Reexamining Heckscher-Ohlin in the Age of Inequality

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To what extent do patterns of global trade explain increasing economic inequality within developed economies? Depending on one's preferred measure, inequality has been upward trending in the United States since the 1980s, or as far back as the 1960s (see Figure 1). Economists continue to debate the costs (Kumhof and Rancière 2010), benefits (Forbes 2000), and necessity (Okun 1975) of economic inequality. However, the U.S. public has become increasingly pessimistic towards inequality, regardless of any associated benefits. In a recent NBC-WSJ poll, 54% of Americans interviewed agreed that "The widening gap between the incomes of the wealthy and everyone else is undermining the idea that every American has the opportunity to move up to a better standard of living" (Cillizza 2014). This is despite the fact that the stock market has enjoyed a robust recovery from the 2007-08 financial crisis (Menton 2014).

Recent works on economic inequality have sought to leverage new historical data to identify inequality's fundamental causes (Piketty 2014). However, in addition to assessing the explanatory power of the new literature, it may be prudent to reexamine the pre-existing theoretical framework in light of the most recent data. In the following paper I lay forth a series of empirical tests designed to assess the Heckscher-Ohlin model's ability to account for rising economic inequality within the developed world.

Testing for Stolper-Samuelson Effects in an Era of Inequality

Developed by Eli Heckscher and Bertil Ohlin, the Heckscher-Ohlin (H-O) model of international trade represents a formalization of David Ricardo's classic theory of comparative advantage (1933). Suppose that there are two countries - country A and country B, and that each country is endowed with varying amounts of two different factors of production - let us call them capital and labor. Following the mechanism of comparative advantage, countries A and B specialize in the good that utilizes the relatively abundant factor of production. Thus, if country A is rich in capital, it will specialize in capital-intensive goods which it will subsequently export to country B. In contrast, country B is relatively rich in labor, and will tend to export labor-intensive goods to country A.

If we assume constant returns and perfect competition, then the H-O model should produce what are known as Stolper-Samuelson effects. Wolfgang Stolper and Paul Samuelson predicted that as the demand for a particular good increases, the returns for factors utilized in the production of that good should increase as well (1941). Thus, when a developing country becomes able to export to developed economies, that country should experience an increase in demand for labor-intensive goods. Prices for labor-intensive goods should increase in turn (assuming that prices correlate with demand). Consequently, the returns to labor (i.e. wages) should increase as well. Conversely, when capital abundant economies such as the U.S. export capital-intensive goods to the developing world, we should expect in an increase in the returns to capital (greater profits, dividends, etc.).

If Stolper-Samuelson effects manifest as predicted, then increasing trade between the developed and developing world may explain increasing economic inequality in the former. Specifically, imports from the developing world should drive down the returns to labor (thus curtailing the income of wage earners within the developed world) while exports to the developing world should increase the returns to capital (thus further enriching the owners of capital).

As intuitive as the logic may be, there is no shortage of controversy as to whether Stolper-Samuelson effects actually exist today. In an early attempt to test the implications of the H-O model, Wassily Leontief found that the capital-abundant U.S. was, counterintuitively, exporting labor-intensive goods while importing capital-intensive goods (1954). In a highly influential article, Paul Krugman presented a parsimonious model explaining the forces underlying the Leontief paradox and why, in the wake of WWII, the developed world did not appear to experience the stagnating wages that the H-O model predicts (1981). Nearly three decades later, Krugman reversed his argument, noting that developing countries were increasingly specializing in unskilled, labor-intensive niches, resulting in “textbook” Stolper-Samuelson effects (2008). Only two years prior, Donald R. Davis and Prachi Mishra had noted rising wage inequality within Latin America following trade liberalization, arguing that “It is time to declare Stolper-Samuelson dead” (2007).

If Stolper-Samuelson effects are at work today, then we should expect international arbitrage to exert an effect on both the returns for labor and capital, with economic inequality increasing in the developed world versus decreasing within the developing world. In theory, the nature of the economic exchange should not matter. When a richer country R trades with a poorer country P, trade in both directions should produce the predicted effect. Thus, exports $R \rightarrow P$ should widen economic inequality within R by benefiting R's top income earners, and imports $R \leftarrow P$ should widen economic inequality by undermining R's lower income earners.

