

Do liberalization and globalization increase income inequality?

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Abstract: Using the Standardized World Income Inequality Database, we examine if the KOF Index of Globalization and the Economic Freedom Index of the Fraser institute are related to within-country income inequality using panel data covering around 80 countries 1970-2005. Freedom to trade internationally is robustly related to inequality, also when adding several control variables and controlling for potential endogeneity using GMM. Social globalization and deregulation is also linked to inequality. Reforms towards economic freedom seem to increase inequality mainly in rich countries, and social globalization is more important in less developed countries. Monetary reforms, legal reforms and political globalization do not increase inequality.

Keywords: Liberalization, Economic freedom, Globalization, Income inequality, Institutions

JEL: D63, F02, D30, C82

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1. Introduction

Over the past 30 years, most countries around the world have experienced substantial increases in economic freedom and globalization. There is a prevalent belief that such changes may benefit economic growth, but at the expense of increased income inequality within countries. Regarding the first issue, the current consensus among researchers seems to be that economic freedom and globalization are indeed linked to economic growth (see, e.g., Berggren and Jordahl 2005, Doucouliagos and Ulubasoglu 2006, and Dreher 2006).³

This paper examines the second question: Are increases in economic freedom and globalization, sometimes broadly referred to as liberalization, associated with increasing income inequality within countries? Although participants in public debate on this topic generally have a clear opinion on the relationships, empirical evidence is surprisingly contradictory (cf. Berggren 1999, Scully 2002, Carter 2007, Dreher and Gaston 2008). Knowledge is limited as to whether all types of liberalization and globalization have similar impacts on income distributions. Due to previous data limitations, empirical studies have also neglected the issue of how different dimensions of economic freedom and globalization influence income inequality at different development levels. Using Gini coefficients of household net income from Solt's (2008) recently developed Standardized World Income Inequality Database (SWIID) as our preferred inequality measure, we can construct a panel from 1970 through 2005 with more observations on within-country income inequality than do other studies in this area. This setup also allows for rigorous analysis of the differential impact across rich and poor contexts and for the use of sophisticated techniques to handle possible endogeneity problems. To quantify globalization and economic freedom, we use the KOF Index of Globalization (KOF), developed and first used by Dreher (2006), and the Economic Freedom of the World Index (EFI) of Gwartney et al. (2008). We make use of the fact that both indices consist of several dimensions, allowing for an analysis of the impact of different types of liberalization and globalization on income inequality.

By estimating a fixed-effect model of country-level income inequality as a function of the KOF and EFI indices, and employing a battery of robustness tests, our analysis arrives at several findings. First, the analysis supports the notion that policy reforms favoring trade openness have on average increased income inequality in recent decades. Exploring the relationship at different levels of development, however, indicates that, in line with theoretical predictions, this significant relationship only appears in middle- and high-income contexts. Second, findings repeatedly also

¹ It should be noted, however, that the proper measurement of globalization or liberalization and the direction of the causality in question is still subject to intense debate; see, for example, Rodriguez and Rodrik (1999) and the response of Lee Ha et al. (2004).

indicate that policy reforms promoting deregulation and social globalization on average have a non-equalizing distributional impact. Moreover, the coefficient of economic globalization is positive, but is sensitive to the exclusion of certain countries from the sample. Third, in estimating a dynamic model, consistent in the case of endogenous variables (Arellano and Bover 1995, Blundell and Bond 1998), we again confirm that trade liberalization and economic globalization increase income inequality.

2. Theoretical expectations and related literature

2.1 The different dimensions of economic freedom and globalization

The Economic Freedom of the World Index (EFI) is a composite index that weighs together five dimensions of economic freedom, EFI1–EFI5, which are in turn based on several indicators.

Size of government (EFI1)

The first dimension of the EFI measures government size using indicators such as public consumption and transfers relative to GDP. It also includes top marginal tax rates and state-owned enterprises. The index is coded so that bigger government means a lower economic freedom value in this dimension.

Theoretically, there are reasons to expect states with larger welfare systems to have lower income inequality, as public sector transfers are often assumed to have equalizing effects (see e.g., Rothstein 1998, Åberg 1989). The welfare state may also stimulate risky but profitable income-equalizing activities such as education, as people are more likely to engage in such activities when enjoying some protection provided by the welfare state (Sinn 1995). Evidence also suggests that the welfare state is particularly beneficial to the middle class (see, e.g., Bergh 2007 and Le Grand and Winter 1986), again suggesting a more compressed income distribution.

Importantly, bigger government, as measured by the index, does not necessarily imply a larger welfare state. In poor countries, where government may be corrupt or even predatory, a smaller government may not increase income inequality at all. A study by Odedokun and Round (2004) examining the relationship between government size and income inequality in 35 African countries supports this view. Following the above, we hypothesize that an increase in EFI1 will have a non-equalizing effect on the within-country income distribution and that this effect will be larger in richer than poorer contexts.

Legal structure and security of property rights (EFI2)

The second dimension of the EFI quantifies the quality and integrity of the legal system and the protection of property rights. This dimension can be thought of as an attempt to quantify rule of law.

It seems intuitive that better protection of property rights should mainly benefit those with more property, as this protection increases tenure security for the owner, which in turn is expected to increase the value of the property itself. However, several scholars suggest the opposite. Inspired by the Russian oligarchs of the 1990s, Sonin (2003) notes that poor protection of property rights may actually be relatively more beneficial to those already rich, resulting in greater inequality. In many developing countries, elites are rich because of corruption and inefficient property rights, and improvements in the legal system may actually be relatively more important for less privileged groups, thereby reducing inequality, as described by, for example, De Soto (2000). Accordingly, we should not be surprised if better protection of property rights is associated with lower inequality.

Access to sound money (EFI3)

The sound money dimension of the EFI captures the effect of large and unpredictable changes in inflation and money supply. This component is coded so that the greater the unpredicted inflation, the lower the value.

The literature on the cost of inflation presents various mechanisms by which inflation could affect income distribution, in particular through returns to capital. High inflation is expected to be relatively more harmful to low-income earners, whose assets are less protected against inflation, increasing income inequality. Moreover, unanticipated inflation may also lead to resource misallocation and to the absorption of considerable resources in information gathering, in an attempt to mitigate the uncertainty of future price levels (Fischer and Modigliani 1978). This will have negative welfare effects that will reduce the possibility of progressive redistribution.

Confirming theory, most empirical studies of the subject indicate a positive relationship between inflation and inequality. For example, Albanesi (2007) presents cross-country evidence that inflation and income inequality are positively correlated. A link between pro-poor growth and low inflation is also found by Son and Kakwani (2008). Hence, we hypothesize that an increase in the EFI3 index will be associated with a narrower spread in the income distribution, irrespective of the level of economic development at which such an increase takes place.

Freedom to trade internationally (EFI4)

This component of the EFI combines measures of trade taxes, tariff rates and trade barriers, and capital market controls to create a composite measure of freedom to trade.

The effect of trade openness on inequality is highly debatable, both theoretically and empirically. Kanbur (2000) describes a widespread and simple intuition into the theoretical relationship between openness and inequality based on Heckscher–Ohlin (H–O) theory in a model including both skilled and unskilled workers, the former being more abundant in rich countries. In this case, trade openness will exert downward pressure on the wages of unskilled workers in rich countries while increasing income from capital, raising inequality within these economies. Versions of this theoretical model are at the core of the debate in many developed countries, where increased trade and outsourcing are assumed to be harmful to unskilled workers. The same theoretical model, however, predicts that the wages of unskilled workers in less developed countries will increase, lowering within-country inequality there.

The above reasoning assumes, however, that factor supply is constant. This is a workable approximation in the short term, before general equilibrium effects kick in. Although wages decline and jobs are lost in some sectors in rich countries, other sectors will benefit from trade and demand more labor, as emphasized by Richardson (1995). Furthermore, more sophisticated theoretical models often feature multiple equilibria at certain openness levels, which complicates the issue substantially (see e.g., Krugman and Venables 1995, Das 2005).

Empirical evidence is also inconclusive. Wood (1995) argues that trade has likely hurt unskilled workers. Sebastian (1997) finds that openness to trade leads to increased income inequality in more developed economies, but not in less developed countries. Savvides (1998), however, concludes that more open, less developed economies experienced increased income inequality in the late 1980s. Gourdon et al. (2008) find that the effects of lower tariffs on income inequality depend on relative factor endowments: In poor countries with a high share of less-educated labor, lower tariffs will raise inequality. Moreover, while both Lindert and Williamson (2001) and O'Rourke (2001) support the position that economic globalization is a force for income convergence between countries, they state that the effect on inequality within countries is less clear.⁴

⁴ Several relevant country studies also exist. According to Kumar and Mishra (2008), trade liberalization has reduced wage inequality between skilled and unskilled workers in India. Acosta and Montes-Rojas (2008), however, present more mixed evidence of the effect of trade liberalization on skill premiums in Mexico and Argentina.

