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The global distribution of gains from globalization

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Abstract
Global interpersonal inequality is increasingly driven by inequalities within countries while the role of inequality between countries diminishes. Is this due to globalization? To answer this question, we use comprehensive global panel data at the country-decile-group level for the past half century and exploit the geographic diffusion of liberalization policies to identify the effect of globalization. Across countries, we find that income gains are substantial for countries at early stages of the globalization process, but the 'marginal returns to globalization' diminish as globalization rises, eventually becoming insignificant for the most globalized countries. Within countries, gains from globalization are largest for the richest ten percent of national income distributions, resulting in substantial increases in national income inequalities. A simple quantitative model is consistent with these empirical results. Over the past half century, globalization has promoted a dual trend of income convergence across countries and income divergence within countries.

Keywords Global inequality · Globalization · Growth

JEL Classification F63 · O15 · O47

1 Introduction

Over the course of the past half century, income gains for people around the world differed markedly both across and within countries. Income growth was concentrated in many developing and emerging economies and at the top of the income distributions in advanced economies. People in the lower halves of national income distributions in advanced economies were among those with the lowest income gains (Lakner and Milanovic 2016;

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Milanovic 2016).[1] While inequality rose in numerous countries, income differences across countries declined (Lakner 2017; Patel et al. 2021). As a result, global interpersonal inequality is now increasingly driven by inequality within countries and to a decreasing extent by income differences across countries (Alvaredo et al. 2017a; Bourguignon 2015; Hammar and Waldenström 2020; Lakner and Milanovic 2016).

These shifts in the global income distribution were coincident with the process of economic globalization. Over the same period, most countries have opened up their economies and experienced an unprecedented rise in the flow of goods and capital across borders. This simultaneity raised the question of whether globalization is an underlying cause of these global distributional changes (Bourguignon 2015; Milanovic 2016; Ravallion 2018). Since evidence on this question is so far mainly descriptive, our goal in this paper is to examine if and how globalization has contributed to changes in global inequality between individuals. Under a unified framework, we analyze how income gains from globalization have been distributed globally across and within countries at different stages of the integration process.

To do so, we combine measures of income growth from national accounts with data on income inequality from various surveys and distributional national accounts (DINA, Alvaredo et al. 2020; Piketty et al. 2018). These global panel data allow us to trace the distributional effects of globalization at the level of country-decile-groups and top country-percentile-groups across 141 countries between 1970 and 2014, covering more than 80 percent of the global population in most periods. The results that emerge from these different types of data are consistent with each other and show how globalization has contributed to fundamental changes in the global income distribution.

To estimate the global effects of globalization, we propose a new empirical approach. We measure economic globalization in a multidimensional way – based on a comprehensive, newly available globalization measure that combines indicators of trade and finance, flows and regulations (Gygli et al. 2019; Dreher 2006) – and exploit the geographic diffusion of economic liberalization policies across borders for identification. The empirical strategy is based on the finding that economic liberalization policies in one country increase the probability that countries in geographic proximity implement similar policies in the subsequent period. Consistent with the concept of 'policy diffusion' (Simmons et al. 2006), we show that an inverse-distance-weighted measure of formally adopted liberalization policies in neighboring countries strongly predicts a country's level of economic globalization in the subsequent period. Analogous to Acemoglu et al. (2019), who exploit democratization in neighboring countries to identify the effect of democracy on incomes, we use economic liberalization policies in neighboring countries to identify the effect of globalization on incomes. All results are robust to relaxing the exclusion restriction behind this approach, to estimating by OLS with two-way fixed-effects, and to a variety of robustness and sensitivity tests.

The results suggest that economic globalization promotes both *income convergence across countries* and *income divergence within countries*. As a consequence, globalization decisively contributes to the fact that global inequality is now increasingly due to within-country inequalities while the contribution of cross-country inequality to global inequality declines. More specifically, we find strong evidence for *diminishing marginal returns to globalization*. Globalizing leads to significantly higher incomes for countries at low and

[1] This result is illustrated in what became known as the "elephant graph," a global growth incidence curve first depicted in Lakner and Milanovic (2016). See also Alvaredo et al. (2017b).

medium levels of globalization, but this effect disappears for the most globalized countries. This promotes income convergence across countries. At the same time, globalization leads to substantially higher income inequality within countries. Analyses of income groups within countries show that this is primarily driven by rising top income inequality: globalization increases the income share of the richest decile group within countries and decreases the share of all other income groups. Disaggregating further, we find that within the richest decile group, the relative gains are largest for the top 1 percent.

As an extension, we show that a simple quantitative model produces results that are consistent with our empirical findings. In our model's environment, agents are endowed with a unit of labor that they use to produce a distinct task associated with the production of a final good. Unobservable heterogeneity in productivity across agents generates income inequality, and globalization allows the final good to be produced with a wider range of differentiated tasks. In line with the previous literature, we show that openness in such an environment increases both average incomes and inequality (Antràs et al. 2017; Helpman et al. 2010; Melitz 2003). Focusing on the nonlinearity of globalization's effect on incomes across countries, we show that under weak assumptions these gains diminish along the globalization process in such an environment: Agents in countries at earlier stages of the integration process benefit more from globalization than agents in highly globalized ones.

To the existing literature, we contribute in several ways. First, we add the focus on the global interpersonal income distribution to the literature on the economic effects of globalization. We consider our main empirical contribution to be the finding that globalization simultaneously promotes convergence across countries and divergence within countries, thereby increasing the relative importance of national inequalities for global inequality. Existing work has examined this topic descriptively (Lakner and Milanovic 2016; Milanovic 2016; Ravallion 2018). Other related work has either focused on globalization's effect on inequality within countries or, separately, on its effect on aggregate growth (e.g., Dorn et al. 2021; Dreher 2006; Dreher and Gaston 2008). Our results speak to these two strands of the literature, which are often separate (see Artuc et al. 2019; Galle et al. 2023, for exceptions). As regards evidence on the effect of globalization on inequality within countries, our results support the dominant view that globalization increases inequality within countries (see Goldberg and Pavcnik 2007, Harrison et al. 2010 Kanbur 2015, Helpman 2016, de Haan and Sturm 2017, and Heimberger 2020 for reviews). A key result of our analysis is that this change in relative incomes is, on a global average, driven by absolute income gains for the rich – in particular for the richest ten percent – and not by income losses for the poor. As regards evidence on aggregate growth effects of globalization, results support the dominant view of a positive effect (see Prasad et al. 2007, Grossman and Helpman 2015, Hsieh et al. 2019 and IMF, World Bank, WTO 2017 for reviews). To this literature, we add that globalization's effect on aggregate growth diminishes along the globalization process and is smaller in more unequal countries. This result supports the perspective that very high levels of globalization – or "hyperglobalization" (Rodrik 2011) – can be associated with stagnating or declining output (Cordella and Ospino 2017; Ghosh et al. 2016; Rodrik and Subramanian 2009) and that efficiency losses can result from high levels of (globalization-induced) inequality (Alesina and Rodrik 1994; Antràs et al. 2017; Arcand et al. 2015; Berg et al. 2018; Galor and Moav 2004).

Methodologically, we add to the literature that aims to estimate causal effects of globalization. In recent years, a large empirical literature emerged that uses methods for causal inference to study various dimensions of globalization. Among the dimensions studied are trade volumes (Egger et al. 2019; Felbermayr and Gröschl 2013), capital account liberalization (Furceri and Loungani 2018), changes in tariffs (Fajgelbaum et al. 2020; Topalova

2010; Topalova and Khandelwal 2011), import competition (Autor et al. 2013), exporting (Klein et al. 2013), capital flows (Behar 2016; Jaumotte et al. 2013; Meschi and Vivarelli 2009), export quota reforms (Khandelwal et al. 2013), and travel (Campante and Yanagizawa-Drott 2018). Like these contributions, we focus on causal identification, but in contrast to them, we estimate globalization's effect on incomes when understood as a process consisting of multiple interconnected components, rather than disentangling individual mechanisms. We thus speak to previous research based on multidimensional measures of globalization – including trade and finance, flows and regulations – which is so far often limited to providing conditional correlations (see Potrafke 2015, for a review). The advantage of treating economic globalization as a multidimensional process helps account for the possibility that the comprehensive concept may be more than the sum of its constituent parts, solves simultaneity issues, and is also closer to the common usage of the term 'globalization' than any individual indicator. The obvious downside of such an approach is its limited value for identifying the more fine-grained mechanisms underlying the broad effects we find. Research on individual economic processes that form part of globalization are thus important complements to this paper.

The remainder of this paper proceeds as follows. In Sect. 2, we describe our data and the identification strategy for the empirical analysis. Sect. 3 presents the results of the empirical analysis. In Sect. 4, we present our theoretical model that helps rationalize our empirical findings. Sect. 5 concludes.