Dependent Variables

I use three different measures for the dependent variable of economic inequality: two different sets of Gini coefficients, and the Theil index. Table 2 presents a correlation matrix of these three measures, while the reader can visually assess the different measures by looking at the different trends for the U.S. presented in Figure 1.

Economists calculate Gini coefficients by using estimates of the Lorenz curve, the Lorenz curve being the hypothetical difference in distributions of wealth between a uniform distribution versus the actual distribution for county i. In turn, a Gini coefficient is the ratio of area enclosed by the Lorenz curve divided by the total area under the uniform distribution. Formally,

$$\text{Gini Coefficient} \equiv A/(A+B) \tag{1}$$

where A is the area enclosed by the Lorenz curve, and B represents the uniform distribution (i.e. a hypothetical society of perfect inequality). For data, I use the World Income Inequality Database (WIID) V3.0B hosted by the United Nations University - World Institute for Development Economics Research (UNU-WIDER) (September 2014). Based upon previous work by Klaus Deininger and Lyn Squire (1996, 1998), the UNU-WIDER dataset contains 7,054 Gini coefficient estimates from 175 states and political entities dating as far back as 1867 (n = 2,821). The dataset lists multiple coefficient estimates per country/year, and assigns each estimate a score on a [1, 4] scale of quality. In preparing the data for analysis, I average together all Gini coefficients across country/year/quality assessments. I then drop the lowest quality coefficients in instances where multiple estimates remain. The summary statistics for the resulting dataset are displayed in Table 1.[1]

Unfortunately, there is no internationally agreed upon standard for the income / consumption data that underlies the construction of these estimates. The UNU-WIDER dataset encompasses different surveys, income/consumption concepts, population concepts, weighting procedures, and so forth. Scrubbing the dataset of the lowest quality estimates alleviates the problem, but does not tackle the fundamental problem of comparability across countries. James Galbraith and Hyunsub Kum note that conventional studies utilizing the Deininger and Squire data show great variation in economic inequality within the Euro Region, but far less variation across countries such as India and Indonesia (2004). The extent of economic integration is far greater in Europe than in South and Southeast Asia, and so we should expect the variance of Gini coefficients to be less within Europe than without. Galbraith and Kum suggest that the fact that the opposite appears to be the case is *prima facie* evidence against the integrity of the Deininger and Squire estimates, and by extension, good reason to treat the UNU-WIDER data with skepticism.

To address these concerns, I supplement the UNU-WIDER data with the Estimated Household Income Inequality (EHII) dataset hosted by the University of Texas Inequality Project (UTIP). Unlike UNU-WIDER, UTIP uses the Theil Index as opposed to Gini coefficients. Formally,

$$\text{Theil Index} \equiv \frac{1}{n} \sum \left[\frac{x_i}{\bar{x}} * ln\Big(\frac{x_i}{\bar{x}}\Big) \right] \tag{2}$$

where n is the number of individuals within the country of interest, x_i is each individual citizen, and $\bar{x}$ is the mean wealth per citizen (i.e. GDP per capita). The above expression implies that in a hypothetical situation where citizen i holds 100% of the country's wealth, the Theil Index will be equal to the natural log of i's wealth divided by the GDP per capita (the term in parentheses). Similar to a Gini coefficient, the Theil Index estimates the difference between a country's actual distribution of wealth versus a uniform distribution from a perfectly egalitarian country. Galbraith and Kum have compiled a dataset of Theil Index estimates comprising 6,900 county/years. After discounting missing data, we are left with 3,918 observations - a significant improvement over the UN-WIDER data.[2]

For my third measure, I turn to the Standardized World Income Inequality Database (SWIID). Despite its relatively recent publication, multiple articles citing SWIID have appeared in such journals as *Social Science Quarterly* and *Political Research Quarterly*. SWIID works by synthesizing the UNU-WIDER dataset together with other datasets such as the OECD Income Distribution Database, Eurostat, the World Bank, and statistical offices around the world (Solt 2014). Using a form of imputation, SWIID leverages information from proximate years within the same country to estimate Gini coefficients that are missing from the UNU-WIDER data. The result is that SWIID maximizes the comparability of estimates while expanding coverage to 174 countries from the years 1960-2013 (n = 4,627), providing the largest available coverage among the three measures of economic equality discussed here (Table 1).[3] Although SWIID presents the researcher with one hundred vectors of imputed Gini coefficients, for the time being I set aside the complexities of multiple imputation, and instead, take the mean estimate for each country/year.

