (1995).

Netherlands, Turkey). Five countries (New Zealand, Mexico, Japan, Korea, and Chile) provide evidence that economic globalization shock reduces long-run inequality. Social globalization (also proxying for the impact of SBTC) is observed to be the stronger driver, impacting on rising long-run inequality for four countries (US, Korea, Portugal, and New Zealand). The UK is the only country where increasing economic globalization seems to be a key driver behind the long-run positive Granger causality between globalization and income inequality — it takes approximately 6 periods from the initial shock to stabilize to long-run equilibrium (Figure 1).

An interesting observation is that among the eight countries in Table 3 that show a negative long-run relationship between overall globalization and inequality, the economic globalization impact is positive for four of them (Australia, Canada, Netherlands, and Turkey), despite political globalization reducing the overall impact on inequality. Therefore, the empirical evidence confirms that even among the group of countries showing a long-run causal relationship between globalization and inequality, the driver of globalization differs and there is no discernible pattern across geographical regions. As observed by many studies in the existing literature, it is also clear from our results that economic globalization does not seem to be the primary cause of the increasing long-run income inequality among developed countries. Moreover, there is evidence to suggest that it is SBTC that has driven rising long-run inequality in a few developed countries, such as the US, Korea, and Portugal.

4.4. Robustness checks of key findings

We check the robustness of the long-run relationships and causality impacts reported in Tables 3 and 4. We control for the effect of education, as it draws special attention in the empirical literature, linking it with the SBTC that has partially driven differences in income inequality across countries. Acemoglu (2002) hypothesized that at high elasticities of substitution between skilled and unskilled labour, an increase in skilled labour due to higher education levels may indeed enhance the SBTC impact on inequality. Furthermore, several studies have used variables such as R&D share in GDP, or secondary and tertiary enrolments and other related variables as proxies for education. However, given data availability constraints for all countries in our sample over time, we incorporate a variable for education (*EDU*), as estimated by the Human Capital Index based on years of schooling and returns to education based on Feenstra et al. (2015).

The results in Table 5 suggest that globalization in the long run still has a positive and statistically significant relationship with income inequality for six countries in our sample: Portugal, Korea, Canada, Mexico UK, and the US. When controlled for education, the impact of globalization on inequality is found to be moderated for the US, UK, and Portugal. This suggests that in these countries, higher education diminishes the SBTC impact that drives long-run inequality, which is contrary to Acemoglu's hypothesis. As an example, for Portugal, a one sd. increase in globalization now leads to a 10.45 sd. increase in inequality as opposed to 13.82 sd. increase without EDU (comparing Table 2). For the US, after controlling for EDU, the positive impact on inequality is found to be much weaker (the positive β coefficient dropped from 1.85 without education to 1.46 with education). This result implies a narrowing of the skill-biased technological gap with advances in skill formation and technological development. However, the same effect has not been observed in the cases of Korea, Canada, or Mexico, where globalization tends to be dis-equalizing and is found to be more pronounced after controlling for education. This is consistent with Acemoglu's hypothesis that there is complementarity between new technologies and highly paid professions, which is a key factor in wage polarization and

accentuates long-run income inequality. The results are robust to the use of both de-facto and de-jure versions of the KOF globalization index.

We also examine the robustness of the Granger causality test results through the Toda and Yamamoto (1995) augmented Granger causality test. The results are found to be robust in general.[36]

5. Summary of results and policy implications

Our analysis of around four decades of annual time-series data revisits the long-run relationship between globalization and income inequality for 24 OECD member countries across different geographical regions. Contrary to the prevailing political narrative, we find evidence of only 10 out of 24 countries in our sample demonstrating that globalization has a long-run causal relationship with inequality. Clearly, the gains associated with globalization do not accrue to countries uniformly. The is further reinforced from our country specific results, that increased globalization causes rising long-run income inequality only for the UK, Mexico, Portugal, and the US, and reduces levels of income inequality for Australia, Canada, France, Japan, Netherlands, and Turkey. No regional patterns are observed in the causality trends. The results are by and large robust when controlling for the effect of education and using Gini and Palma[37] as the measures of inequality; we find that education moderates the impact of SBTC on inequality.

Our Impulse Response analysis further informs that forces driving income inequality differ across OECD member countries. Our findings align with Nolan et al. (2019) observations that cross-country regressions in a panel-setting framework will find reaching a consensus on the globalization inequality nexus challenging. The earlier findings suggesting financial globalization to be the leading cause of rising inequality among developed countries (Heimberger (2020), Cabral et al. (2016) and Asteriou et al. (2014) may suffer from homogeneity assumptions and therefore likely to be biased.

In contrast to earlier findings, we find that in almost all these countries (other than the UK), forces of economic globalization (that subsumes financial globalization) tend to be more favourable to reducing long-run income inequality rather than the other way around.

Furthermore, in the US context, we find a much stronger impact of social globalization than economic globalization that is widening income inequality and is more likely arising because of skill-biased technological change and labour market imperfections. This suggests that income distribution had been more skewed and getting concentrated in the hand of the top 10% segment of the population in recent decades. In fact, both US and UK have experienced a rise in income & wealth inequalities post-GFC but with divergent policies at hand. In case of UK, the larger contribution is, however, coming from economic globalization and likely reflects the impact of economic trade and integration within EU aggravating income inequality, ultimately leading to the Brexit vote in 2016.