2 Data and method

2.1 Outcomes

Our goal is to study how income gains and losses from globalization are globally distributed among individuals across and within countries. To do so, we consider multiple outcome variables. First, we look at the average per capita growth rate of a country's gross domestic product (GDP) to examine how average income levels in countries are affected at different stages of the globalization process. GDP figures are taken from the World Development Indicators (World Bank 2017a), and we run robustness tests with the Penn World Tables (Feenstra et al. 2015). Second, we go beyond country means and look at the Gini index of income inequality to see how globalization affects the distribution of income within countries. We use data on inequality of gross incomes from the distributional national accounts (DINA) of the World Inequality Database (WID, Piketty et al. 2018; Alvaredo et al. 2020), from the Standardized World Income Inequality Database (SWIID) (Solt 2016), as well as from PovcalNet (World Bank 2017b), and All the Ginis (ATG) (Milanovic 2014). As a third step, we look at income growth by income decile groups within countries to see how different parts of the income distribution are affected in absolute terms and in relation to each other. These data are taken from the WID's DINAs in the baseline and from the Global Income and Consumption Project (GCIP, Lahoti et al. 2016) for robustness.

The use of these data comes with the typical caveats. GDP and growth figures for many low-income economies have repeatedly been criticized for being inaccurate (Jerven 2013). Data on income inequality are often considered problematic because they require fine-grained microdata, which were not gathered frequently and reliably enough in earlier periods, particularly for many developing countries. This limits data coverage. Furthermore,

for many countries the data underlying the inequality measures are based on different measurement methods (e.g., household level vs. individual level, income vs. consumption, net income vs. market income). This limits data comparability. The existing datasets deal with these issues in different ways: PovcalNet and ATG disregard the country-year observations for which no or no satisfactory data are available. If multiple measures exist for a given country-year observation the score with the highest quality is selected ("choice by precedence") (Milanovic 2014; World Bank 2016). SWIID and GCIP apply interpolation and imputation methods that use the available information from multiple sources to calculate estimates for some missing country-year observations to increase coverage and adjust other estimates to increase comparability (Lahoti et al. 2016; Solt 2016). WID data are based on the DINA (distributional national accounts) method (Piketty et al. 2018; Alvaredo et al. 2020). As this method seeks to ensure coherence between income data from national accounts and from surveys, it is ideally suited for our purpose. We use WID and SWIID data for our baseline regressions, but also show that our results are robust to using data from PovcalNet and ATG, and GCIP.[2] We thus make sure that our analysis is based on the most standard, most reliable, and most up-to-date data sources that currently exist for a large panel of countries. In most periods, the data cover more than 80 percent of the global population.

2.2 Measuring globalization

A key challenge for any study investigating the effects of globalization is the question of how to define and measure this multifaceted concept. We follow a long tradition of research that understands globalization as a process "that erodes national boundaries, integrating national economies, cultures, technology, producing complex relations of mutual interdependence" between actors across the globe (Norris 2000, p. 155). More specifically, we focus on the 'economic' rather than on the 'political' or 'social' dimension of globalization (Gygli et al. 2019; Keohane and Nye 2000). Research generally underlines that the concept of 'economic globalization' is multidimensional, covering flows of goods and capital, and containing both a *de jure* dimension (i.e., the amount of legal restrictions

[2] We report the results of these robustness regressions in Sect. 3.4 and Appendix 5. We use both kinds of data because we acknowledge that there are trade-offs between coverage, comparability, and precision of inequality data. For the purpose of our study, the bias resulting from not being able to consider a large number of country-period observations is arguably more severe than larger measurement error in the dependent variable: While inequality data is unlikely to be missing at random (potential correlates include, for instance, the quality of institutions), we have no reason to expect a systematic measurement bias in either direction that results from interpolation and imputation and is correlated with our explanatory variables of interest. This is the reason why we aim to maximize coverage in the baseline. To be sure, measurement error is likely to be larger when interpolated and imputed values are used but this only increases standard errors and reduces the likelihood of detecting statistically significant effects even if they exist. Our focus on five-year-averages further mitigates this concern. In contrast to studies that aim to report exact figures for country-year specific levels of inequality our focus is on establishing broad long-term links between trends in globalization and inequality for which some idiosyncratic imprecision for individual observations is less of a problem. Note that the correlation between the Ginis taken from the SWIID and the Ginis taken from PovcalNet and ATG is $r = .89$ in our sample. For recent contributions to the discussion on cross-national inequality data see Ferreira, Lustig, and Teles (2015), Jenkins (2015), Solt (2015), and World Bank (2016). For a recently published study that is closely related to ours and based on the SWIID, see Furceri and Loungani (2018).

Table 1 Collinearity of globalization indicators

Pairwise correlations (r) (N = 697)	Trade (% GDP)	FDI (% GDP)	Tariff reduction	Capital account liberalization
Trade (% GDP)	1.00	0.59	0.35	0.30
FDI (% GDP)	0.59	1.00	0.37	0.38
Tariff reduction	0.35	0.37	1.00	0.57
Capital account liberalization	0.30	0.38	0.57	1.00

Unit of observation in Table 1 and Fig. 1 is the country-period (5-year-averages). Data are from Gygli et al. (2019)

to economic flows), and a de facto dimension (the actual amount of these flows) (Dreher 2006).

This multidimensionality is a challenge for estimating the overall effects of economic globalization. A single indicator (e.g., trade as a share of GDP) is unlikely to be representative of this multidimensional process and of what people usually think of as economic globalization. Adding multiple indicators to the statistical analyses, however, creates collinearity problems as the individual indicators are highly correlated with each other. In joint regression analyses their variations would thus overlap to a substantial extent. We illustrate this issue in Table 1 and Fig. 1.

Table 1 shows pairwise correlations between four key indicators of economic globalization: measures of trade and FDI volumes as well as tariff reduction and capital account liberalization. All correlation coefficients in Table 1 are positive and between 0.30 and

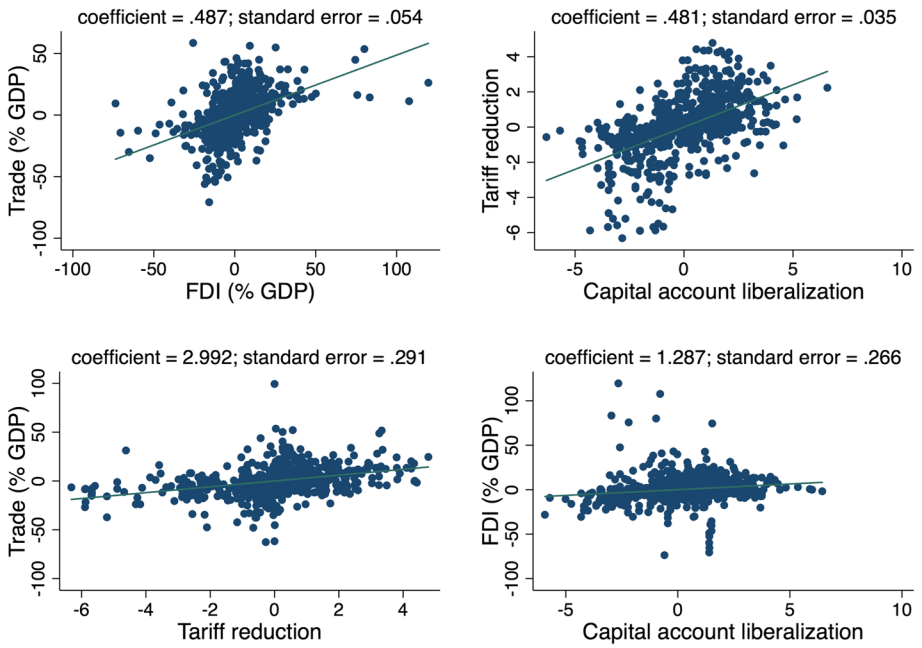

Fig. 1 Collinearity of globalization indicators. Note: Added-variable-plots of OLS-FE regressions of the variable plotted on the y-axis on the variable plotted on the x-axis controlling for country fixed effects

0.59. Figure 1 shows that these relatively strong, positive associations hold when unobserved country-specific, time-invariant heterogeneity is netted out by means of country fixed effects. In addition to the association between the two de facto and the *de jure* variables, the figures also show the conditional correlations of the two variables related to trade (trade and tariff reduction) as well as of the two variables related to finance (FDI and capital account liberalization). In sum, these observations suggest that the individual subcomponents of economic globalization are highly collinear.

In addition to the facts that one indicator does not capture the multidimensionality of economic globalization and that its overall effect may be different from the sum of the effects of its constituent parts, this collinearity is the key reason why we follow the empirical literature that uses composite indices to measure globalization. The most widely used among them has long been the 'KOF Index of Globalization' (Dreher 2006; Dreher et al. 2008).[3] This popular index was revised comprehensively by Gygli et al. (2019) to cover a substantially larger amount of globalization indicators than the original version. By means of a principal component analysis yielding weights for each indicator this index combines 14 prominent measures of economic globalization (trade in goods, trade in services, trade partner diversity, foreign direct investments, portfolio investment, international debt, international reserves, international income payments, trade regulations, trade taxes, tariffs trade agreements, investment restrictions, capital account openness, international investment agreements). The index ranges from 0 (no globalization) to 100 (maximum globalization) and is typically slow to change within countries: its median (mean) change from one period to the next is 2.1 (2.9) points.[4] To our knowledge, this study is the first to use this new KOF index for examining the distributional effects of globalization.

2.3 Descriptive evidence

To give a first impression of the main data used in this study, Fig. 2 shows how levels and over-time changes of globalization correlate with levels and over-time changes of income levels. Panel A shows a strong positive cross-country correlation of globalization and GDP per capita levels. Panel B plots the within-country change of globalization between 1990 and 2014 against GDP per capita growth, showing that countries that globalized more over also grew more strongly in this period.[5]

Figure 3 repeats the same analyses for inequality as measured by the Gini index of market income. Panel A shows a positive association between globalization and market inequality across countries, while panel B points to the same positive association when over-time variation within countries is looked at. In sum, increases in globalization tend to coincide with increases in both income levels and income inequality. These associations obviously provide only descriptive and correlational evidence. The next section turns to a more rigorous econometric analysis.