Contradictory theoretical and empirical results leave us in a vacuum when it comes to predicting the direction of any distributional effect of an increase in EFI4. However, given that our use of data based on five-year averages is unlikely to capture long-term general equilibrium effects, we rely on traditional trade theories and hypothesize that higher EFI4 levels will increase income inequality in more developed contexts but not in less developed ones.

Regulation of credit, labor, and business (EFI5)

In this dimension, greater economic freedom means less regulation of credit markets, labor markets, and business in general. Regarding the income distribution impact, this issue is theoretically ambiguous. On one hand, increasing the availability of credit, for example, will likely reduce income inequality, as a larger fraction of people will be able to realize their potential (see, e.g., Galor and Zeira 1993 on economic growth). On the other hand, such reform might also increase income inequality in cases where the political elite can influence the format of a deregulation policy (see, e.g., Claessens and Perotti 2007). If economic regulation creates monopoly rents, the impact of deregulation on income inequality depends on how these rents are redistributed when deregulation increases competition.

Existing empirical studies suggest that we should expect deregulation to increase income inequality. For example, Calderón and Chong (2009) find that labor market regulations reduce income inequality. Similarly, Fortin and Lemieux (1997) argue that the declining real value of the minimum wage, declining unionization, and general deregulation together explain a third of the increase in wage inequality in the United States in the 1980s. Roine et al. (2009) moreover find financial development to be particularly pro-rich in a context of relatively low incomes.

Since there are no clear theoretical underpinnings for the relationship between deregulation and income inequality, we have no hypothesis regarding the sign of the EFI5 component.

We now turn to our measure of globalization, the KOF Index of Globalization (KOF). This is a composite index weighting together three dimensions of globalization, KOF1–KOF3.

Economic globalization (KOF1)

According to the KOF Index, economic globalization is closely related to the fourth dimension of the Economic Freedom Index (EFI4). Several components are identical, so our theoretical expectations regarding the relationship with income inequality are more or less the same.

Two important aspects, however, are noteworthy. First, in contrast to the EFI4, KOF1 includes information on foreign direct investment (FDI). As Feenstra and Hanson (1997) argue that FDI increases the relative demand for skilled labor in developed *and* developing economies, higher economic globalization levels should relate to increasing income inequality in the latter context as well. Second, comparing the individual components of KOF1 and EFI4, we see that the latter is slightly more institutional, whereas the former relies more on actual flows of trade. This distinction could be important. Rodriguez and Rodrik (1999) note that the significant link between openness and growth, when openness is measured using flow variables, is not robust when instead using policy measures such as mean tariff rates.⁵

Based on the theoretical underpinnings, we hypothesize that increases in KOF1 associate with increasing income inequality in high-income settings, while the same theoretical underpinnings suggest that such a change will have ambiguous effects at lower development levels.

Social globalization (KOF2)

The social component of the KOF Index captures factors such as outgoing telephone traffic, number of Internet users, and number of IKEA and McDonald's outlets per capita. No formal theory forecasts any specific effect of social globalization on income distribution. Nevertheless, Atkinson (1997) notes that changing social norms (which may follow from increased interaction and more integration among countries), can affect economic inequality, for example, by influencing the behavior of unions, resulting in larger wage differentials becoming more socially acceptable.

Following this argument, we predict that an increase in KOF2 associates with higher income inequality, and do not expect the impact to differ between low- and high-income settings.

Political globalization (KOF3)

The third dimension of the KOF Index measures the number of embassies, membership in international organization, and participation in UN Security Council Missions.

There is no obvious reason to expect such political cooperation to influence income inequality. Tsai (2007) notes that the international political system can bring supra-territorial interests into domestic policy arenas, such as epidemic management, human rights issues, and global environmental concerns, contributing to the advance of human well-being. Using the KOF Index, he finds political globalization to positively associate with the Human Development Index

⁵ Their criticism is directed toward often-cited papers such as that of Sachs and Warner (1995).

(HDI). Furthermore, findings here indicate that globalization increases the state's revenue-extracting capacity, rejecting the idea that closer integration constrains state capacity.

Since neither theory nor empiricism provides any indication that KOF3 is associated with income inequality, we hypothesize that this component will have no distributional effect.

From the above we are uncertain about the inequality impact in several cases, but to summarize: in this setting we hypothesize that the coefficients of EF1, EFI4 and KOF1 will be positive in richer contexts, while inequality could decrease and increase, respectively, with EFI3 and KOF2 focusing on the full sample.

The relationship between different types of liberalization

As Table 1 illustrates, several dimensions of economic freedom and globalization are highly correlated. Thus, the matrix confirms the common view that countries with liberal policies in some areas also tend have them in other areas. In particular, EFI4 is, as expected, highly correlated with KOF1. However, EFI1 is negatively correlated with both EFI2 and all other measures of globalization. In other words, countries with big governments are on average more globalized and have higher legal system integrity. This corroborates the view that reform programs may affect diverse policy arenas differently.

Table 1 Correlations between components of the Economic Freedom Index and the KOF Index

	EFI	EFI1	EFI2	EFI3	EFI4	EFI5	KOF	KOF1	KOF2	KOF3
EFI	1									
EFI1	0.31	1								
EFI2	0.76	-0.18	1							
EFI3	0.80	0.18	0.48	1						
EFI4	0.84	0.08	0.69	0.56	1					
EFI5	0.81	0.24	0.63	0.50	0.66	1				
KOF	0.75	-0.12	0.76	0.51	0.81	0.65	1			
KOF1	0.77	-0.10	0.68	0.47	0.84	0.65	0.88	1		
KOF2	0.75	-0.09	0.73	0.51	0.75	0.65	0.94	0.84	1	
KOF3	0.37	-0.15	0.45	0.31	0.42	0.28	0.71	0.35	0.50	1

2.2 Empirical studies using the EFI and KOF indices

Three studies, i.e. Berggren (1999), Scully (2002), and Carter (2007), examine the Economic Freedom Index in relation to income inequality in a cross-country setting. Only Dreher and Gaston (2008) have so far analyzed the relationship between the KOF Index and inequality.⁶

The results regarding economic freedom are surprisingly contradictory. Scully (2002) and, to a lesser extent, Berggren (1999) claim to find evidence that economic freedom reduces income inequality by examining the issue using data on 26 and 66 countries, respectively, over the 1975–1990 period. These early studies, however, suffer from several problems, including the problem of non-comparable Gini coefficients and limited data availability.⁷ Improving on several weaknesses, Carter (2007) is the first to analyze the question in a panel setting. In contrast to Berggren and Scully, he finds a positive but relatively inelastic relationship, where an increase in economic freedom of two standard deviations leads to an increase in the Gini coefficient of 0.33 standard deviations.⁸

Carter's unbalanced panel runs from 1980 to 2000 but contains data for only seven countries in 1980 and 15 countries in 1985. The efficient sample in the empirical analysis refers to 104 observations from 39 countries, most of which are OECD members, which limits the possibility of analyzing the relationship between economic freedom and income inequality at different development levels. As Carter's study focuses on the income distribution effect within countries of *overall* economic freedom, the examination focuses entirely on the composite index.

Using the KOF Index and income and wage inequality data, Dreher and Gaston (2008) find evidence that globalization on average has increased income inequality in OECD countries from 1970 through 2000. However, their findings do not identify any robust impact in less-developed nations. Not discriminating between economic, social, and political globalization, their baseline examination refers to a sample of approximately 400 observations (varying somewhat in size depending on whether focus is on wage or income inequality).

⁶ A paper that also deserves mention is that of Ashby and Sobel (2008), who use data on US states. They find that increased economic freedom between 1980 and 2003 have reduced income inequality by increasing incomes relatively more for low-income groups.

⁷ Carter (2007) provides a comprehensive review of the problems in earlier studies.

⁸ In fact, Carter estimates a quadratic relationship between economic freedom and inequality. For all but three observations, however, the index value is high enough that an increase in freedom is estimated to raise inequality. We estimate a linear relationship, but estimate a quadratic model as one of our robustness checks.

3. Data and empirical specifications

The data comprise an unbalanced panel of observation from 79 countries covering the 1970–2005 period (Table A in the Appendix provides information on countries covered). To reduce the possibility that short-term movements and measurement errors may affect the results, the data are averaged over five-year periods resulting in eight distinct periods. With regard to income inequality, the initial observation is the average for the 1965–1970 period.⁹ This results in the first period of the panel containing information on 51 countries when using the KOF Index, and 38 countries when using EFI. The efficient sample consists of more than 500 observations meeting baseline specifications. Roughly 40% of these observations refer to conditions in countries classified as low- or low-middle-income countries with a 2007 GNI per capita of USD 3705 or less.

3.1 Dependent variables - On the use and misuse of inequality data

Among the most commonly used measures of inequality are the Gini coefficients. For completely egalitarian income distributions in which the whole population has the same income, the Gini coefficient takes a value of 0. A value of 1 indicates that all incomes are concentrated in one person.