In summary, while being valid, our model results suggest that country-specific internal factors such as institutional quality and the role of governance influence the dynamics of the

[36] We also conduct robustness tests using de-facto and de-jure versions of the KOF globalization index. These and the complete Granger causality robustness test results are not reported here for reasons for brevity but are available from the authors upon request.

[37] We use Palma (ratio of income of top 10% to bottom 40%) as an alternative measure of inequality and the results are in line with those with Gini. For brevity reasons, these are made available from the authors on request.

long-run relationship. The fruits of globalization are likely to be shared equally in countries where policy making is reflected in effective governance. This is indeed confirmed further while comparing our results with the World Bank (2023) estimate of the World Governance Indicator (WGI) component of government effectiveness [38] that declined from 1996 to 2016 for US, UK, Mexico, and Portugal.[39] Labour market imperfections are also reflected in this declining score, as US and Mexico are both countries in our model wherein long-run inequality is adversely affected by globalization and increasing minimum wages through legislation. In the case of UK and Portugal, unionization, rather than minimum wages, accentuates long-run inequality.

The above results advise policymakers on several fronts. First, anti-globalization policies based on popular and political rhetoric will not reduce income inequality within developed countries, and our evidence points to the fact that these could worsen the same. Attention must be focused on aiming policies to reduce labour market imperfections as they are more of an important causal factor behind the worsening within country inequality. Second, engaging more widely in human capital formation by investing into R&D and building on the educated workforce will ensure that globalization does not worsen within country inequality, even when there is a large heterogeneity across income groups. Quality and provision of education at all levels, while adapting to rapid changes in technology (including recent ones such as blockchain and Artificial Intelligence (AI)) are crucial for effective governance and to moderate the SBTC impact of social globalization on inequality. Third, contrary to the advice from cross-country panel studies, economic drivers of globalization through greater integration in trade and finance are not a causal factor behind increasing income inequality and should be promoted through financial sector development & trade facilitation measures and not discouraged through protectionist barriers.

Finally, while country-specific domestic factors matter in ensuring that globalization benefits are shared within countries, a balanced combination of alternative policies through compensation mechanisms, such as unemployment benefits and subsidized programs, would work better to mitigate any adverse impact on inequality from higher education or rapid technological changes.

Looking forward to the future, one such policy whose implementation has been experimented in some countries in the wake of the COVID-19 pandemic led economic disruptions is that of a Universal Basic Income (UBI) scheme. The key idea is that a certain amount of guaranteed basic income is received by citizens irrespective of their employment status and income group.[40] This scheme is still a subject of current policy debate, with no empirical evidence of its success in creating more jobs or reducing income inequality gaps.

From a policymaking perspective, funding such schemes without burdening the taxpayer is a conundrum. The opportunity cost of implementing such a UBI could be very high especially if it disincentivizes labour force participation. This is more likely to occur in economies with pre-existing labour market imperfections and lower education levels. Hence, policymakers in the four

[38] This sub-indicator within the WGI reflects perceptions of the quality of public and civil services, and that of policy formulation and implementation, and well as credibility of the government's commitment to such policies, and the extent of its independence from political pressures.

[39] The estimate of governance score according to the WGI ranges from − 2.5 to + 2.5. As an example, for the UK and US, this score declined from 1.88 to 1.60–1.52 to 1.47 (standard error of 0.17–0.22) respectively, over 1996–2016. These further deteriorated to 1.28 and 1.34 respectively for both these countries by 2021 (standard error of 0.25). These changes in governance estimates substantiate the fact that economic disruptions brought about by recent events such as COVID-19 have worsened the quality of governance further, leading globalization to cause higher long-run inequality.

[40] See https://www.vox.com/future-perfect/2020/2/19/21112570/universal-basic-income-ubi-map for a summary of UBI policies experimented recently across the world, including countries modelled in our sample, such as US, Japan and Canada.

Table 5
Standardized beta coefficients controlling for education (dependent variable: Gini).[41]

	Americas				Asia		Oceania	Europe				
	US	CAN	CHL	MEX	JPN	KOR	AUS	FRA	NLD	PRT	TUR	UK
LRGDPpc	-4.17**	0.49	-0.99**	-1.49**	-14.01***	0.05	6.36**	-3.14**	0.83**	-2.45*	16.17**	0.06**
KOF	1.46***	5.89***	-1.71**	7.26**	-2.69**	2.52***	-3.68**	-10.05**	-0.61**	10.45***	-7.20**	0.10**
LRMW	1.10***	1.86***	0.18	1.61**	2.78**	-0.36***	-0.2	15.31**	0.06*	-0.51***	-8.69**	-0.21**
TOT	0.14	-0.57	0.72**	1.63	3.93***	0.83***	-1.90**	-3.26*	0.59*	-6.03***	0.19**	0.07**
Union	-4.22***	-7.92***	-0.94**	-2.59	-1.57	0.10**	0.87	8.21**	-0.86**	9.63***	4.43**	1.09**
EDU	0.42*	2.98***	-1.70**	-3.44**	-5.68***	0.33***	0.38*	20.51*	0.008	-2.78***	0.48*	0.18**

Notes: ***, ** and * denote statistically significant variables at the 1% and 5% and 10% level of significance, respectively.