[3] More than 100 studies use the KOF index. Potrafke (2015) provides a survey of the literature using this index.

[4] In Appendix 2 we illustrate and describe the main trends of globalization across countries that this index captures.

[5] We use values from 1990 for this figure because this allows us to include more countries, especially from the developing world. Figures with 1970 or 1980 as starting years look very similar.

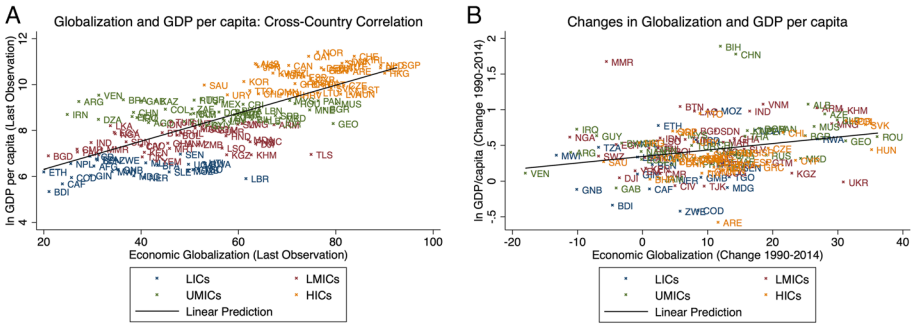

Fig. 2 Descriptive evidence: Globalization and growth. Note: Correlations of (over-time changes of) economic globalization and GDP per capita. Each country's income group according to the World Bank's 2015 classification of low-income countries (LICs), lower middle-income countries (LMICs), upper middle-income countries (UMICs) and high-income countries (HICs) is also indicated. **Panel A**: Cross-country correlation of globalization and GDP per capita (latest values). **Panel B**: Correlation of over-time changes of globalization and GDP per capita (between 1990 and 2014)

2.4 Identification

We are interested in panel regressions of the following type:

$$y_{d,i,t} = \beta g_{i,t-1} + \boldsymbol{X'}_{i,t-1}\delta + \mu_i + \vartheta_t + \epsilon_{i,t} \tag{1}$$

where y represents one of the dependent variables of interest (i.e., income growth, income inequality, mean income growth of decile group d), g denotes the globalization measure, and $\boldsymbol{X'}$ is a vector of control variables, which we describe below. μ_i and ϑ_t are full sets of country fixed effects and period fixed effects, respectively, and ϵ describes the error term. All variables enter as averages of five-year-periods (indicated by t) in the given country (indicated by i). Our sample covers a maximum of 141 countries between 1970 and 2014.

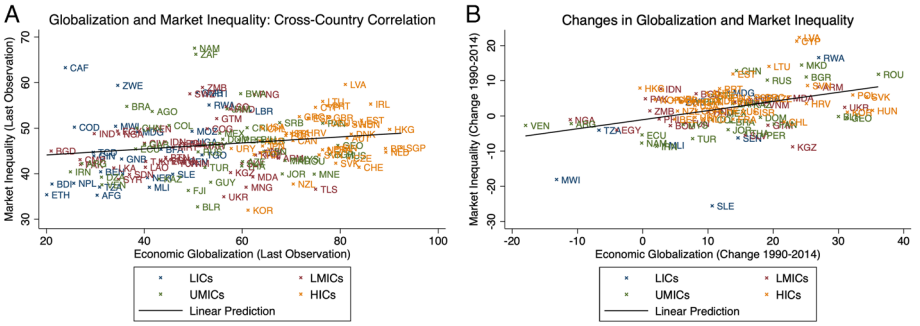

Fig. 3 Descriptive evidence: Globalization and inequality. Note: Correlations of (over-time changes of) economic globalization and the Gini index of market inequality. Each country's income group according to the World Bank's 2015 classification is also indicated. **Panel A**: Cross-country correlation of globalization and inequality (latest values). **Panel B**: Correlation of over-time changes of globalization and inequality (between 1990 and 2014)

In additional regressions, we also include the square of g to allow for nonlinear effects of globalization.[6]

Initially, we run standard two-way fixed-effects (TWFE) regressions to estimate the conditional correlations between changes in globalization and the outcome variables by OLS. Even though such conditional correlations are interesting in themselves, we cannot exclude the possibility that these correlations are driven by omitted variables or reverse causality in this setting. In additional regressions, we address this potential endogeneity of globalization by means of IV regressions in which g is substituted by $\widehat{g}$ denoting the fitted values of a first-stage regression of g on an excluded IV as well as $\boldsymbol{X'}$, μ_i, and ϑ_t.[7]

$$y_{d,i,t} = \beta \widehat{g}_{i,t-1} + \boldsymbol{X'}_{i,t-1}\delta + \mu_i + \vartheta_t + \varepsilon_{i,t} \tag{2}$$

Instrumental variable approach Our IV exploits the geographical diffusion of economic liberalization policies that promote economic globalization.[8] According to prominent findings in the political-science literature, policies 'diffuse' across borders due to learning, competition, and emulation processes (e.g., Simmons et al. 2006). Hence, the implementation of economic liberalization policies in a country increases the probability that countries in the geographical vicinity implement similar policies in subsequent periods. As a consequence, economic globalization in a given country is more likely to increase if countries in its geographical vicinity implemented liberalizing policy reforms that promoted economic globalization in the previous period. At the same time, it is unlikely that liberalization policies of other countries in previous periods affect incomes in the given country through other channels than increasing economic globalization in this country. This argument is closely related to the identification strategy in Acemoglu et al. (2019) who, in a similar setting, instrument for democracy with democratizations in geographically close countries. They argue that democratization in nearby countries should affect incomes only through democratization in the given country. In analogy, we argue that economic liberalization policies in nearby countries should affect incomes only through globalization in the given country. As in their setting, we always absorb country fixed effects and period fixed effects and control for initial income and democracy levels.

[6] If there are positive but diminishing marginal returns to globalization, not allowing for nonlinearity will lead to a downward bias. The size of this bias will increase over time as average globalization scores have increased. See Arcand et al. (2015) for details and an application of this approach in a related setting.

[7] An alternative empirical strategy of addressing endogeneity, which we explicitly decide against, is employing the difference or system generalized methods of moments (GMM) estimators proposed by Arellano and Bond (1991) and Blundell and Bond (1998). These GMM estimators instrument potentially endogenous explanatory variables using lagged values and first differences of the same variables. Having been used frequently in related research (particularly in growth empirics), the recent literature has become highly skeptical as to whether the underlying assumptions are fulfilled in most settings: Bazzi and Clemens (2013) show that weak instrument bias is widespread and often masked when employing the system GMM estimator. Kraay (2015) demonstrates the fragility of estimated effects when accounting for this bias. In addition, many scholars have raised doubts as to whether the internal instruments used in GMM estimations actually fulfill the exclusion restriction in most growth regressions (Acemoglu 2010; Deaton 2009).

[8] Note that we use the term "economic liberalization policies" to refer to the de jure dimension of economic globalization, i.e., policies and reforms that liberalize economic activity across borders, in order to differentiate it from the concept "economic globalization," which covers both its de jure and its de facto dimension.

Specifically, we instrument the globalization score of country i (with $i \in I$, the set of countries) at time t with the inverse-distance-weighted index of liberalization policies ($lib_{j,t-1}$) of other countries $j \neq i$ (with $j, i \in I$) in period $t-1$:

$$IV_{i,t-1} = Neighborhood\ Liberalization_{i,t-1} = \frac{\sum_{j \neq i} \left(\frac{1}{distance_{i,j}} lib_{j,t-1} \right)}{\sum_{j \neq i} \frac{1}{distance_{i,j}}} \forall j, i \in I \quad (3)$$

As a measure of liberalization policies (lib_{jt-1}), we use the *de jure* dimension of the KOF index of economic globalization. This composite index combines a total of seven measures of legal restrictions to trade and financial flows. It is only based on laws and does not capture any economic flows. The geographical distance between two countries i and j ($distance_{ij}$) is the population-weighted distance between all agglomerations of the two countries (Mayer and Zignago 2011). Our first-stage regression is thus:

$$g_{i,t-1} = \alpha\, IV_{i,t-2} + \boldsymbol{X'}_{i,t-1}\gamma + \mu_i + \vartheta_t + u_{i,t} \quad (4)$$

We use this regression to calculate fitted values $\hat{g}$ for the second stage of our 2SLS panel regressions (7). We run these regressions with and without the control variables $\boldsymbol{X'}_{i,t-1}$ (described below), because we assume the exclusion restriction to hold without conditioning on them. Formally, the identifying assumption is:

$$E\left(IV_{i,t-2}\varepsilon_{i,t} | \mu_i, \vartheta_t\right) = E\left(IV_{i,t-2}\varepsilon_{i,t} | \mu_i, \vartheta_t, \boldsymbol{X'}_{i,t-1}\right) = 0 \quad (5)$$

Plausibly exogenous In robustness regressions, we relax this assumption and assume instead that our exclusion restriction is only "plausibly exogenous" (Conley et al. 2012); i.e., the expression in Eq. 5 is only assumed to be close to 0 and not exactly equal to 0. Arguably, this is a plausible assumption in macroeconomic settings like ours, where one can only claim to approximate causal effects. We then estimate the extent to which this exclusion restriction can be violated without threatening our inferences. These estimations suggest that the IV could have a considerable direct effect without changing the results (see Figure A4 in the Appendix).[9] At the same time, it is worthwhile to mention that all main findings that emerge when estimating by IV also emerge when estimating by OLS.