Gini coefficients can be calculated in several ways: for gross income (before taxes and transfers), net income (after taxes and transfers), and consumption expenditure. Furthermore, the unit of analysis can be individuals or households. The lack of comparable Gini coefficients both between countries and over time has long been a major obstacle in inequality research. Many consider the Luxembourg Income Study (LIS) to be the best option, as it is based on reliable microdata from national household income surveys. Unfortunately, LIS data are available for only thirty countries, almost exclusively rich ones, and contain few observations from before 1990.

As a second best solution, many scholars resort to the World Income Inequality Database (WIID), created by the World Institute for Development Economics Research of the United Nations University (UNU-WIDER). This is an updated and expanded version of the Deininger and Squire (1996) dataset, used by, for example, Berggren (1999). The WIID contains a large set of inequality statistics from several sources, totaling over 5000 observations from 160 countries.

⁹ The eight periods are thus 1965–1970, 1971–1975, 1976–1980, 1981–1985, 1986–1990, 1991–1995, 1996–2000, and 2001–2005.

However, as Deininger and Squire have themselves pointed out, the observations are rarely comparable across countries or over time within a single country.¹⁰

Two recent papers have attempted to handle the problem of few and non-comparable Gini measures: the Standardized Income Distribution Database (SIDDD) created by Babones and Alvarez-Rivadulla (2007), and the Standardized World Income Inequality Database (SWIID) created by Solt (2008). Both the SWIID and the SIDDD aim to improve data *availability* and *comparability* for cross-national research by exploiting the fact that different types of Gini coefficients display systematic relationships. The Gini coefficient of gross income is typically larger than the coefficient of net income, which in turn is larger than the Gini coefficient of expenditure. Similarly, Gini coefficients for households are typically lower than coefficients calculated on an individual basis.¹¹ For example, Deininger and Squire (1996) recommend adding three points to net-income-based inequality observations to make them comparable with the gross-income-based observations.

There are problems, however, with such a constant adjustment procedure. For reasons explained in Bergh (2005), the difference between gross and net income Gini coefficients depends on the degree to which taxes and transfers are progressive and redistribute income from rich to poor. As a result, the difference varies across countries and within countries over time, so constant adjustment will introduce systematic errors into the data. The same reasoning applies to the empirical strategy of including dummy variables to correct for different types of Gini coefficients being used in the same regression, as this also assumes that differences between different types of Gini coefficients remain constant over time.

The adjustment procedure is the major reason for preferring the SWIID to the SIDDD: Babones and Alvarez-Rivadulla (2007) use a constant adjustment procedure to compensate for missing data. Solt (2008), however, uses various techniques to estimate the ratios between different types of Gini coefficients, relying more on information about the ratio in the same country nearby in time, to increase the number of comparable observations.¹² An additional advantage of Solt

¹⁰ Nevertheless, hundreds of cross-country studies use the Deininger and Squire dataset. It is often hard to tell how or even whether authors have dealt with the problem of non-comparable Gini coefficients. Solt (2008) notes that Deininger and Squire's recommendations on how to use their data are often entirely overlooked by researchers.

¹¹ Gross Gini coefficients are larger than net Gini coefficients because taxes and transfers typically equalize the income distribution. The Gini coefficient of consumption is smaller because people use savings and loans to smooth consumption.

¹² Another advantage of the SWIID over the SIDDD is that the former is based on version 2.0c of the WIID data, released in May 2008, whereas the latter relies on the older WIID version 1.0.

(2008) is the provision of estimates of uncertainty for observations, which implies that users can easily do robustness tests with respect to their chosen inequality measure.

Our preferred distributional measure and dependent variable is the *net income Gini coefficient* from Solt (2008). As a test of sensitivity, we use the *gross income Gini coefficient*, also from Solt (2008), and the *Kuznets ratio* as dependent variables. The latter measure is calculated as the ratio of income shares of high- to low-income earners (80th to the 40th percentile). In contrast to the Gini coefficient, which is most sensitive to changes at the mode of the income distribution, the Kuznets ratio is sensitive to changes in the upper and lower parts of the distribution. The effects of liberalization or globalization gauged using this measure might thus be different from those gauged using the Gini coefficient if, for example, the top income earners are the ones who benefit the most from a reform. Information on income shares comes from WIID 2.0c (Wider 2008). To maximize comparability, the country datapoints are well matched. In other words, information from time t in country i is determined as in $t-1$, with respect to income measure, unit of analysis, etc.; however, the above caveats still apply.

3.2 Independent variables

To measure economic freedom and globalization, we use the EFI and KOF indices. The former was developed by Gwartney and Lawson (2003) and covers a large number of countries every fifth year since 1970, and yearly since 2000; we use the 2008 dataset. The composite index and its subcomponents range from 0 to 10, 0 indicating the lowest and 10 the greatest economic freedom.¹³ The composite EFI exists in a chain-linked version, suitable for analysis over time, which we use in our analysis. As discussed previously, we also examine the association with inequality and the five subdimensions. Since the subcomponents are not completely comparable over time, these results should be interpreted with care.¹⁴

The KOF Index was developed by Dreher (2006) and covers more than 120 countries on a yearly basis from 1970 through 2008. The composite index and its subcomponents take values between 0 and 100, higher values representing more globalization. Table B and C in the Appendix provides the details of the areas and components of the EFI and KOF indices.

¹³ As discussed by De Haan et al. (2006), the EFI has been criticized for being ideologically biased, but it has nevertheless often been used in research as a descriptive device.

¹⁴ Numerous authors, however, have successfully obtained results using the subcomponents of the index; see Carlsson and Lundstrom (2002) and Berggren and Jordahl (2005) on the relationship between types of economic freedom and growth, and Berggren (1999) on the relationship between types of economic freedom and inequality.

We include a number of control variables in specifications to correct for the influence that factors other than economic freedom and globalization may have on income inequality. Adopting measures similar to those used in previous studies, we add three control variables to our baseline regression. First, the model includes *log of real GDP per capita* to correct for any distributional effects driven by income levels. Following Kuznets (1955), we expect inequality to follow an inverted U-curve over levels of development and this control variable to be positive.

Second, we include a variable for the *share of population above 25 years old with higher education* to correct for human capital effects. Theoretically the impact of higher education on inequality is ambiguous. More people with higher education implies that a larger share of the population will enjoy the wage premium. Such a development, however, may also serve to reduce the premium associated with higher education.¹⁵ Moreover, Krusell et al. (2000) present a model emphasizing the complementarity of capital and skills as drivers of increasing income inequality in high-income contexts. Lindquist (2005) moreover demonstrates that such complementarities raised the premium to higher education in Sweden (and thus income inequality), even during a period of increasing relative supply of well-educated workers.

Third, the baseline model includes a *dependency ratio*, corresponding to the share of population younger than 15 years and older than 64 years. The primary effect of demographic change is the modification of the population age distribution. Following Higgins and Williamson (1999), and assuming relatively large cohorts to obtain low earning rewards, income inequality will decrease when relatively large cohorts are mature and are situated at the top of the age–earnings curve. When these cohorts are young adults or old, inequality increases.¹⁶ Although an ideal indicator would measure the size of the mature cohort in relation to the number of adults in the population, we predict that a higher dependency ratio will be associated with higher income inequality.

To examine the robustness of our results, we modify the baseline model in several ways. One set of sensitivity tests involves adding further covariates. Following Kuznets (1955), we include a variable for the *share of labor force employed in the industrial sector* to control for the structure of the economy. A small but increasing share of people employed in the modern sector will widen the gap between rich and poor. When the manufacturing sector provides a larger share of less-skilled

¹⁵ Education data exist on a five-year basis from 1960 through 2000. To fully explore existing information on inequality, economic freedom, and globalization, data on human capital in 2005 are estimated as the year 2000 value plus the country change over the 1995–2000 period. Our results do not depend on this operation. Results are robust to excluding the final period, to assuming human capital to be constant between 2000 and 2005, and to the use of a lagged human capital variable.

¹⁶ This framework also assumes poor people to be evenly distributed in the population.

workers an opportunity to earn higher wages, income inequality will eventually decrease. We also test the results by including a variable for the *share of labor force employed in the service sector*.

Moreover we test the robustness of our results by including the *population share living in urban areas*. Following traditional development theories, urbanization mirrors economic development, so we also expect this variable to be nonlinear to inequality. Nevertheless, there are also arguments in the inequality literature that relate larger shares of urban populations to higher degrees of population heterogeneity (Wirth 1938), arguing for the existence of only a positive association. Finally, we perform a sensitivity test in which we include information on *civil liberties* and *political rights*.

Except for the data corresponding to human capital, wealth, civil liberties and political rights that come from Barro and Lee (2000), Heston (2006), and Freedom house (2009) respectively, independent variables come from the World Development Indicators (World Bank 2008). Tables C and D in the Appendix provide descriptive statistics, information on exact definitions, and the sources of all variables and cross correlations.