Independent Variables

This study examines the extent to which Stolper-Samuelson effects can account for economic inequality within the developed world. The causal mechanism can manifest in either one, or both of two ways: the *de facto* importation of labor (i.e., imports from poorer countries) or equally, the exportation of capital (i.e., exports to poorer countries). To operationalize the independent variables, I adopt a 2 x 2 approach, decomposing the casual mechanism into exports to developing countries (Exports_t^p), exports to developed countries (Exports_t^r), imports from developing countries (Imports_t^p), and imports from developed countries (Imports_t^r). These are all relative measures, as we are less interested in the absolute amount of trade than the relative influence trade has given the size of country i's economy. Thus, I divide each of these four measure by the size of country i's economy at year t. The resulting four measures are shown below.

$$\frac{\text{Imports}_t^r}{GDP_{it}} \qquad \frac{\text{Imports}_t^p}{GDP_{it}} \qquad \frac{\text{Exports}_t^r}{GDP_{it}} \qquad \frac{\text{Exports}_t^p}{GDP_{it}} \tag{3}$$

I fill out the above measures by using data from the International Monetary Fund (IMF). The IMF dataset encompasses 188 countries and other political entities, spans the period of 1948-2013, and contains over 1.5 million observations after discounting for missing data.[4] The unit of measurement is country/year/trade direction, with separate observations denoting a dyad's imports versus exports.[5] Figure 2 shows the distributions for the logged imports and exports weighted by GDP valued at purchasing-power-parities.

Control Variables

Constructing the measures listed in expression (3) requires us to weigh trade flows relative to GDP. In addition, I use GDP per capita to define whether country i's trade partner j is relatively rich (GDP per $\text{capita}_j >$ GDP per capita_i) or relatively poor (GDP per $\text{capita}_i >$ GDP per capita_j). I also include country i's inflation rate for year t as an additional control. I use data from the World Bank to address these three requirements, excluding from the analysis 78 cases that are either subnational entities (e.g. the Virgin Islands) or aggregations (e.g. "OECD members").

We might expect representational governments to have more incentive to mitigate the gap between top and bottom tier income earners relative to autocracies. To control for government type, I use the Political Regime Characteristics and Transitions dataset from the Polity IV Project (Marshall, Gurr, and Jaggers 2014). The Polity IV data encompasses 167 countries (minimum population of 500,000) over the period 1800-2013. The Polity IV measure varies from 10 (pure democracy) to -10 (pure autocracy). I trichotomize this measure, creating a dummy variable for democracies (Polity IV ≥ 6) and autocracies (Polity IV $\leq$ -6).[6]

While governments vary greatly in their willingness to use the power of the state to correct perceived inequality, virtually all governments engage in some degree of economic redistribution via their respective tax regimes. To control for this I use data from the International Centre for Tax and Development (ICTD). [7]. The ICTD dataset spans 191 political entities - the disadvantage being that the available data only goes back as far as 1980. I use two variables to operationalize country i's tax regime - revenue from sales taxes as percentage of GDP (a relatively regressive tax) and tax revenue from income, profits, and capital gains as percentage of GDP. Table 1 lists the summary statistics for all controls, independent, and dependent variables.