Control variables In the choice of our country-period-specific control variables, $\boldsymbol{X'}_{i,t-1}$, we aim to be as close to the existing, related literature as possible.[10] As is common in most growth regressions we include the natural logarithm of GDP per capita (in constant US dollars) of the previous 5-year-period to control for convergence as predicted by the Solow model. In the inequality regressions we additionally include a squared term of logged GDP per capita to control for a potential non-linear association between income levels and income inequality as predicted by Kuznets (1955).[11] Additional standard control variables of growth regressions that we add include the rate of population growth, average

[9] In addition to concerns regarding exclusion restrictions, weaknesses of IV-based strategies include their limitation of only identifying a Local Average Treatment Effect (Imbens and Angrist 1994) and their sensitivity to outliers (Young 2019). We further address these limitations when discussing results and their robustness in Sect. 4.

[10] See, for instance, Acemoglu et al. (2019), Barro (2003), and Dreher (2006).

[11] See also Milanovic (2016).

life expectancy as a proxy for the country's health level, and average years of schooling as a proxy for its education level. We also control for political liberalization by adding the Polity IV index to our control vector. Arguably, controlling for political liberalization is relevant in this setting, as it makes sure that the estimated effect of economic globalization is isolated from the effect of potentially simultaneous political liberalization policies. For all variables we use the average of the previous five-year period.[12]

When applying the IV approach we also run regressions without these control variables. They are then not necessary for identification because we assume that our exclusion restriction holds without conditioning on these covariates. Furthermore, some of the covariates could themselves be outcomes of changes in globalization. If globalization, for instance, increases health or education levels, which in turn are plausible determinants of income levels, then controlling for these variables would prevent the regression from attributing this effect to the estimated effect of globalization. Our initial regressions, thus, include either no or only a parsimonious set of one-period-lagged controls. Nevertheless, we show that our results hold with and without the baseline controls and when adding more extensive sets of controls including investment, debt, and government expenditure (all as a share of GDP).

In addition to these variables, we exploit the panel structure of our data and control for period fixed effects and country fixed effects. The former control for all global time trends such as economic and technological shocks.[13] The latter absorb all country-specific time-invariant characteristics such as a country's geography, colonial history, legal origin, natural resource endowment, etc.

3 Empirical results

3.1 Income growth

We begin our regression analyses by looking at the effect of economic globalization on a country's rate of economic growth in the subsequent five-year period. In general, we find that globalization increases income growth per capita. These gains from globalizing, however, get smaller the more globalized the country already is. There are 'diminishing marginal returns to globalization.'

In Table 2, we report the results of two-way fixed-effects regressions of five-year growth rates on levels of economic globalization. In column 1, we estimate by OLS, absorb country and period fixed effects, and control for the level of GDP per capita in the previous period. Column 2 adds the set of control variables described above. The covariates that are

[12] See Appendix 3 for sources and descriptive statistics of all variables used in this analysis.

[13] We decide against controlling for a country-period specific control variable for technology because, as mentioned above, we consider technological diffusion, at least on the macro level, to be inextricably linked to economic flows. Arguably, the existing technology is the same for all countries in a given year and thus in principle available. What differs, however, is countries' *access* to this technology. This access, in turn, is a direct function of a countries' economic openness and controlling for it would take out the arguably important effects of globalization operating via enhancing such access to globally available technology. This is consistent with Grossman and Helpman (1991, 2015), who consider and model the diffusion of technology as an important channel for the effect of trade on incomes, and with Rodrik (2017, p. 10), who argues that for effects on wages "a sharp distinction between trade and technology has become harder to make." See also Ebenstein et al. (2014). For studies aiming to disentangle these effects see Dabla-Norris et al. (2015) and Jaumotte et al. (2013).

Table 2 Globalization and income growth

Estimation Method	(1) OLS	(2) OLS	(3) IV	(4) IV	(5) OLS	(6) IV
Economic Globalization$_{t-1}$	0.0027**	0.0021*	0.0011	0.0011	0.0157***	0.0588***
	(0.0012)	(0.0012)	(0.0036)	(0.0034)	(0.0038)	(0.0142)
Economic Globalization $_{t-1}^2$					-0.0001***	-0.0004***
					(0.0000)	(0.0001)
GDP/capita (ln)$_{t-1}$	-0.2550***	-0.2488***	-0.2485***	-0.2442***	-0.2523***	-0.3249***
	(0.0409)	(0.0406)	(0.0463)	(0.0456)	(0.0354)	(0.0497)
Population Growth (%) $_{t-1}$		-0.0052		-0.0051	0.0010	0.0132
		(0.0131)		(0.0130)	(0.0130)	(0.0134)
Education$_{t-1}$		-0.0115		-0.0118	-0.0093	-0.0015
		(0.0113)		(0.0111)	(0.0100)	(0.0137)
Democracy$_{t-1}$		0.0025*		0.0026*	0.0008	-0.0041
		(0.0014)		(0.0014)	(0.0015)	(0.0027)
Life Expectancy $_{t-1}$		0.0072***		0.0074***	0.0053**	-0.0014
		(0.0019)		(0.0020)	(0.0021)	(0.0038)
Period FE and Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	787	787	786	786	787	787
R^2	0.266	0.288	0.263	0.287	0.321	0.269
First-Stage Estimates						
Neighborhood Liberalization $_{t-2}$			0.9269***	0.9536***		1.3386**
			(0.1563)	(0.1556)		(0.5821)
K-P underidentification (p)			0.000	0.000		0.000
K-P weak identification (F)			35.166	37.554		7.132

Dependent variable: GDP/capita growth. Averages of five-year periods. OLS and 2SLS fixed effects regressions. Standard errors clustered at the country-level in parentheses. Full first-stage estimates are reported in Table A1. Significance levels: * p < .10, ** p < .05, *** p < .01

statistically significant at conventional levels enter with the expected sign: Higher life expectancy and more democratic institutions are associated with higher per capita growth rates.

The coefficient of interest indicates a positive, statistically significant, but economically small conditional correlation between economic globalization and growth in these two regressions. A one-point increase in globalization is associated with an increase in the five-year growth rate by 0.2–0.3 percentage points. In column 3, we apply our IV strategy to account for potential endogeneity. The first-stage diagnostics show that the instrument is relevant: The coefficient of the IV in the first stage ($\alpha = 0.93$) is statistically significant ($t = 5.93$, $p < 0.001$) and the Kleibergen-Paap (K-P) F-statistics comfortably pass standard tests of instrument relevance.[14] This implies that the implementation of economic liberalization policies in a country's neighborhood strongly predicts an increase in the country's

[14] The Kleibergen-Paap weak identification F-statistics show that the IV surpasses the relevant thresholds calculated by Stock and Yogo (2005), i.e., 16.38 for the regressions with one endogenous regressor and 7.03 for the regressions with two endogenous regressors. Surpassing these critical values ensures that the 2SLS size distortion potentially resulting from weak identification is smaller than 10 percent. In the regressions with two endogenous regressors (globalization and its squared term) the squared IV is the second excluded instrument. Full first-stage estimates are reported in Table A1.

level of globalization in the subsequent period. Adding control variables (column 4) barely affects the estimates, suggesting that this association is not due to observable confounders. In the second stage, the coefficient on globalization loses statistical significance at conventional levels as standard errors get larger when this approach is used in the linear specifications (column 3–4). However, when allowing for nonlinearity, it becomes obvious that the linearity assumption in columns 1–4 masks a strong heterogeneity. In both OLS and IV estimations (columns 5 and 6), the coefficients are positive on the linear term, negative on the squared term, and both are statistically significant ($p < 0.001$). Together, these estimates provide strong evidence for significantly positive, yet diminishing marginal effects of globalization on growth.

Figure 4 visualizes the marginal effects based on our preferred model (column 6). It shows that in countries where the level of globalization is low, increasing globalization leads to substantially stronger growth. The higher globalization already is, the smaller the effect becomes. The growth effect stops being statistically significant at the five percent level at a globalization score of about 66 – roughly the current level of countries like Poland, Chile, and Australia. Our results suggest that countries with this relatively high[15] degree of economic globalization do, on average, not gain additional significant income growth from globalizing further.[16] For countries with lower globalization scores, however, the growth effects are economically substantial. As the vertical lines in the figure indicate, the average low-income country in the last sample period – as an example take Nigeria, which had an average globalization score of 41 in the most recent period – would be expected to increase its total five-year-period growth rate by about 2 percentage points when increasing globalization by one point. For the average middle-income country, the expected growth effect is estimated at approximately 1 percentage point. This is an economically substantial effect, considering that the mean (median) increase in the economic globalization index from one period to the next is about three (two) points.