3.3 Empirical strategy

To analyze the effect of economic freedom and globalization on inequality, we formulate the following empirical model, where countries are represented by i and time by t :

$$y_{it} = \alpha + \text{lib}_{it}' \beta + x_{it}' \gamma + \delta_i + \rho_t + \varepsilon_{it} \quad (1)$$

Here, y_{it} is the dependent variable of interest, lib_{it} is a vector of indices of liberalization, and x_{it} includes the additional covariates presented above. δ_i corresponds to a country fixed effect that captures stable differences in economic inequality between countries, while ρ_t is a period fixed effect, capturing the influence of shocks that affect economic inequality in multiple countries at the same time. ε_{it} is a normally distributed error term. All variables are included as 5-year averages for available data points in each period.¹⁷ As a baseline, the EFI1–EFI5 and KOF1–KOF3 sub-indices are included separately, and we estimate the relationships of interest by least squares and country fixed-effects.¹⁸

¹⁷ Before 2000, the Economic Freedom Index was only available for every fifth year, so the value for e.g. the period 1976-1980 is calculated as the average for 1975 and 1980, and the value for the first period is the value in 1970. In the sensitivity analysis, we verify that results are robust to various changes in this specification.

¹⁸ Views differ as to whether to include the various dimensions of liberalization and globalization simultaneously or not. Heckelman and Stroup (2005) argue that any summary index may result in a misspecification bias, and suggest also performing the analysis using the actual individual components. Dreher and Gaston (2008), however, argue that

The above specification has a potential endogeneity problem if levels of economic freedom or globalization are influenced by the changes in income inequality, and not just the other way around. Gradstein (2007), for example, states that the more equal the income distribution in a society, the greater the support for property rights protection. Politicians may respond to increases in income inequality by implementing certain policies, favoring either more or less economic freedom or globalization depending on their preferences and beliefs about the causes of inequality. If an increase in inequality reduces liberalization and globalization, we believe our analysis may underestimate the inequality impact.

The endogeneity problem has been handled in different ways in the related literature. Berggren (1999), using cross-country data, let the independent variables (policy reforms) predate the dependent one (inequality); this is also the strategy used by Ashby and Sobel (2008). In our setting, this corresponds to regressing inequality on the lagged indices, lib_{it-1} , thus using average economic freedom for 1976-1980 to explain average inequality 1981-1985. Another possibility is to run regressions using end period gini coefficients only, using period averages of explanatory variables to explain inequality in the final year of each period. We test both variants in the sensitivity analysis.

The panel data structure, however, also lets us handle potential endogeneity by estimating our model using a system GMM estimator (Arellano and Bover 1995, Blundell and Bond 1998).¹⁹ In a single system, this estimator combines the regression equations of both differences and in levels, each having a particular set of instrumental variables. Specifically, the system is jointly estimated using first-difference equations instrumented by lagged levels and using level equations instrumented by the first differences of the regressors. If these variables are appropriate instruments, the estimator should be consistent in the presence of endogenous variables. The system GMM estimator is also consistent in the presence of country-specific effects and the estimation method works for unbalanced panels and situations with few periods and many countries.²⁰

components of globalization should be regressed in the same specification, as the different components are highly correlated, to control for other globalization dimensions. To avoid problems caused by multicollinearity, our preferred approach is to include the indices separately.

¹⁹ We use the Stata command `xtabond2` to estimate the system GMM. See Bond et al. (2001) and Roodman (2006) for a rigorous outline of the method and the syntax.

²⁰ As demonstrated by Arellano and Bond (1991), the GMM *difference* estimator could also be used in this context. In empirical examinations, however, the difference estimator often performs poorly when the number of periods, as in our case, is limited (Bond et al., 2001). Moreover, the difference estimator does not allow for country-specific effects.

GMM specifications are preferred by Dreher and Gaston (2008), whereas Carter (2007) does not discuss the potential endogeneity problem. We regress our model using the system GMM estimator as another robustness test of our baseline results. This also lets us test the sensitivity of our findings when including a lagged dependent variable.

While the benefits of a panel dataset are evident, the choice to construct a panel based on five-year averages is not an obvious one as within-country Gini coefficients remain relatively stable over time. As an alternative to the panel specification, we study the development of globalization and inequality by considering the difference over a longer period, a method used by, for example, Sylwester (2002), in analyzing the effects of education policy on income inequality.²¹ In this exercise, we examine whether the changes in the dimensions of liberalization and globalization between 1980 and 2000 are associated with increasing income inequality over the 1985–2005 period.²² In this case, our empirical specification is

$$\Delta y_i = \alpha + \beta(\Delta lib)_i + \gamma(x_{i,1980}) + \varepsilon_i \quad (2)$$

where Δy_i and Δlib_i correspond to the differences in income inequality and liberalization in country i , respectively, computed as the level of inequality or index of interest in the last period minus the level in the first one. This method also lets us examine whether the results are robust to using an alternative measure of income inequality. Thus, equation 2 is estimated using both the Gini coefficient and Kuznets ratio as the dependent variable.

4. Empirical analysis

Before estimating our model, we study the pairwise correlations among independent variables. As Table E in the Appendix illustrates, some of the indicators are closely related. Examining the variance inflation factor (VIF), however, suggests that there is no incidence of multicollinearity.²³

4.1 Baseline results

We begin the empirical analysis by estimating baseline specifications by least squares and country fixed effects. The dependent variable is country Gini coefficients of net incomes. All regressions include period dummies and we employ robust standard errors throughout the empirical

²¹ The same method is also used by Bergh and Fink (2008), Savvides (1998), and Sebastian (1997).

²² The periods differ to minimize the risk of reverse causality.

²³ The VIF test can only be calculated for pooled regressions. Numbers for individual variables range from 1.9 (EFW) to 6.2 (GDP per capita), which is below the critical value of 7. In most cases, the average VIF is well below 3.

examination to account for heteroscedasticity. To maximize comparability, in all estimations focusing on the distributional impact of dimensions of the EFI, the sample contains the same countries. The equivalent approach is applied in the regressions including KOF indices. The number of observations might, however, vary across index-specific estimations.

Results are presented in Tables 2 and 3. Overall economic freedom is positively associated with income inequality. This result appears to be driven by EFI4 (Freedom to Trade Internationally) and EFI5 (Regulation of Credit, Labor, and Business). The evidence that freedom to trade is positively associated with inequality is theoretically reasonable, given that most sample observations are from middle- or high-income countries. The coefficient on EFI5 supports the political economy argument that an elite gains most of the benefits of such liberalization initiatives while the risks are shared by a larger group. Among the EFI components, deregulation in fact has the quantitatively greatest impact on inequality. In baseline estimations coefficients on EFI2 (legal structure and security of property rights) and EFI3 (access to sound money) are both negative but not significant.

Table 2 Net income inequality and the dimensions of economic freedom, OLS fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)
GDP per capita	3.304** [1.570]	3.849*** [1.242]	3.077** [1.328]	3.353** [1.506]	3.680** [1.464]	4.361** [1.862]
Human capital	0.373** [0.162]	0.366** [0.148]	0.240* [0.133]	0.308* [0.157]	0.409*** [0.147]	0.341* [0.177]
Dependency ratio	4.219 [3.490]	7.137** [3.220]	4.477 [3.399]	5.437 [3.450]	3.105 [3.086]	3.044 [3.754]
EFI	0.949** [0.384]					
EFI1		0.604 [0.368]				
EFI2			-0.045 [0.273]			
EFI3				-0.007 [0.212]		
EFI4					0.662** [0.295]	
EFI5						1.260*** [0.459]
Constant	-4.522 [14.528]	-8.170 [12.514]	5.191 [12.753]	9.910 [10.907]	-5.674 [13.146]	-14.636 [17.081]
Number of countries	78	78	78	78	78	78
Observations	479	509	461	503	493	465
R-squared (within)	0.142	0.160	0.117	0.142	0.144	0.152
Period dummies (Prob > F)	0.02	0.00	0.01	0.00	0.02	0.01
Country dummies (Prob > F)	0.00	0.00	0.01	0.00	0.00	0.00

*** Denotes significant at 1% level, ** significant at 5 % level, * significant at 10 % level.

Robust standard errors in brackets. All estimations include period dummies.

Repeating the above exercise using KOF indices, reveals a positive coefficient on the aggregated index, which seems to be driven by social globalization. Though not significant, the sign and size of the coefficient on economic globalization is the same. Political globalization, however, lacks both economic and statistical significance. The results support the idea that a purely economic perspective on globalization might be too narrow in analyzing distributional effects across countries.