A Note on Missing Data

Issues of missing data routinely hamper analysis of economic inequality, and this study is no exception. As Table 1 describes, the number of missing observations exceeds 47% of the IMF data. Unfortunately, there are good reasons to believe that applying standard listwise deletion in this data will introduce bias. We can expect the availability and quality of economic data to lessen the further back in time one goes. If one takes into account that developing economies often lack the resources necessary to derive accurate economic statistics, then there are at least two theoretical justifications for us to assume that the data is not missing at random. To confirm, I perform Little's test of missing completely at random (MCAR) assumptions for the dependent variable (Little 1988). The test rejects the MCAR assumption for all three measures ($p < .001$).

This study is agnostic regarding the most appropriate way of handling the missing data problem, whether the solution lies in multiple imputation as is the case with the SWIID data, or the abandonment of the traditional Gini coefficient as proposed by UTIP. The subsequent analysis uses both approaches. In addition to concerns of bias, the large number of missing observations introduces the problem of unbalanced data. To mitigate this problem, I aggregate the data across five-year intervals in preparation for the statistical model I introduce in the next section.

Analysis

Before specifying a statistical model, I conduct some preliminary analysis using the four measures constructed in Equation 2. Figure 3 displays the results from a 2 x 2 design with the SWIID Gini coefficient as the dependent variable, and trade as a portion of GDP as the independent variable. Use of the alternate measures does not induce any change in the basic shape of the four data clouds.

Looking to the four scatterplots, we can see close similarities across types of trade partners. In other words, the two data clouds for trading with a rich partner appear similar, regardless of whether we are examine imports or exports. Similarly, the data cloud corresponding to exports to a poorer country closely resembles the data cloud for imports from a poorer country.

In only two of the four scatterplots does the predicted relationship between trade penetration and Gini coefficients manifest. For exports and imports to and from richer countries (the scatterplots on the right), the data cloud captures the normally distributed dependent variable and little else. In contrast, for exports and imports to and from poorer countries (the scatterplots on the left), the respective data clouds have multiple tendrils trending in a pattern consistent with Stolper-Samuelson effects. In other words, economic inequality within richer countries appears to increase as trade with poorer economies constitutes an increasing share of GDP. Deconstructing these tendrils, we see that the corresponding data points belong to only 17 countries.[8] With the exception of Singapore, all of these countries are developed economies and are members of the Organization for Economic Co-operation and Development (OECD). The rest of the 168 countries included in the analysis do not display any indication of the predicted relationship.

There is no theoretical explanation for Stolper-Samuelson effects only emerging among the world's most developed economies. One possible explanation is that there must be a wide disparity in GDP per capita among trade partners otherwise the resulting Stolper-Samuelson effects may be subtle. To shed further light on these preliminary findings, I turn to a series of difference-of-means tests presented in Table 3. Within the first six rows the independent variable is the percentage of GDP from exports to poorer countries, while the bottom six rows look at percentage of GDP coming from imports from poorer countries. I begin by dividing observations into two categories - those with Exports^p/GDP or Imports^p/GDP greater than the statistical mean, and those below. I then conduct a two sample t-test to find the mean Gini coefficient across the two groups. The unit of analysis is country/year.

Looking to Table 3, we see that all six t-tests are statistically significant, regardless of the measure of the dependent variable. However, the difference in mean economic inequality across the two groups is the opposite of what we would predict given the presence of Stolper-Samuelson effects. Moreover, the results do not seem to match the shape of the data clouds from Figure 3. Countries that fell below the average level of economic integration had relatively higher levels of economic inequality. In contrast, those countries that are inordinately dependent upon trade with poorer countries had, on average, lower levels of economic inequality compared to their less economically integrated peers. The preliminary evidence suggests that to the extent that Stolper-Samuelson effects exist, their relationship with economic inequality is only discernible among the world's most economically developed countries. Moreover, the direction of the relationship is unclear. I now turn to a statistical model.