As an alternative to estimating this non-linearity by means of a quadratic term, we split the sample at the median level of initial globalization (48.6) in Table A2 and Figure A2. Consistent with the baseline estimation, the results show a large, positive, and statistically significant effect of globalization in the sample with a low level of initial globalization ($\beta = 0.40$ [0.17, 0.63], $p = 0.001$). In the high-globalization sample, the effect is close to zero, and not statistically significant at conventional levels despite being precisely estimated ($\beta = -0.003$ [-0.008, 0.001], $p = 0.162$).

In sum, the growth effect of economic globalization is positive, but also diminishing with an increasing degree of globalization. While weakly globalized countries substantially benefit from globalizing, countries gain considerably less the more they are already integrated in the global economy. For the world's most globalized countries, there is no evidence for a positive effect of globalizing further.

[15] About 18 percent of country-period observations in the sample surpass the value of 66.

[16] Note that Fig. 7 plots negative effects for values that are close to the theoretical maximum of the globalization measure. As the underlying histogram shows, the number of observations that actually reach these high values is close to zero. We thus do not interpret this as evidence for a negative effect at very high levels of globalization.

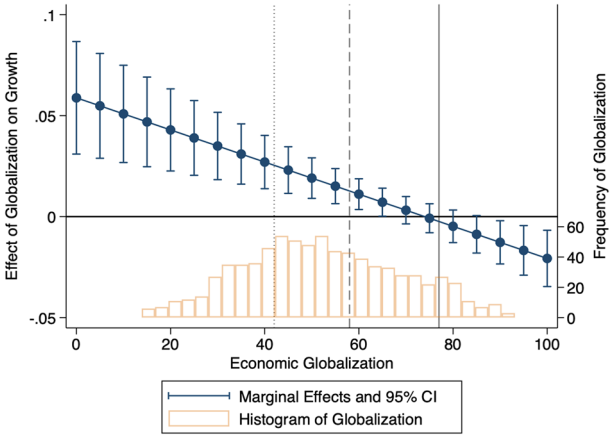

Fig. 4 Diminishing marginal returns to globalization. The figure visualizes the result of the growth regression reported in Table 3, column 6. The blue line depicts the marginal effect (and 95 percent confidence intervals) of a one-point-increase in economic globalization depending on a given level of economic globalization. A histogram of the distribution of globalization levels across the sample is shown below. The three vertical lines indicate the current average globalization score of LICs (dotted), MICs (dashed), and HICs (solid)

3.2 Income inequality

Having analyzed how the gains from globalization are distributed *across* countries, we now turn to the distribution of these gains *within* countries. In general, our findings indicate that globalization leads to higher income inequality within countries. These results, which are presented in Tables 3, show that there is a robustly positive and statistically significant effect of economic globalization on the Gini coefficient of gross incomes.

Table 3 is structured analogously to Table 2. In columns 1 and 2, we report the results of OLS fixed-effects regressions with and without control variables. The control variables enter with the expected signs. Higher education levels and more democratic institutions are weakly associated with lower levels of income inequality. The coefficient on globalization indicates a positive association between economic globalization and the Gini index. When endogeneity is accounted for by means of the IV strategy in columns 3 and 4, we continue to find this positive effect. The inclusion of control variables does not affect this results in either specification. In analogy to the growth regressions, we also allow for nonlinear effects in columns 5 and 6, but there is no empirical evidence for a significant nonlinearity of the effect.

According to these estimates, a one-point increase in economic globalization leads to a rise in the Gini index of about 0.4–0.5 points. This is an economically substantial effect, considering that the average change in the economic globalization index amounts to an increase of three points per period. According to a method proposed by Blackburn (1989), a change in the Gini coefficient by 1.5 points, which such a change in globalization would approximately induce, is equivalent to an increase in inequality resulting from a lump-sum transfer of 3 percent of the country's mean income from the bottom half of the income distribution to the upper half.

In Appendix 6, we examine differences between inequality before and after redistribution. The evidence suggests that national redistribution policies mitigate – but do not fully prevent – these distributional effects of globalization. Appendix 8 provides suggestive evidence that both the financial dimension and the trade dimension of economic globalization contribute to these distributional effects.

Table 3 Globalization and inequality

	(1) OLS	(2) OLS	(3) IV	(4) IV	(5) OLS	(6) IV
Economic Globalization	0.125**	0.127**	0.457**	0.436**	0.152	0.424
	(0.051)	(0.049)	(0.202)	(0.192)	(0.198)	(0.535)
Economic Globalization^2					-0.000	0.000
					(0.002)	(0.004)
GDP/capita (ln)	-1.393	2.284	0.023	4.395	1.618	4.622
	(7.905)	(7.767)	(8.546)	(8.413)	(9.353)	(13.324)
GDP/capita (ln, squared)	0.371	0.129	0.147	-0.129	0.171	-0.142
	(0.424)	(0.435)	(0.489)	(0.499)	(0.518)	(0.774)
Population Growth (%)		0.325		0.403	0.334	0.399
		(0.396)		(0.383)	(0.410)	(0.415)
Education		-0.600		-0.538	-0.603	-0.538
		(0.402)		(0.392)	(0.403)	(0.392)
Democracy		-0.161		-0.168*	-0.163	-0.167*
		(0.101)		(0.093)	(0.103)	(0.097)
Life Expectancy		-0.021		-0.063	-0.023	-0.062
		(0.127)		(0.128)	(0.129)	(0.138)
Period FE and Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	618	618	618	618	618	618
R^2	0.145	0.167	0.008	0.049	0.167	0.051
First-Stage Estimates						
Neighborhood Liberalization $_{t-2}$			0.807***	0.827***		1.530**
			(0.173)	(0.176)		(0.597)
K-P underidentification (p)			0.000	0.000		0.000
K-P weak identification (F)			21.804	22.152		6.176

Dependent variable: Gini index of net income. Averages of five-year periods. All explanatory variables are lagged by one period. OLS and 2SLS fixed effects regressions. Standard errors clustered at the country-level in parentheses. Full first-stage estimates are reported in Table A3. Significance levels: * $p<.10$, ** $p<.05$, *** $p<.01$

3.3 Income growth by country-decile group

Next, we bring our empirical results on growth and inequality together. Instead of treating them as two separate outcomes, we substitute the dependent variable by changes in incomes of various parts of the income distribution. More specifically, we use income shares and income growth of country-period-decile-groups based on the distributional national accounts (DINA) from the World Inequality Database (WID) and from GCIP for robustness. The results from these analyses are consistent with the above findings and suggest that the gains from globalization are positive and substantial but concentrated at the top of the national income distributions. Specifically, globalization promotes inequality by increasing incomes at the top rather than by decreasing incomes at the bottom and it particularly benefits the top 5% by increasing their income share relative to the bottom 95%.

Table 4 reports the results of our preferred inequality regression (IV-estimation, baseline controls) when the outcome variable is the period-specific income share of income decile groups 1–10 (columns 1–10). Columns 11–13 look inside the top decile group and

Table 4 Globalization and income shares by decile group

Outcome Variable: Income Share of:	Decile Group 1	Decile Group 2	Decile Group 3	Decile Group 4	Decile Group 5	Decile Group 6	Decile Group 7	Decile Group 8	Decile Group 9	Decile Group 10	P90-P95	P95-P99	P99-P100 (top 1%)
Economic Globalization	-0.005***	-0.026**	-0.042***	-0.046***	-0.048***	-0.044***	-0.040***	-0.022	0.009	0.265***	-0.009	0.034	0.241***
	(0.002)	(0.011)	(0.016)	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.025)	(0.101)	(0.021)	(0.033)	(0.075)
Observations	777	777	777	777	777	777	777	777	777	777	777	777	777
First-stage Estimates													
Neighborhood Liberalization $_{t-2}$	0.834***	0.834***	0.834***	0.834***	0.834***	0.834***	0.834***	0.834***	0.834***	0.834***	0.834***	0.834***	0.834***
	(0.164)	(0.164)	(0.164)	(0.164)	(0.164)	(0.164)	(0.164)	(0.164)	(0.164)	(0.164)	(0.164)	(0.164)	(0.164)
K-P weak identif. (F)	25.974	25.974	25.974	25.974	25.974	25.974	25.974	25.974	25.974	25.974	25.974	25.974	25.974

2SLS regressions. Averages of five-year periods. All explanatory variables are lagged by one period. Standard errors clustered at the country-level in parentheses, significance levels: * $p<.10$, ** $p<.05$, *** $p<.01$. All regressions include country FE, period FE, the lagged baseline control variables and the lagged income level of the respective income quantile

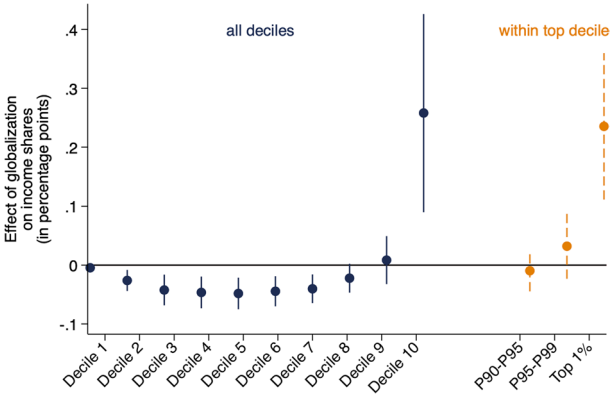

Fig. 5 Relative income shares: Note: Coefficient plot corresponding to Table 5. 90% confidence intervals

consider the income shares of the top 1%, the next 4% (P95-P99), and the 5% below (P90-P95). Consistent with the previous results we find that, in relative terms, people at the bottom of the income distribution lose while those at the very top benefit most from economic globalization. What stands out in this analysis, is that only the richest decile group gains significantly in relative terms. All other decile groups face statistically significant relative losses (D1-D7) or are not significantly affected (D8-D9).[17] When further disaggregating the data and looking inside the top decile group, it becomes evident that relative gains are also unequally distributed within the top decile group. Gains in income shares are only positive for the top 5% and are statistically significantly positive only for the top 1%. Specifically, a one-point increase in the globalization score increases the top 1 percent's income share by about 0.24 percentage points. Figure 5 visualizes these effects for all income groups. These results support and add to research documenting that recent periods of income growth have disproportionally benefitted the very top of the income distribution in several economies (Alvaredo et al. 2017b; Piketty et al. 2018). Our estimates suggest that economic globalization is one of the factors contributing to this trend.