Table 3 Net income inequality and the dimensions of globalization, OLS fixed effects

	(1)	(2)	(3)	(4)
GDP per capita	3.550*** [1.322]	3.960*** [1.440]	3.655*** [1.384]	4.159*** [1.460]
Human capital	0.362** [0.154]	0.354** [0.154]	0.327** [0.158]	0.404** [0.167]
Dependency ratio	6.069* [3.511]	5.842* [3.462]	5.239 [3.433]	5.661* [3.381]
KOF	0.141* [0.076]			
KOF1		0.085 [0.051]		
KOF2			0.089** [0.038]	
KOF3				0.010 [0.029]
Constant	-9.440 [13.294]	-9.613 [13.482]	-5.726 [12.763]	-6.819 [13.889]
Number of countries	79	79	79	79
Observations	521	521	521	521
R-squared (within)	0.167	0.161	0.164	0.147
Period dummies (Prob > F)	0.01	0.00	0.01	0.01
Country dummies (Prob > F)	0.00	0.00	0.00	0.00

*** Denotes significant at 1% level, ** significant at 5 % level, * significant at 10 % level.

Robust standard errors in brackets. All estimations include period dummies.

The influence of GDP per capita on income inequality is in line with the theoretical expectation and consistently positive across baseline estimations. Results moreover suggest that a larger share of the population having a higher education increases inequality, which might mirror an average rise in returns on human capital investments. The positive association between education and income inequality corroborates the findings of Carter (2007) and Berggren (1999), who use measures of the average education of the population and illiteracy levels respectively. The coefficient of the demographic indicator is positive, consistent with the view that smaller cohorts benefit from greater income rewards; however, this control variable is significant in only four of ten cases.

The null hypothesis of no country effects is rejected in all estimations, implying that a pooled regression model is inappropriate. Moreover, the random-effect model is rejected by a standard Hausman test against the fixed-effect model, which supports our methodological choice. Time dummies are jointly significant in all specifications, implying they should be included in the model.

4.2 Sensitivity analysis

(a) Variations on baseline specification

To examine the robustness of the baseline findings, we carry out several sensitivity checks; Table 4 summarizes these results. All regressions include controls for GDP per capita, human capital and dependency, but we only present coefficients on the composite indices and the significant subcomponents. The sensitivity analysis reveals a positive and significant EFI4 coefficient in all specifications, but also other relevant findings.

The first type of robustness test focus on the KOF and EFI indices. *Lagging index values*, reveals a significant positive effect of economic globalization in addition to confirming baseline findings. This supports the notion that larger trade flows and more foreign direct investment increase income inequality with a time lag. Next, we exclude countries with *extreme values* on the KOF and EFI indices, defined countries with at least one index observation further than 2 standard deviations away from the sample mean. This excludes 8 countries from the KOF regression and 10 countries from the EFI regression. Again, the only difference compared to the baseline is that KOF1 is significant.

The results of simultaneously including *all dimensions* of the EFI or the KOF Index in one specification the significant association between the deregulation component and inequality disappears. EFI2 (legal structure and security of property rights) is now however negative and significant, suggesting more secure property to be associated with lower inequality. Following Carter (2007), we also include *quadratic terms* for the indices. This entirely eliminates the significance of both indices, and the quadratic term is small and insignificant, giving little support to the quadratic specification.

The second type of robustness test involves the dependent variable. Excluding countries with at least one inequality observation further than 2 standard deviations away from the mean, removes 10 countries from the sample, but does not change baseline findings. Because the SWIID

contains information about the standard deviation, we can use the same method to identify particularly *uncertain Gini estimates*. This removes 23 Gini observations from the sample, but does not change baseline findings. Replacing average Gini coefficients with *end period values*, social globalization is no longer significant. Replacing net income Gini coefficients with their *gross income* equivalents, results in both aggregate indices, as well as economic globalization, being significant, while significance on EFI5 disappears.

A third type of robustness tests concern how results are affected by including additional covariates in our baseline model. First, we follow Carter (2007) and include the Gastil indices of *civil liberties* and *political rights*. The indices are not significant, but their inclusion reveals a significant positive coefficient on economic globalization. Adding the degree of *urbanization* does not alter main findings, with urbanization being negative but not significant. *Unemployment*, when included, has the expected positive and significant effect on inequality. In this case, the coefficient on EFI5 is insignificant, suggesting that deregulation increases inequality by increasing unemployment. Including share of *employment in industry* confirms baseline results and renders KOF1 positive. The same holds when we control also for the share of *employment in the service*. In some regressions using EFI, the share of industry employment is significantly negatively related to inequality, but the size of other coefficients does not change.

Finally, we examine the robustness of our findings by excluding countries in the geographical regions *sub-Saharan Africa*, *Latin America*, and *East Asia* from the sample. These groups of countries are often found to differ systematically in a way that might not be fully captured by the country fixed effect, or by dividing the sample in developed and developing countries. Excluding these groups, does not affect main results for economic freedom. Excluding sub-Saharan or East Asian countries, however, means that social globalization loses significance.

(b) Longer time period

In addition to the sensitivity tests reported in Table 4, we analyze whether changes in liberalization and globalization over a longer time period associate with higher income inequality. Table 5 presents the results when using Gini coefficients of net income (column 1) or the Kuznets ratio (column 2) as the dependent variable. Due to data limitations, the sample is smaller than that used in baseline estimations. In particular, the sample is small and mainly consists of high- and upper-middle-income countries when using the Kuznets ratio (Table A in the Appendix provides information on the country coverage). Still, the results in general confirm our conclusions so far.

Column 1 shows that market deregulation stands out, in terms of both size and significance, in Gini estimations. Furthermore, social globalization has an unequalizing impact when using this dependent variable, while estimations using the Kuznets ratio provide evidence that freedom to trade internationally has a significant positive influence. This empirical estimate possibly confirms theoretical predictions. According to H–O theory, capital owners benefit more than do low skilled workers from trade in high-income countries. Assuming that capital owners appear in the upper tail of the income distribution, the positive effect of EFI4 should particularly appear when using the Kuznets ratio as our dependent variable.

Table 4 Summary of sensitivity tests

Variation	Composite index					
Baseline	EFI	0.949**	[0.384]	EFI4	0.662**	[0.295]
				EFI5	1.260***	[0.459]
	KOF	0.141*	[0.076]	KOF2	0.089**	[0.038]
Lagged EFI and KOF indices (t-1)	EFI	0.998*	[0.545]	EFI4	0.574*	[0.341]
				EFI5	1.410***	[0.523]
	KOF	0.175**	[0.081]	KOF1	0.136**	[0.061]
				KOF2	0.083**	[0.037]
Excluding countries with extreme EFI indices (10 countries)	EFI	1.312***	[0.425]	EFI4	0.986***	[0.312]
				EFI5	1.622***	[0.529]
Excluding countries with extreme KOF indices (8 countries)	KOF	0.143*	[0.085]	KOF1	0.110*	[0.060]
				KOF2	0.104**	[0.041]
All EFI sub-indices together				EFI2	-0.655**	[0.278]
				EFI4	1.192***	[0.313]
All KOF sub-indices together				KOF2	0.069*	[0.041]
Quadratic specification EFI	EFI	-2.652	[1.820]			
	EFI ²	0.238	[0.164]			
Quadratic specification KOF	KOF	0.162	[0.179]			
	KOF ²	0.000	[0.001]			
Excluding countries with extreme Gini coefficients (5 countries)	EFI	0.512	[0.383]	EFI4	0.626**	[0.309]
				EFI5	0.912**	[0.437]
	KOF	0.070	[0.065]	KOF2	0.069*	[0.036]
Excluding Gini coefficients with extreme standard errors	EFI	0.414	[0.428]	EFI4	0.533*	[0.300]
				EFI5	0.979**	[0.454]
	KOF	0.122*	[0.073]	KOF2	0.076**	[0.037]
Replacing average Ginis by end values	EFI	0.576	[0.382]	EFI4	0.510**	[0.248]
				EFI5	1.382***	[0.382]
	KOF	0.130*	[0.076]			
Replacing net income Gini by gross income Gini	EFI	1.029*	[0.531]	EFI4	0.799*	[0.447]
	KOF	0.241**	[0.094]	KOF1	0.142**	[0.067]
				KOF2	0.171***	[0.048]

*** Denotes significant at 1% level, ** significant at 5 % level, * significant at 10 % level. Robust standard errors in brackets. All estimations include period dummies.