To help correct for the problems of unbalanced and missing data, I change the unit of analysis from country/year to country/5-year interval, taking the mean value of each variable across the half decade. A series of Wald tests showed significant differences across countries, implying the suitability of a fixed effects approach. However, a Breusch and Pagan (1979) test yielded a significant result, suggesting that the variance of the error term varies across countries as well. The implication is that both fixed and random effects may be at work. A subsequent Hausman (1978) specification test was statistically significant, suggesting that a random effects model may suffer from violations of Gauss-Markov assumptions. For these reasons, I adopt the safer of the two approaches and opt for the following fixed effects model,

$$\begin{aligned}\text{Economic Inequality}_{it} = \beta_0 &+ \beta_1\left(\frac{\text{Imports}_t^r}{GDP_{it}}\right) + \beta_2\left(\frac{\text{Imports}_t^p}{GDP_{it}}\right) + \beta_3\left(\frac{\text{Exports}_t^r}{GDP_{it}}\right) \\ &+ \beta_4\left(\frac{\text{Exports}_t^p}{GDP_{it}}\right) + \beta_5\big(\text{GDP per Capita}\big)_{it} + \beta_6\big(\text{Inflation Rate}\big)_{it} \\ &+ \beta_7\big(\text{Democracy [0,1]}\big)_{it} + \beta_8\big(\text{Autocracy [0,1]}\big)_{it} \\ &+ \beta_9\big(\text{Taxes of Profits (\% GDP)}\big)_{it} + \beta_9\big(\text{Sales Tax (\% GDP)}\big)_{it} \\ &+ \sigma_i^{\upsilon} + \sigma_{it}^{\epsilon}\end{aligned} \tag{4}$$

where the term σ_i^{υ} is the unobserved time-invariant individual effect while σ_{it}^{ϵ} is the error term. Estimates of the Durbin-Watson statistic proved statistically insignificant (Durbin and Watson 1950,1951), suggesting that autocorrelation is not a concern. I run nine different models, three for each measure of the dependent variable. The results are presented in Tables 4, 5 and 6.

Looking at the F-statistics across models, it is clear that the Gini coefficients by SWIID articulate the strongest relationship between economic inequality and the explanatory variables (mean F-stat. = 4.89), then the Thiel Index by UTIP (4.32), and lastly the conventional UNU-WIDER coefficients (2.71). Within the SWIID models (Table 5) and UTIP models (Table 6), only two of the explanatory variables appear to have robust, statistically significant results: Exports to poorer countries where GDP per capita$_i$ > GDP per capita$_j$, and imports from poorer countries. The relationship for exports to poorer countries is strong enough to remain significant even in Model VI and Model IX, where the inclusion of controls for tax regime effectively halve the number of observations. The estimates for the β coefficient range from -.08 to -.25. Interpreting these results, assume β = -0.16. This would imply that when country i grows such that exports to poorer countries constitute an additional 10 percentage points of GDP, economic inequality as measured by the Gini coefficient should fall 1.6 percentage points. This is a modest amount, but it is also worth bearing in wide the enormous variation of export dependence across time and countries. To put this in context, Singapore's exports in 2012 totaled approximately 195% of GDP whereas for Afghanistan the comparable figure was 5.5% (World Bank).

More significant than the size of the coefficient is its sign. The negative signage is consistent across models, and implies that the *de facto* export of capital to poorer economies reduces economic inequality in the exporting country. This result turns the predicted relationship on its head and suggests that either Stolper-Samuelson effects are not in play, or that the less well off within richer countries are somehow getting a larger share of the returns from trade than the owners of capital. This is counterintuitive, and may be due to deficiencies in the measures for the independent variable.

The other statistically robust relationship is that between economic inequality and the amount of imports emanating from poorer countries as a portion of country i's GDP. The estimates for the β coefficient range from .1 to .24. Thus, when country i grows such that imports from poorer countries constitute an additional 10 percentage points of GDP, economic inequality as measured by the Gini coefficient should increase by some amount between 1 and 2.4 from percentage points. For context, note that in 2013 there was approximately a 17 percentage point difference in economic inequality between the United States (Gini = .37) and Sweden (Gini = .24).