In the Appendix, we repeat the same analysis with data from GCIP and find very similar results (Table A8). Furthermore, we also conduct this analysis using absolute decile-group-specific income growth rather than relative income shares as outcome variables (Table A4). These regressions show changes in absolute incomes rather than in relative incomes shares. The most notable result of this analysis is that all coefficients are positive.[18] While the point estimates for decile-group-specific growth effects are larger for higher decile groups than for lower decile groups, there is no evidence that globalization reduces incomes for any income group across countries. Hence, the rise in national inequalities is driven by rising incomes for the rich rather than by falling incomes for the poor. This is in line with the results on income growth across and within countries.

[17] Multivariate two-sided Wald-tests show that the coefficients for decile groups 1–9 are all statistically significantly different from the coefficient for decile group 10 at the five percent level.

[18] A multivariate two-sided Wald-test rejects the null hypothesis that all ten coefficients for the ten decile groups are zero with a p-value of 0.0001. A regression that uses the mean income growth across all decile groups as the dependent variable yields a positive coefficient that is statistically significant at the 5-percent level.

3.4 Robustness

To examine the robustness of our results, we conduct several tests that fall into three categories. First, we challenge our identification strategy and show that results are robust to relaxing the exclusion restriction. Second, our results are robust to using alternative measures and alternative datasets from other sources for all key concepts in our model (growth, inequality, and globalization). Third, we run a wide range of sensitivity tests and additional models with alternative specification choices and find that results remain stable. These robustness tests are reported and discussed in detail in Appendix 5.

4 Extension: a simple quantitative model

As an extension, we propose a simple quantitative model that helps rationalize our results from a theoretical perspective. We show that a basic open-economy model produces results that are consistent with the results of the empirical analysis under weak assumptions.

4.1 Economic environment

We consider an open-economy model formed by two symmetric regions like Antràs et al. (2017). Agents in each region produce a differentiated good (intermediary inputs) according to a linear technology in their labor effort. The aggregate final goods produced in different regions are perfect substitutes and, due to symmetry, are not traded across regions. Conversely, all tasks worldwide are imperfectly substitutable. Hence, trade integration allows the final good to be produced more efficiently by combining a greater diversity of tasks provided by agents as in Melitz (2003).

Agents can market their task in the local market at no cost, while in order to sell the output of their task to another market they pay a fixed and a variable cost. Agents differ in their productivity to produce their good which generates heterogeneity in the decision to export.

Preferences Agents have preferences over consumption of an aggregated good c and labor l:

$$u(c, l) = c - \frac{l^{\gamma}}{\gamma} \tag{6}$$

where the parameter $\gamma \geq 1$ controls the Frisch elasticity of labor supply, which is given by $1/(\gamma - 1)$ and is decreasing in γ.

Technology Agents have access to a linear production function that uses labor inputs. They produce output $y = \varphi l$ of their own variety, where φ is the individual intrinsic ability, which is distributed according to $H(\mu, \sigma^2)$. Tasks performed by different agents are imperfect substitutes and are combined in the production of the aggregate final consumption good according to

Table 5 Calibration parameters

Parameter	Value	Source
Frisch Elasticity:γ	2.80	Antràs et al. (2017)
Task Elasticity of Substitution:β	0.80	Antràs et al. (2017)
Ability Distribution:μ, σ	0.002, 0.7806	GCIP
Fixed Cost:f	5.15	Arkolakis et al. (2019)
Variable Cost:d	1.37	Bernard et al. (2007)

$$Q = \left(\int y_{\varphi}^{\beta} dH \right)^{1/\beta}, \tag{7}$$

where the parameter $\beta \in [0, 1]$ controls the elasticity of substitution $1/(1-\beta)$ across intermediary inputs.

Trade costs Agents need to pay a fixed trade cost f and a variable cost d in the form of a shipping cost to access international markets. For each $d > 1$ unit of shipped intermediary inputs only one unit reaches the foreign market.

4.2 Optimization problem

Agents choose their labor supply, decide whether to export to foreign markets, and optimally allocate the total output of their intermediary inputs across markets. The demand q of an input is given by:

$$q = Q\left(\frac{p}{P}\right)^{\frac{-1}{1-\beta}}, \tag{8}$$

where p is the price of the input and P is the price of the final good that is normalized to 1.[19] Under this condition, agents' revenue from selling only domestically is given by:

$$r = Q^{1-\beta} y^{\beta}. \tag{9}$$

While agent's revenue from selling to both domestic and foreign markets is given by:

$$r^* = Q^{*1-\beta} \left(\frac{q^*}{d} \right)^{\beta} + Q^{1-\beta} (\varphi l - q^*)^{\beta} - f, \tag{10}$$

where Q^* is the foreign market aggregate demand. Note that in this environment, revenue r^* can be higher when sales occur in domestic and foreign markets, because marginal revenue in each market is higher relative to a situation where all output is sold only in one particular location.

[19] The price of the final good is given by $P = \left(\int p_{\phi}^{-\frac{\beta}{1-\beta}} dH_{\phi} \right)^{-(1-\beta)/\beta}$.

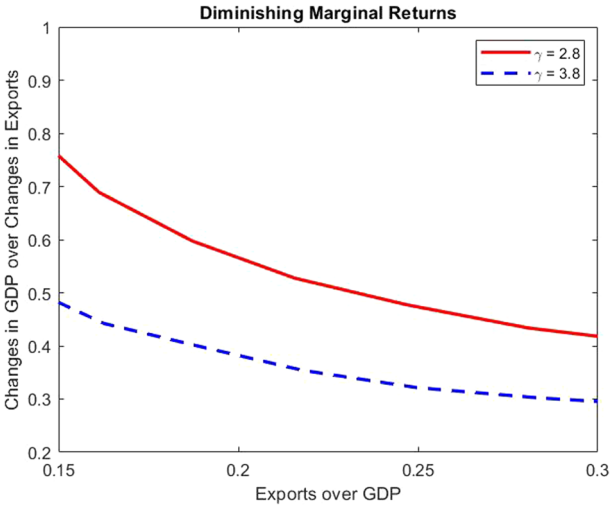

Fig. 6 Income growth across countries. Note: Change in output divided by change in exports from a reduction in the variable trade cost in 0.05 increments. One economy with a high elasticity of labor supply ($\gamma = 2.8$) and one economy with a low elasticity of labor supply ($\gamma = 3.8$)

4.3 Calibration

In order to run a numerical exercise, we calibrate our model to match key moments of the US economy (see Table 5). Two parameters are chosen exogenously: the Frisch elasticity of labor supply γ and the parameter that governs the elasticity of substitution between different tasks β. Following Antràs et al. (2017), we choose γ to be equal to 2.8 and β to be equal to 0.8 resulting in an elasticity of substitution $\frac{1}{1-\beta} = 5$. We assume that the ability distribution H is lognormal. The two parameters that determine the lognormal distribution are calibrated together with the fixed trade cost f and variable cost d to match the average income of each decile group of the US income distribution, the share of exports over output, and the share of foreign exporting firms (Bernard et al. 2007).

4.4 Numerical exercise

For a numerical exercise based on the model, we start from the calibrated economy and reduce the variable trade cost d letting exports increase from 15 to 30 percent of GDP and analyze the impact on income growth across and within countries.Such an increase in the exports-to-GDP ratio from 15 to 30 percent roughly corresponds to the global increase in the exports-to-GDP ratio from 1970 to 2014, our observation period in the empirical analysis below.

Income growth across countries: diminishing marginal returns A reduction in the variable trade cost leads to an increase in the return of exporting. As a result, agents that are already exporting choose to export more (intensive margin) and some agents that were not exporting start to export (extensive margin). As new agents start to export, the final good is produced more efficiently because it is combining a greater diversity of tasks leading to an increase in aggregate demand. Higher aggregate demand benefits all agents in the economy including those that only sell domestically. The impact of reducing the variable cost on

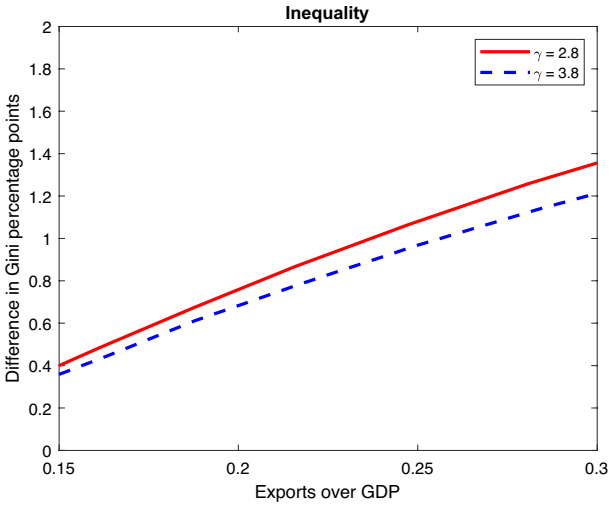

Fig. 7 Inequality within countries. Note: Difference in the Gini between the benchmark economy and economies with lower variable trade costs. One economy with a high elasticity of labor supply ($\gamma = 2.8$) and one economy with a low elasticity of labor supply ($\gamma = 3.8$)

output is positive and exhibits diminishing marginal returns (Fig. 6). As countries increase their openness, the growth rate of the economy relative to the change in exports declines.