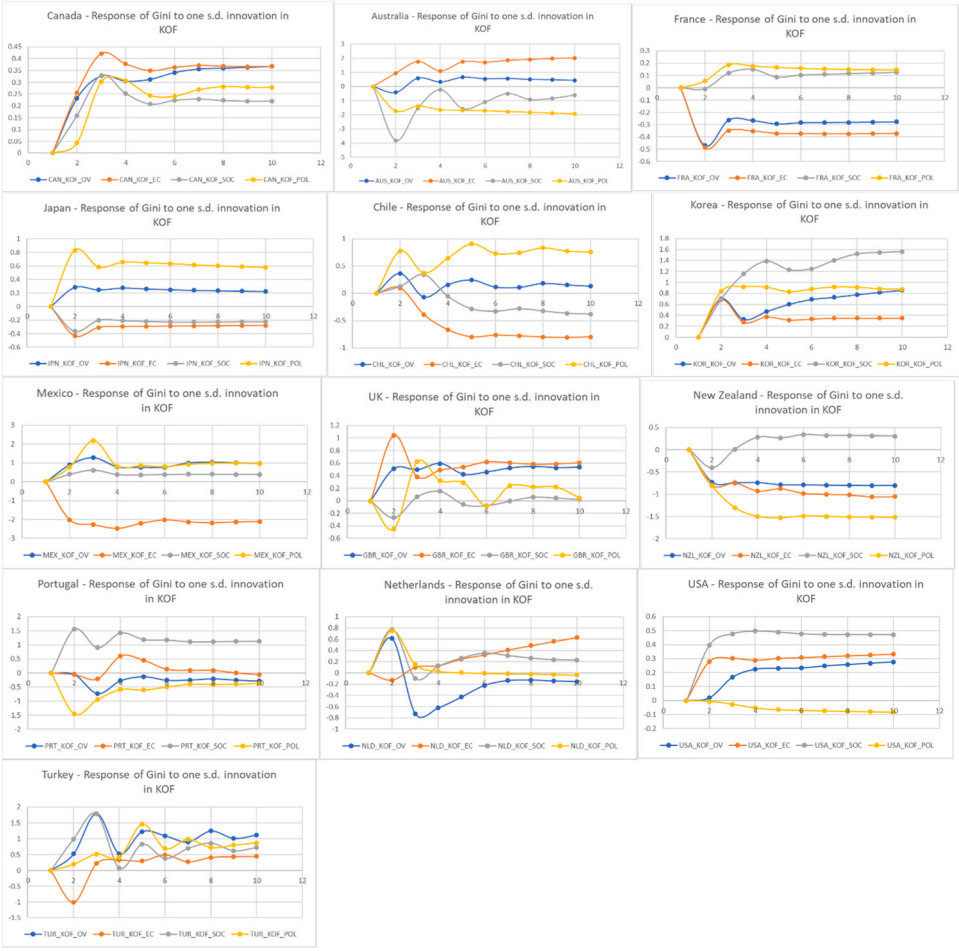

Figure 1. Impulse response of inequality (Gini) to sub-components of globalization (KOF)[42] for selected OECD member countries.[43] Source: Authors' calculations.

countries (US, UK, Mexico, and Portugal) where we do find globalization to increase long-run income inequality, are unlikely to succeed with piloting UBI to reduce income inequality, although it may improve well-being or perceptions of happiness, which is not a subject of this study.

[41] We only report robustness results here for the countries for which we have sufficient degrees of freedom after including the EDU variable.

[42] For all countries, KOF_OV refers to overall globalization; KOF_EC denotes economic globalization; KOF_SOC denotes social globalization; and KOF_POL denotes political globalization. All these indices are a weighted average of de-facto and de-jure versions of these indices as computed by Gygli et al. (2019).

[43] We only show these for 14 countries for whom a long-run relationship between overall globalization and inequality is established in Table 1. The complete set of impulse responses for all 24 countries are available from the authors on request.

6. Conclusion

Covering 24 OECD countries from 1980 to 2017 this paper observes that rapid globalization is not the key cause of rising long-run intra country inequality. This result is obtained by controlling for growth, terms of trade, minimum wage legislation, and unionization and found robust by further controlling education. Most of the countries in our study with a long-run relationship reveal the robust reverse causal impact of rising globalization on reducing inequality. Unlike existing empirical research, our impulse response breakdown across various sub-components of globalization suggests that economic globalization is not a primary contributor to long-run inequality for developed industrialized countries. Notwithstanding some data constraints inherent in undertaking a multi-country study, our findings support the complex interactive relationship between globalization and inequality, as pointed out by Helpman (2018). Our framework can guide future research to concentrate more on the country-specific relationships, with policy guidance tailored for each country based on their level of economic development and institutional quality.

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