Table 4 continued

Variation	Composite index					
Including civil liberties	EFI	0.760*	[0.450]	EFI4	0.605*	[0.339]
				EFI5	1.151**	[0.451]
	KOF	0.179**	[0.085]	KOF1	0.109**	[0.054]
				KOF2	0.120***	[0.044]
Including political rights	EFI	0.749	[0.479]	EFI4	0.573*	[0.343]
				EFI5	1.111**	[0.464]
	KOF	0.174**	[0.081]	KOF1	0.108*	[0.054]
				KOF2	0.116***	[0.042]
Including civil liberties and political rights	EFI	0.749	[0.479]	EFI4	0.577*	[0.337]
				EFI5	1.127**	[0.445]
	KOF	0.184**	[0.084]	KOF1	0.110**	[0.053]
				KOF2	0.121***	[0.043]
Including urban population	EFI	0.889**	[0.374]	EFI4	0.654**	[0.289]
				EFI5	1.223***	[0.459]
	KOF	0.139*	[0.076]	KOF2	0.087**	[0.039]
Including unemployment rates	EFI	0.334	[0.429]	EFI4	0.668**	[0.258]
	KOF	0.101	[0.066]	KOF2	0.080**	[0.032]
Including share of employment in industry	EFI	0.331	[0.342]	EFI4	0.667**	[0.276]
				EFI5	0.590*	[0.347]
	KOF	0.104**	[0.051]	KOF1	0.086**	[0.035]
				KOF2	0.091***	[0.032]
Including share of employment in industry and service	EFI	0.330	[0.343]	EFI4	0.657**	[0.278]
				EFI5	0.599*	[0.354]
	KOF	0.103**	[0.052]	KOF1	0.086**	[0.036]
				KOF2	0.091***	[0.033]
Excluding sub-Saharan countries (14 countries)	EFI	0.986***	[0.352]	EFI4	0.745**	[0.297]
				EFI5	1.477***	[0.523]
	KOF	0.048	[0.064]			
Excluding Latin American countries (22 countries)	EFI	0.987	[0.613]	EFI4	0.642*	[0.365]
				EFI5	1.357**	[0.595]
	KOF	0.220***	[0.079]	KOF2	0.097**	[0.040]
Excluding East Asian countries (11 countries)	EFI	0.884**	[0.410]	EFI4	0.559*	[0.297]
				EFI5	0.937**	[0.429]
	KOF	0.114	[0.075]			

*** Denotes significant at 1% level, ** significant at 5 % level, * significant at 10 % level. Robust standard errors in brackets. All estimations include period dummies.

Table 5 Liberalization, globalization, and inequality increase between 1985 and 2005²⁴

	Gini	Kuznets ratio
EFI 2000-1980	0.625 [0.506]	0.156 [0.118]
EFI1 2000-1980	0.195 [0.322]	0.041 [0.065]
EFI2 2000-1980	-0.243 [0.333]	-0.021 [0.061]
EFI3 2000-1980	0.273 [0.226]	0.021 [0.043]
EFI4 2000-1980	0.122 [0.386]	0.127* [0.072]
EFI5 2000-1980	1.340* [0.691]	0.238 [0.170]
KOF 2000-1980	0.129* [0.0757]	0.011 [0.013]
KOF1 2000-1980	0.059 [0.0620]	0.004 [0.011]
KOF2 2000-1980	0.098* [0.054]	0.006 [0.008]
KOF3 2000-1980	0.023 [0.045]	0.004 [0.010]
Observations	59 or 60	39 or 41

*** Denotes significant at 1% level, ** significant at 5 % level, * significant at 10 % level.

Robust standard errors in brackets.

(c) GMM estimation

As a final robustness test, we apply the system GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998). In addition to providing consistent results in the presence of endogenous variables, this estimator allows the inclusion of a lagged value of inequality. While fixed-effect estimations control for country characteristics that are constant over time, including the lag of inequality will control for the longer-term impacts of our existing independent variables and for omitted variables that change over time in a way that could drive the results. As noted by Owen and Wu (2007), the inclusion of the lagged dependent variable also changes the model slightly, from examining how liberalization and globalization relates to the level of income inequality, to examining the growth of inequality. Thus, by including lagged inequality, we will capture effects that appear within a five year period in our case.

Following Roodman's (2006) recommendations, we use a technique to reduce the number of instruments and test the sensitivity of our results with respect to lag lengths, since the GMM

²⁴ Regressions control for the 1980 values of GDP per capita, human capital, and the dependency ratio. Moreover, the initial inequality value and dummies for Latin America and East Asia are included. As above, indices are included separately in the estimations.

estimator easily becomes biased due to over-identification of instruments. The estimations treat the lagged information on income inequality and the different indices as endogenous and all other variables as exogenous. Moreover, we use a two-step estimator, including Windmeijer's (2005) finite sample correction. Before interpreting the results, we note that the Hansen J-test suggests that the instruments are valid. We also conduct the Arellano–Bond test for second-order autocorrelation. As Table 6 shows, there is no significant serial correlation in most specifications, so the estimator should be consistent.

Results confirm positive and significant effects of EFI4 and the aggregate KOF Index. Economic globalization is now significant, while social globalization is not, though both are positive. The positive effect of market deregulation on income inequality loses significance when using the system GMM estimator. Finally, the GMM-estimation indicates that increases in the dependency ratio have a big an immediate impact on inequality.

To summarize the sensitivity analysis, the positive effect of EFI4 is robust, suggesting that trade liberalizations increase within-country income inequality. Moreover, social globalization and deregulation as measured by KOF2 and EFI5 is found to have a significant positive impact in 16 and 15 of the 22 different sensitivity tests, respectively. KOF1, however, is significant only in 8 specifications, but among these we find the GMM estimation, as well as the baseline with lagged indices. Interestingly, EFI1, EFI2, EFI3, and KOF3 are never significantly positively correlated with inequality, and in many cases the sign is negative. As a result, the composite indices are often insignificant in our specifications.

Table 6 System GMM estimation with lagged inequality and liberalization and globalization index values as endogenous

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Inequality (t-1)	0.366 [0.240]	0.488*** [0.188]	0.457* [0.239]	0.333 [0.272]	0.787*** [0.104]	0.334 [0.252]	0.305 [0.255]	0.270 [0.251]	0.241 [0.308]	0.476** [0.204]
GDP per capita	-1.644 [1.027]	-0.530 [0.562]	0.433 [1.584]	-0.293 [0.804]	-1.543** [0.691]	-1.207 [1.023]	-2.376* [1.241]	-2.952** [1.317]	-2.870* [1.522]	-0.231 [0.639]
Human capital	0.044 [0.081]	0.023 [0.062]	0.035 [0.079]	0.014 [0.092]	0.058* [0.035]	0.041 [0.095]	-0.008 [0.108]	0.061 [0.114]	-0.021 [0.125]	-0.070 [0.116]
Dependency ratio	16.453** [7.581]	14.614** [6.427]	9.874 [6.932]	20.911** [9.598]	4.295* [2.602]	17.166** [8.014]	23.196** [9.313]	23.027** [9.136]	22.867** [10.313]	14.047* [8.067]
EF1	0.556 [0.986]									
EF11		0.432 [0.623]								
EF12			-1.089 [0.907]							
EF13				-0.078 [0.390]						
EF14					0.673* [0.403]					
EF15						0.147 [1.103]				
KOF							0.114* [0.069]			
KOF1								0.131* [0.078]		
KOF2									0.110 [0.068]	
KOF3										-0.034 [0.061]
Constant	25.190** [11.170]	12.748 [8.931]	17.119 [12.950]	16.287* [9.069]	14.434** [7.046]	24.984** [11.926]	27.488*** [10.567]	32.044*** [11.477]	35.774** [15.400]	17.239** [7.085]
Number of i	78	78	78	78	78	78	79	79	79	79
Observations	453	476	439	470	465	440	482	482	482	482
Number of instruments	25	25	25	25	25	25	25	25	25	25
Period dummies	0.00	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Serial correlation [p-value]	0.09	0.20	0.02	0.47	0.36	0.41	0.92	0.99	0.93	0.37
Hansen J-test [p-value]	0.88	0.38	0.64	0.64	0.11	0.23	0.60	0.71	0.30	0.17

*** Denotes significant at 1% level, ** significant at 5% level, * significant at 10% level.

Robust standard errors in brackets. All estimations include period dummies.

4.3 Distinguishing between development levels

As discussed in Section 2, there are reasons to suspect that some types of liberalization and globalization may have different inequality consequences at different development levels. To test this, we divide the sample in two ways and re-run our baseline regressions. First, we split the sample into two groups; 43 high- and middle-income countries and 36 low- and lower middle-income countries according to World Bank (2008) classifications. This division inevitably means that both groups are rather heterogeneous.²⁵ Therefore, we also divide our sample into 28 high-income countries and 37 middle-income countries, excluding the 14 poorest economies.

As shown in Table 7, the results for economic freedom in the full sample seem to be driven by developed countries. Among these 43 countries, smaller government (higher EFI1 value) also significantly associates with higher inequality. In addition, coefficients for EFI4, EFI5 and aggregate economic freedom are bigger and focusing on the 28 richest countries in the sample reveals even larger coefficient. This suggest that reforms toward more economic freedom increases income inequality in relatively developed economies. Globalization, however, seem to matter only in less rich countries, where social globalization is positive and significant.

²⁵ For example, the high- and upper middle-income group contains Sweden and Denmark as well as Botswana and Uruguay.