These diminishing marginal returns arise from agents' concave labor supply decision. The concavity of the labor supply implies that agents' extra effort to produce an extra unit of output increases with production. To illustrate this mechanism, we simulate the impact of globalization on two different economies: one with a high elasticity of labor supply ($\gamma = 2.8$) and one with a low elasticity of labor supply ($\gamma = 3.8$), where the initial export shares in the two economies are kept the same by adjusting the iceberg cost. As Fig. 6 indicates, the economy with a higher elasticity of labor supply benefits more from trade openness. However, the benefit of openness declines faster in the high-elasticity economy causing larger diminishing marginal returns.

In Appendix 7, we examine an additional corollary of this theoretical framework. The model predicts that the size of the effect depends on initial conditions: the growth gains from globalization will be larger countries with lower inequality. When we bring this prediction to our data, we find empirical support for it. In our sample, the estimated effect of globalization is indeed larger in countries with lower inequality (see Figure A10 and Table A16 in Appendix 7).

Income growth within countries: increasing inequality As a final step of this numerical exercise, we also assess how the income gains in this model are distributed within countries. We find that globalization generates an increase in income inequality because it benefits richer agents more than poor agents. A decline in the trade cost increases the exporting revenue of agents that are already exporting, which are richer. While poorer agents also benefit from an increase in aggregate demand, they benefit less because poor agents only sell on the domestic market. This translates into an increase in inequality. This is visualized in Fig. 7, which plots the difference between the Gini coefficient in the benchmark economy and in increasingly open economies. Again, the exercise is conducted for economies with low and high elasticities of labor supply.

5 Conclusion

Economic globalization – defined as a multidimensional process encompassing the increasing economic importance and legal liberalization of goods and capital flows across borders – leads to substantial income gains for many. These gains, however, are unequally distributed between people around the world. Across countries, globalization substantially increases incomes in countries at early and medium stages of the economic integration process, but the growth effects from further globalizing diminish with increasing levels of globalization. For the most globalized countries, there is no evidence of a positive growth effect. Within countries, globalization increases inequality. Gains from globalization primarily go to the top ten percent of national income distributions and, on average, do not significantly affect incomes of the poor.

These results suggest that globalization is an important force behind the well-established fact that global inequality today is increasingly driven by within-country inequality and to a decreasing extent by between-country inequality. According to our results, globalization promotes *convergence across countries* through a substantial growth effect on countries in the early stage of the integration process, and *divergence within countries* due to a tendency to disproportionally benefit the richest decile group.

The finding of positive yet *diminishing marginal returns to globalization* suggests that the benefits of globalization decrease over the course of the globalization process, while its distributional costs increase. This is consistent with rising skepticism of globalization that is observed in many highly globalized countries. According to our results, it is here that income gains from globalization are small while distributional costs are high. Future research could shed more light on the political implications of the global distributional effects of globalization.

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Data availability The data and code used in this study are available from the corresponding author upon request.

Declarations

Ethical approval Not applicable

Competing interests The authors have no relevant financial or non-financial interests to disclose. The research results and conclusions expressed herein are those of the authors and do not necessarily reflect the view of the IMF, its Executive Board, its Management, or FCDO.

References

Acemoglu, D.: Theory, General Equilibrium and Political Economy in Development Economics. J. Econ. Perspect. **24**(3), 17–32 (2010)
Acemoglu, D., Naidu, S., Restrepo, P., Robinson, J.A.: Democracy Does Cause Growth Suresh Naidu Pascual Restrepo. J. Polit. Econ. **127**(1), 47–100 (2019)
Alesina, A., Rodrik, D.: Distributive Politics and Economic Growth. Quart. J. Econ. **109**(2), 465–490 (1994)
Alvaredo, F., Atkinson, A., Chancel, L., Piketty, T., Saez, E., & Zucman, G. Distributional National Accounts (DINA) guidelines: Concepts and methods used in WID. world. (2020). https://shs.hal.science/halshs-02794308/document
Alvaredo, F., Chancel, L., Piketty, T., Saez, E., Zucman, G.: World Inequality Report 2018. World Inequality Database, Paris (2017a)
Alvaredo, F., Chancel, L., Piketty, T., Saez, E., Zucman, G.: Global inequality dynamics: New findings from WID.world. Am Econ Rev **107**(5), 404–409 (2017)
Antràs, P., de Gortari, A., Itskhoki, O.: Globalization, inequality and welfare. J. Int. Econ. **108**, 387–412 (2017)
Arcand, J.-L., Berkes, E., Panizza, U.: Too Much Finance? J. Econ. Growth **20**(2), 105–148 (2015)
Arellano, M., Bond, S.: Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. Rev. Econ. Stud. **58**, 277 (1991)
Arkolakis, C., Costinot, A., Donaldson, D., & Rodríguez-Clare, A.: The Elusive Pro-Competitive Effects of Trade. The Review of Economic Studies **86**(1), 46–80 (2019)
Artuc, E., Porto, G., Rijkers, B.: Trading off the income gains and the inequality costs of trade policy. J. Int. Econ. **120**, 1–45 (2019)
Autor, D., Dorn, D., Hanson, G.H.: The China Syndrome: Local labor market impacts of import competition in the United States. Am. Econ. Rev. **103**(6), 2121–2168 (2013)
Barro, R.J.: Determinants of Economic Growth in a Panel of Countries. Ann. Econ. Financ. **4**, 231–274 (2003)
Bazzi, S., Clemens, M.A.: Blunt instruments: Avoiding common pitfalls in identifying the causes of economic growth. Am. Econ. J. Macroecon. **5**(2), 152–186 (2013)
Behar, A.: The endogenous skill bias of technical change and wage inequality in developing countries. J. Int Trade Econ. Dev. **25**(8), 1101–1121 (2016)
Berg, A., Ostry, J.D., Tsangarides, C.G., Yakhshilikov, Y.: Redistribution, inequality, and growth: new evidence. J. Econ. Growth **23**(3), 259–305 (2018)
Bernard, A.B., Jensen, J.B., Redding, S.J., & Schott, P.K.: Firms in International Trade. J. Econ. Perspect. **21**(3), 105–130 (2007)
Blackburn, M.L. : Interpreting the Magnitude of Changes in Measures of Income Inequality. J. Econom. **42**(1), 21–25 (1989)
Blundell, R., Bond, S.: Initial conditions and moment restrictions in dynamic panel data models. J. Econ. **87**(1), 115–143 (1998)
Bourguignon, F.: The Globalization of Inequality. Princeton University Press (2015)
Campante, F., Yanagizawa-Drott, D.: Long-range growth: economic development in the global network of air links. Q. J. Econ. **133**(3), 1395–1458 (2018)
Conley, T.G., Hansen, C.B., Rossi, P.E.: Plausibly Exogenous. Rev. Econ. Stat. **94**(1), 260–272 (2012)
Cordella, T., & Ospino, A. Financial Globalization and Market Volatility. World Bank Policy Research Working Paper, 8091. (2017)
Dabla-Norris, M. E., Kochhar, M. K., Suphaphiphat, M. N., Ricka, M. F., & Tsounta, M. E.: Causes and consequences of income inequality: a global perspective. International Monetary Fund. (2015). https://www.elibrary.imf.org/openurl?genre=articlel&issn=2617-6750&volume=2015&issue=013&artnum=A001
de Haan, J., Sturm, J.-E.: Finance and Income Inequality: A Review and New Evidence. Eur. J. Polit. Econ. **50**, 171–195 (2017)
Deaton, A. S.: Instruments of development: Randomization in the tropics, and the search for the elusive keys to economic development. NBER Working Paper, 14960. (2009). https://www.nber.org/system/files/working_papers/w14690/w14690.pdf
Dorn, F., Fuest, C., & Potrafke, N. Trade openness and income inequality: New empirical evidence. Econ. Inquiry (May), 1–22. (2021)
Dreher, A.: Does globalization affect growth? Evidence from a new index of globalization. Appl. Econ. **38**(10), 1091–1110 (2006)
Dreher, A., Gaston, N.: Has Globalization Increased Inequality? Rev. Int. Econ. **16**(3), 516–536 (2008)