Table 7 Analyzing the effects of economic freedom at different development levels

Division	Composite index		Significant components	
High- and upper middle income countries (43 countries)	EFI 1.435***	[0.401]	EFI1 1.267***	[0.282]
			EFI4 0.712*	[0.374]
			EFI5 1.850***	[0.572]
	KOF 0.066	[0.075]		
Low- and lower middle income countries (36 countries)	EFI 0.474	[0.636]		
	KOF 0.208	[0.140]	KOF2 0.283***	[0.073]
High-income countries (28 countries)	EFI 1.832**	[0.798]	EFI1 1.486***	[0.384]
			EFI4 1.890***	[0.524]
			EFI5 2.081***	[0.674]
	KOF 0.146*	[0.074]		
Middle income countries (37 countries)	EFI 0.481	[0.460]	EFI5 1.160*	[0.593]
	KOF 0.073	[0.093]	KOF2 0.144**	[0.060]

*** Denotes significant at 1% level, ** significant at 5 % level, * significant at 10 % level.
Robust standard errors in brackets. All estimations include period dummies.

4. Conclusion

In short, our analysis has established that the fourth dimension of the Economic Freedom Index (freedom to trade internationally) has a robust positive effect on within-country income inequality. In many specifications, we have also found significant positive effects from deregulation (the fifth dimension of the economic freedom), and social globalization as measured by the second dimension of the KOF Index. Dividing the sample according to development levels suggest that inequality effects from economic freedom appear in relatively rich countries, while the effect of social globalization comes from middle- and low-income countries.

The estimates of the EFI4 coefficient are rather stable at approximately 0.7, and a two standard deviation increase in EFI4 increases Gini inequality with 0.22 standard deviations (though the effect is more than twice as big in the richest 28 countries). This effect is comparable to that found by Carter (2007), who found that a two standard deviation increase in the aggregated Economic Freedom Index was related to a Gini-increase of a third standard deviation. As a concrete example, we note that Sweden increased its EFI4 score by 1.4 points between 1980 and 2000. According to estimated coefficients in the full sample, this explains a quarter of Sweden's inequality increase from 21 to 25 points in the SWIID data. Using estimates for high income countries only, however, the increase in EFI4 explains more than half of the inequality increase in Sweden during this period.

Finally, it bears emphasizing that many types of liberalization studied here have no significant effect on income inequality. Only among the richest countries do we find that smaller government is linked to higher inequality. Improvements in the monetary system as measured by EFI3 can probably also be done without increasing inequality. Perhaps most interestingly, legal structure as measured by EFI2 typically has a negative sign (though rarely significant). At the same time, Berggren and Jordahl (2005) demonstrate that EFI2 is in fact the most robust component of the Economic Freedom Index when it comes to explaining economic growth. This finding suggests that building a well-functioning legal system may offer a way to promote growth without inducing negative distributional consequences.

Acknowledgements

The paper has benefitted from comments from seminar participants at Ratio and Lund University and from discussions at the meeting of the American Public Choice Society in San Antonio 2008. In addition, we thank Niclas Berggren, Christian Bjørnskov, Pernilla Johansson, Jesper Roine, Susanna Thede and an anonymous referee for useful comments.

The authors want to thank SIDA for financial support. Andreas Bergh also gratefully acknowledges Vetenskapsrådet and Torsten och Ragnar Söderbergs stiftelser for financial support. Therese Nilsson gratefully acknowledges financial support from the Swedish Council for working life and social research.

Appendix

Table A Country list

Argentina	Fiji*	Kenya*	Senegal*
Australia□	Finland□	Korea, Rep.□	Sierra Leone*
Austria□	France□	Malawi*	Singapore
Bangladesh*□	Germany	Malaysia	South Africa
Barbados	Ghana*□	Mali*□	Spain□
Belgium□	Greece	Malta	Sri Lanka*
Bolivia*	Guatemala*□	Mauritius	Sweden□
Botswana	Guyana*	Mexico□	Switzerland
Brazil□	Haiti*	Mozambique*	Thailand*□
Cameroon*	Honduras*□	Nepal*	Trinidad and Tobago
Canada□	Hong Kong, China□	Netherlands□	Tunisia*□
Chile□	Hungary□	New Zealand□	Turkey
China*□	India*□	Nicaragua*	Uganda*□
Colombia*	Indonesia*□	Norway□	United Kingdom□
Costa Rica□	Iran, Islamic Rep.*	Pakistan*□	United States□
Cyprus	Ireland□	Panama□	Uruguay
Denmark	Israel□	Paraguay*	Venezuela, RB□
Dominican Republic*□	Italy□	Peru*	Zambia*
Ecuador*	Jamaica*□	Philippines*□	Zimbabwe*
Egypt, Arab Rep.*	Japan	Poland□	
El Salvador*	Jordan*□	Portugal	

* Low or lower middle income countries

□ Countries included in estimations employing Kuznets ratio as the dependent variable

Table B The Economic Freedom of the World Index

1: Size of Government: Expenditures, Taxes, and Enterprises

- A. General government consumption spending as a percentage of total consumption
- B. Transfers and subsidies as a percentage of GDP
- C. Government enterprises and investment as a percentage of GDP
- D. Top marginal tax rate (and income threshold at which it applies)
 - i. Top marginal income tax rate (and income threshold at which it applies)
 - ii. Top marginal income and payroll tax rate (and income threshold at which it applies)

2: Legal Structure and Security of Property Rights

- A. Judicial independence: the judiciary is independent and not subject to interference from the government or parties in disputes
- B. Impartial courts: A trusted legal framework exists for private businesses to challenge the legality of government actions or regulation
- C. Protection of intellectual property
- D. Military interference in rule of law and the political process
- E. Integrity of the legal system

3: Access to Sound Money

- A. Average annual growth of the money supply in the last five years minus average annual growth of real GDP in the last ten years
- B. Standard inflation variability in the last five years
- C. Recent inflation rate
- D. Freedom to own foreign currency bank accounts domestically and abroad

4: Freedom to Trade Internationally

- A. Taxes on international trade
 - i. Revenue from taxes on international trade as a percentage of exports plus imports
 - ii. Mean tariff rate
 - iii. Standard deviation of tariff rates
- B. Regulatory trade barriers
 - i. Hidden import barriers: no barriers other than published tariffs and quotas
 - ii. Costs of importing: the combined effect of import tariffs, license fees, bank fees, and the time required for administrative red tape raises costs of importing equipment: by 10% or less = 10, by more than 50% = 0
- C. Actual size of trade sector compared with expected size
- D. Difference between official exchange rate and black market rate
- E. International capital market controls
 - i. Access of citizens to foreign capital markets and foreign access to domestic capital markets
 - ii. Restrictions on the freedom of citizens to engage in capital market exchange with foreigners—index of capital controls among 13 IMF categories

5: Regulation of Credit, Labor, and Business

- A. Credit market regulations
 - i. Ownership of banks: percentage of deposits held in privately owned banks
 - ii. Competition: domestic banks face competition from foreign banks

- iii. Extension of credit: percentage of credit extended to private sector
- iv. Avoidance of interest rate controls and regulations that lead to negative real interest rates
- v. Interest rate controls: interest rate controls on bank deposits and/or loans are freely determined by the market
- B. Labor market regulations
 - i. Impact of minimum wage: the minimum wage, set by law, has little impact on wages because it is too low or not obeyed
 - ii. Hiring and firing practices: hiring and firing practices of companies are determined by private contract
 - iii. Share of labor force whose wages are set by centralized collective bargaining
 - iv. Unemployment benefits: the unemployment benefits system preserves the incentive to work
 - v. Use of conscripts to obtain military personnel
- C. Business regulations
 - i. Price controls: extent to which businesses are free to set their own prices
 - ii. Administrative conditions and new businesses: administrative procedures are an important obstacle to starting a new business
 - iii. Time spent dealing with government bureaucracy: senior management spends a substantial amount of time dealing with government bureaucracy
 - iv. Starting a new business: starting a new business is generally easy
 - v. Irregular payments: irregular, additional payments connected with import and export permits, business licenses, exchange controls, tax assessments, police protection, or loan applications are very rare

Table C The KOF Index of Globalization

A. Economic Globalization

i) Actual flows

Trade (percent of GDP)

Foreign direct investment, flows (percent of GDP)

Foreign direct investment, stocks (percent of GDP)

Portfolio investment (percent of GDP)

Income payments to foreign nationals (percent of GDP)

ii) Restrictions

Hidden import barriers

Mean tariff rate

Taxes on international trade (percent of current revenue)

Capital account restrictions

B. Social Globalization

i) Data on personal contacts

Outgoing telephone traffic

Transfers (percent of GDP)

International tourism

Foreign population (percent of total population)

International letters (per capita)

ii) Data on information flows

Internet hosts (per 1000 people)
Internet users (per 1000 people)
Cable television (per 1000 people)
Trade in newspapers (percent of GDP)
Radios (per 1000 people)
iii) Data on cultural proximity
Number of McDonald's restaurants (per capita)
Number of IKEA outlets (per capita)
Trade in books (percent of GDP)

C. Political Globalization

Embassies in country
Membership in international organizations
Participation in U.N. Security Council missions

Table D Summary statistics for different samples

Variable	Explanation	Countries	Obs.	Mean	Std. Dev.	Min	Max	Source
Baseline								
Gini	Gini coefficient of net incomes	79	521	38.23	9.57	20.86	63.11	Solt (2008)
Gini gross	Gini coefficient of gross incomes	79	514	51.30	9.90	28.37	82.54	Solt (2008)
GDP per capita	Natural logarithm of real GDP per capita (PPP adjusted)	79	521	8.26	1.15	4.77	10.52	Heston (2006)
Human capital	Share of total population over 25 years with higher education	79	521	5.44	4.79	0.10	31.40	Barro and Lee (2000)
Dependency	Dependency ratio (dependents to working-age population)	79	521	0.69	0.18	0.39	1.13	WDI (2008)
Employment industry	Share of total employment in industry	71	318	24.99	7.22	2.30	39.80	WDI (2008)
Employment service	Share of total employment in service	71	318	53.47	16.15	3.95	76.70	WDI (2008)
Urban	Share of population living in urban areas	79	521	55.19	23.35	4.48	100	WDI (2008)
Unemployment	Share of labor force unemployed	75	316	8.09	4.77	0.60	35.50	WDI (2008)
Civil liberties	Gastil index for civil liberties	78	459	4.93	1.67	1.00	7.00	Freedom house (2009)
Political rights	Gastil index for political rights	78	459	5.12	1.88	1.00	7.00	Freedom house (2009)
EFI	Aggregated chain-linked economic freedom of the world index	78	479	6.12	1.19	2.58	9.105	Gwartney and Lawson (2008)
EFI1	Size of government	78	478	5.54	1.58	1.79	9.71	Gwartney and Lawson (2008)
EFI2	Legal structure and secure property rights	78	459	6.07	2.26	1.29	9.87	Gwartney and Lawson (2008)
EFI3	Access to sound money	78	463	7.06	1.99	0.14	9.77	Gwartney and Lawson (2008)
EFI4	Freedom to exchange with foreigners	78	473	6.36	1.54	1.53	9.77	Gwartney and Lawson (2008)
EFI5	Regulation of credit, labor and business	78	460	5.84	1.07	2.89	8.85	Gwartney and Lawson (2008)
KOF	Aggregated globalization index	79	521	48.62	18.99	8.51	92.61	Dreher (2008)
KOF1	Economic globalization	79	521	50.65	19.77	7.80	94.76	Dreher (2008)
KOF2	Social globalization	79	521	42.55	21.94	5.52	95.19	Dreher (2008)
KOF3	Political globalization	79	521	54.93	24.38	4.27	98.45	Dreher (2008)
Longer time period - Gini								
Gini 2005-1985	Change in Gini coefficient of net income	60	60	1.37	5.32	-20.90	12.90	Solt (2008)
Gini 1985	Initial value of Gini coefficient of net income	60	60	37.32	10.11	20.95	61.46	Solt (2008)
EFI 2000-1980	Change in aggregated chain-linked index	59	59	1.19	0.92	-0.80	3.32	Gwartney and Lawson (2008)
EFI1 2000-1980	Change in EFI1	59	59	1.27	1.57	-3.56	5.52	Gwartney and Lawson (2008)
EFI2 2000-1980	Change in EFI2	59	59	0.39	1.41	-2.47	4.68	Gwartney and Lawson (2008)
EFI3 2000-1980	Change in EFI3	59	59	1.84	2.18	-3.22	7.21	Gwartney and Lawson (2008)
EFI4 2000-1980	Change in EFI4	59	59	1.52	1.14	-0.45	4.68	Gwartney and Lawson (2008)
EFI5 2000-1980	Change in EFI5	59	59	0.61	0.67	-1.29	2.70	Gwartney and Lawson (2008)
KOF 2000-1980	Change in aggregated globalization index	60	60	16.98	6.90	1.32	30.08	Dreher (2008)
KOF1 2000-1980	Change in KOF1	60	60	19.69	8.79	-4.67	39.86	Dreher (2008)
KOF2 2000-1980	Change in KOF2	60	60	20.14	8.60	4.46	39.13	Dreher (2008)
KOF3 2000-1980	Change in KOF3	60	60	8.09	13.75	-19.40	35.51	Dreher (2008)
GDP per capita 1980	Initial value log real GDP per capital	60	60	7.81	1.01	5.82	9.25	Heston (2006)
Human capital 1980	Initial value share of population with higher education	60	60	5.56	2.76	0.54	11.87	Barro and Lee (2000)
Dependency 1980	Initial value of dependency ratio	60	60	0.74	0.16	0.48	1.07	WDI(2008)
Latin America	Dummy for countries in Latin America	60	60	0.29	0.46	0.00	1.00	WDI(2008)
East Asia	Dummy for countries in East Asia	60	60	0.14	0.35	0.00	1.00	WDI(2008)

Table D continued

Longer time period - Kuznet	Explanation	Countries	Obs.	Mean	Std. Dev.	Min	Max	Source
Kuznets ration 2005-1985	Change in Kuznets ratio	41	41	0.06	0.65	-2.22	1.23	WIID2.c(2008)
Kuznets ratio 1985	Initial value of Kuznets ratio	41	41	3.12	1.74	1.19	7.43	WIID2.c(2008)
EFI 2000-1980	Change in aggregated chain-linked index	39	39	1.24	0.87	-0.80	3.32	Gwartney and Lawson (2008)
EFI1 2000-1980	Change in EFI1	39	39	1.42	1.32	-0.91	5.52	Gwartney and Lawson (2008)
EFI2 2000-1980	Change in EFI2	39	39	0.55	1.48	-2.47	4.68	Gwartney and Lawson (2008)
EFI3 2000-1980	Change in EFI3	39	39	1.85	2.02	-1.72	6.99	Gwartney and Lawson (2008)
EFI4 2000-1980	Change in EFI4	39	39	1.41	1.27	-0.12	5.17	Gwartney and Lawson (2008)
EFI5 2000-1980	Change in EFI5	39	39	0.58	0.64	-1.29	2.00	Gwartney and Lawson (2008)
KOF 2000-1980	Change in aggregated globalization index	41	41	17.17	5.93	3.13	30.08	Dreher (2008)
KOF1 2000-1980	Change in KOF1	41	41	20.27	7.74	9.76	39.86	Dreher (2008)
KOF2 2000-1980	Change in KOF2	41	41	20.14	8.19	4.40	39.13	Dreher (2008)
KOF3 2000-1980	Change in KOF3	41	41	7.90	13.35	-19.40	35.51	Dreher (2008)
GDP per capita 1980	Initial value log real GDP per capital	41	41	7.98	0.98	5.91	9.22	Heston (2006)
Human capital 1980	Initial value share of population with higher education	41	41	5.95	2.88	0.54	11.87	Barro and Lee (2000)
Dependency 1980	Initial value of dependency ratio	41	41	0.74	0.17	0.48	1.07	WDI(2008)
Latin America	Dummy for countries in Latin america	41	41	0.26	0.44	0	1	WDI(2008)
East Asia	Dummy for countries in East Asia	41	41	0.18	0.39	0	1	WDI(2008)

Table E Correlation matrix

	Gini	Gini gross	GDP per capita	Human capital	Dependency	Employment industry	Employment service	Urban	Unemployment	Civil liberties	Political rights
Gini	1										
Gini gross	0.93	1									
GDP per capita	-0.44	-0.36	1								
Human capital	-0.30	-0.26	0.73	1							
Dependency	0.61	0.55	-0.75	-0.62	1						
Employment industry	-0.47	-0.46	0.52	0.15	-0.54	1					
Employment service	-0.07	0.04	0.74	0.61	-0.41	0.20	1				
Urban	-0.35	-0.29	0.77	0.64	-0.64	0.44	0.67	1			
Unemployment	0.19	0.14	-0.06	-0.10	0.12	-0.08	0.16	-0.05	1		
Civil liberties	-0.36	-0.29	0.58	0.54	-0.46	0.38	0.53	0.40	0.08	1	
Political rights	-0.31	-0.25	0.56	0.53	-0.45	0.39	0.49	0.39	0.11	0.95	1
EFI1	0.38	0.32	0.01	0.05	0.02	-0.24	0.04	0.00	-0.09	-0.04	-0.02
EFI2	-0.64	-0.56	0.66	0.44	-0.66	0.45	0.47	0.57	-0.13	0.67	0.61
EFI3	-0.30	-0.23	0.44	0.41	-0.36	0.09	0.36	0.33	-0.16	0.35	0.31
EFI4	-0.42	-0.36	0.67	0.48	-0.61	0.35	0.48	0.59	-0.08	0.52	0.49
EFI5	-0.25	-0.19	0.63	0.46	-0.54	0.18	0.55	0.54	0.02	0.57	0.51
KOF1	-0.36	-0.28	0.77	0.56	-0.62	0.33	0.62	0.64	0.05	0.59	0.56
KOF2	-0.48	-0.39	0.83	0.67	-0.70	0.37	0.67	0.70	-0.04	0.67	0.64
KOF3	-0.48	-0.37	0.49	0.54	-0.51	0.25	0.22	0.48	-0.13	0.39	0.36

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