Dreher, A., Gaston, N., Martens, P.: Measuring Globalization – Gauging Its Consequences. Springer, Berlin (2008)
Ebenstein, A., Harrison, A., McMillan, M., Philipps, S.: Estimating the Impact of Trade and Offshoring on American Workers using the Current Population Surveys. Rev. Econ. Stat. **96**(4), 581–595 (2014)
Egger, P.H., Nigai, S., Strecker, N.M.: The taxing deed of globalization. Am. Econ. Rev. **109**(2), 353–390 (2019)
Fajgelbaum, P.D., Goldberg, P.K., Kennedy, P.J., Khandelwal, A.K.: The Return to Protectionism. Q. J. Econ. **135**(1), 55 (2020)
Feenstra, R.C., Inklaar, R., Timmer, M.P.: The next generation of the penn world table. Am. Econ. Rev. **105**(10), 3150–3182 (2015)
Felbermayr, G., Gröschl, J.: Natural disasters and the effect of trade on income: A new panel IV approach. Eur. Econ. Rev. **58**, 18–30 (2013)
Ferreira, F.H., Lustig, N., Teles, D.: Appraising cross-national income inequality databases: An introduction. J. Econ. Inequal. **13**(4), 1–30 (2015)
Furceri, D., Loungani, P.: The distributional effects of capital account liberalization. J. Dev. Econ. **130**, 127–144 (2018)
Galle, S., Rodríguez-Clare, A., Yi, M.: Slicing the pie: quantifying the aggregate and distributional effects of trade. Rev. Econ. Stud. **90**(1), 331–375 (2023)
Galor, O., Moav, O.: From Physical to Human Capital Accumulation: Inequality and the Process of Development. Rev. Econ. Stud. **71**, 1001–1026 (2004)
Ghosh, A.R., Ostry, J.D., Qureshi, M.S.: When Do Capital Inflow Surges End in Tears? Am. Econ. Rev. **106**(5), 581–585 (2016)
Goldberg, P., Pavcnik, N.: Distributional Effects of Globalization in Developing Countries. J. Econ. Lit. **45**(1), 39–82 (2007)
Grossman, G.M., Helpman, E.: Trade, knowledge spillovers, and growth. Eur. Econ. Rev. **35**(2–3), 517–526 (1991)
Grossman, G.M., Helpman, E.: Globalization and Growth. Am. Econ. Rev. **105**(5), 100–104 (2015)
Gygli, S., Haelg, F., Potrafke, N., Sturm, J.-E.: The KOF Globalisation Index – revisited. Rev. Int. Org. **14**, 543–574 (2019)
Hammar, O., Waldenström, D.: Global Earnings Inequality, 1970–2018. Econ. J. **130**(632), 2526–2545 (2020)
Harrison, A., McLaren, J., & McMillan, M. S. Recent Findings on Trade and Inequality. NBER Working Paper Series, 16425. (2010). https://www.nber.org/system/files/working_papers/w16425/w16425.pdf
Heimberger, P.: Does economic globalisation affect income inequality? A meta-analysis. World Econ. **43**(11), 2960–2982 (2020)
Helpman, E.: Globalization and Wage Inequality. NBER Working Paper, 22944. (2016). https://www.nber.org/system/files/working_papers/w22944/w22944.pdf
Helpman, E., Itshoki, O., Redding, S.: Inequality and unemployment in a global economy. Econometrica **78**(4), 1239–1283 (2010)
Hsieh, C.-T., Klenow, P. J., Nath, I. B.: A global view of creative destruction. NBER Working Paper, 26461. (2019). https://www.nber.org/system/files/working_papers/w26461/w26461.pdf
Imbens, G.W., Angrist, J.D.: Identification and estimation of local average treatment effects. Econometrica **62**(2), 467–475 (1994)
IMF, World Bank, & WTO.: Making trade an engine of growth for all: the case for trade and policies to facilitate adjustment. (2017). https://www.imf.org/en/Publications/Policy-Papers/Issues/2017/04/08/making-trade-an-engine-of-growth-for-all
Jaumotte, F., Lall, S., Papageorgiou, C.: Rising Income Inequality: Technology, or Trade and Financial Globalization? IMF Econ Rev. **61**(2), 271–309 (2013)
Jenkins, S.P.: World income inequality databases: an assessment of WIID and SWIID. J. Econ. Inequal. **13**(4), 629–671 (2015)
Jerven, M.: Poor numbers: how we are misled by African development statistics and what to do about it. Cornell University Press, Ithaca NY (2013)
Kanbur, R.: Globalization and inequality. In: Atkinson, A., Bourguignon, F. (eds.) Handbook of income distribution, vol. 2, pp. 1845–1881. Elsevier (2015). https://www.sciencedirect.com/handbook/handbook-of-income-distribution
Keohane, R.O., Nye, J.S.: Introduction. In: Nye, J.S., Donahue, J.D. (eds.) Governance in a Globalizing World. Broookings Institution, Washington DC (2000)
Khandelwal, A.K., Schott, P.K., Wei, S.J.: Trade liberalization and embedded institutional reform: Evidence from Chinese exporters. Am. Econ. Rev. **103**(6), 2169–2195 (2013)
Klein, M.W., Moser, C., Urban, D.M.: Exporting, skills and wage inequality. Labour Econ. **25**, 76–85 (2013)
Kraay, A.: Weak instruments in growth regressions: implications for recent cross-country evidence on inequality and growth. World Bank Policy Research Working Paper, 7494. (2015). https://documents.worldbank.org/curated/en/841781468198003536/pdf/WPS7494.pdf

Kuznets, S.: Economic Growth and Income Inequality. Am. Econ. Rev. **45**(1), 1–28 (1955)
Lahoti, R., Jayadev, A., Reddy, S.: The Global Consumption and Income Project (GCIP): An overview. J. Global. Dev. **7**(1), 61–108 (2016)
Lakner, C.: Global inequality. In: J.B.D., Heather Boushey M.S. (eds.) After Piketty: the agenda for economics and inequality. Harvard University Press, Cambridge, MA (2017)
Lakner, C., Milanovic, B.: Global income distribution: from the fall of the Berlin Wall to the Great Recession. World Bank Econ Rev **30**(2), 203–232 (2016)
Mayer, T., & Zignago, S. Notes on CEPII's distances measures: The GeoDist database. CEPII Working Paper, 25. (2011)
Melitz, M.J.: The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. Econometrica **71**(6), 1695–1725 (2003)
Meschi, E., Vivarelli, M.: Trade and Income Inequality in Developing Countries. World Dev. **37**(2), 287–302 (2009)
Milanovic, B.: Description of all the Ginis dataset. Luxembourg Income Study, New York (2014)
Milanovic, B.: Global inequality: a new approach for the age of globalization. Harvard University Press, Cambridge, MA (2016)
Norris, P.: Global Governance and Cosmopolitan Citizens. In: Nye, J.S., Donahue, J.D. (eds.) Governance in a Globalizing World, pp. 155–177. Brookings Institution Press, Washington DC (2000)
Patel, D., Sandefur, J., Subramanian, A.: The new era of unconditional convergence. J. Dev. Econ. **152**, 102687 (2021)
Piketty, T., Saez, E., Zucman, G.: Distributional National Accounts: Methods and Estimates for the United States. Quart. J. Econ. **133**(2), 553–609 (2018)
Potrafke, N.: The evidence on globalisation. World Econ. **38**(3), 509–552 (2015)
Prasad, E.S., Rogoff, K., Wei, S., Kose, M.A.: Financial Globalization, Growth and Volatility in Developing Countries. In: Harrison, A. (ed.) Globalization and Poverty, pp. 457–516. University of Chicago Press, Chicago (2007)
Ravallion, M.: Inequality and Globalization: A Review Essay. J. Econ. Lit. **56**(2), 620–642 (2018)
Rodrik, D.: The globalization paradox: democracy and the future of the world economy. WW Norton & Company, New York, NY (2011)
Rodrik, D.: Populism and the Economics of Globalization. NBER Working Paper, 23559. (2017). https://www.nber.org/system/files/working_papers/w23559/w23559.pdf
Rodrik, D., Subramanian, A.: Why Did Financial Globalization Disappoint? IMF Staff. Pap. **56**(1), 112–138 (2009)
Simmons, B.A., Dobbin, F., Garrett, G.: Introduction: The International Diffusion of Liberalism. Int. Organ. **60**(4), 781–810 (2006)
Solt, F.: On the assessment and use of cross-national income inequality datasets. J. Econ. Inequal **13**(4), 683–691 (2015)
Solt, F.: The Standardized World Income Inequality Database. Soc. Sci. q. **97**(5), 1267–1281 (2016)
Stock, J.H., Yogo, M.: Testing for Weak Instruments in Linear IV Regression. In: Stock, J.H., Andrews, D. (eds.) Identifcation and Inference for Econometric Models: Essays in Honor of Thomas J. Rothenberg. Cambridge University Press, New York (2005)
Topalova, P.: Factor Immobility and Regional Effects of Trade Liberalization: Evidence from India. Am. Econ. J. Appl. Econ. **2**, 1–41 (2010)
Topalova, P., Khandelwal, A.: Trade Liberalization and Firm Productivity: The Case of India. Rev. Econ. Stat. **93**(3), 995–1009 (2011)
World Bank: Poverty and Shared Prosperity 2016: Taking On Inequality. World Bank Group, Washington, DC (2016)
World Bank.: World Development Indicators. The World Bank, Washington DC (2017a)
World Bank.: PovcalNet. The World Bank, Washington DC (2017b)
Young, A.: Consistency without inference: instrumental variables in practical Application. Eur. Econ. Rev. **147**, 104112 (2019)