Discussion

Debate continues over the relevance of the Heckscher-Ohlin model and Stolper-Samuelson effects during this period of rapid globalization and mounting intra-national inequality. Our preliminary results have done little to reconcile this debate. Using country/half-decade as the unit of analysis, nine fixed effects models employed four measures of international trade to discern if increasing trade between relatively capital-abundant countries and relatively labor-abundant countries corresponds with increases in economic inequality. Two of the measures appear irrelevant (exports $\rightarrow$ rich countries, and imports $\leftarrow$ rich countries), one measure is robust across all models using the SWIID and UTIP data (exports $\rightarrow$ poor countries), while the final measure also appears significant (imports $\leftarrow$ poor countries), although the supporting coefficient estimates are slightly less robust. Among the two significant measures, one explanatory variable followed the predicted relationship whereas the other took on the opposite sign.

The picture we are left with less resembles the Heckscher-Ohlin model of international trade, and more closely resembles a mercantilist world view. Exporting goods to poor countries appears to enrich everyone, not just the owners of capital - thus reducing economic inequality within the exporting countries. In contrast, if richer countries reciprocate by opening their own markets, the influx of labor-intensive goods represents the *de facto* importation of labor, driving down wages and increasing inequality. The range and magnitude of coefficient estimates for exports → poor countries and imports ← poor countries are roughly comparable, suggesting that richer countries can avoid exacerbating economic inequality so long has they avoid running trade deficits with poorer countries.

I conclude by noting that these findings are in no way definitive. First, the four preliminary measures consume a great deal of statistical power and are not particularly efficient. The four measures do not take into account the disparity in capital and labor endowments among trade partners. For example, both Germany and Afghanistan have a lower GDP per capita than the U.S. The current measures for trade treat both countries comparably - despite the fact that Germany's GDP per capita is more than sixty times that of Afghanistan. A more appropriate set of measures might take the form of expression 5.

$$\begin{aligned}
\text{Capital Exports}_t^i &\equiv \log\left(\sum_{i=1}^{n}\left[\frac{\text{Exports}_t^j\left(\text{GDP per Capita}_t^i - \text{GDP per Capita}_t^j\right)}{\text{GDP}_t^i}\right]\right) \\
\text{Labor Imports}_t^i &\equiv \log\left(\sum_{i=1}^{n}\left[\frac{\text{Imports}_t^j\left(\text{GDP per Capita}_t^i - \text{GDP per Capita}_t^j\right)}{\text{GDP}_t^i}\right]\right)
\end{aligned} \tag{5}$$

Beginning with the parentheses enclosed area of the numerator, we take the difference in GDP per capita for country i and its trade partner j for year t. If we are discussing exports, then a positive value should correspond with the exportation of capital which should increase economic inequality, whereas negative values represent the exportation of labor which should decrease inequality. Having taken the difference between i and j, the signage is then transferred to the absolute amount of exports to the left of the parentheses, which is then weighted as a portion of GDP by the denominator. We repeat the process for all trade partners and then take the log of the resulting sum.

The benefit of the above approach is that it does not just allow for different endowments of capital and labor, but captures the extent of the disparity in endowments. This should greatly reduce error relative to the original measures. However, a price is paid in the ease of interpretability. In Figure 4, I use the SWIID data to present scatterplots and LOESS smoothing of the measures in expression 5. The results are ambiguous, only somewhat following the predictions of the Heckscher-Ohlin model. Regardless, future work will need to do a better job of incorporating information pertaining to the magnitude of differences in factor endowments.

Finally, this study did not control for demographic factors. Wealth strongly correlates with age. Variation in the distribution of age cohorts across or within countries may be a potential source of omitted variable bias. Aging populations, changes in the divorce rate, changes in the average family size, emigration, and immigration all have the potential to greatly influence the level of economic inequality within a society. Verifying that such factors are controlled for should be a priority for subsequent studies.

Notes

[1]Omitted the following sub-national entities and redundancies from the UNU-WIDER dataset: U.S.S.R.; Puerto Rico; South Sudan; Taiwan; West Bank And Gaza; East Timor; Yugoslavia (1963 only).

[2]Omitted the following sub-national entities and redundancies from the UTIP dataset: Country"; China (Hong Kong SAR); China (Macao SAR); China (Taiwan Province); Puerto Rico; Germany, Fed.Rep (1991-2008); and Germany (1963-1990).

[3]Omitted the following sub-national entities and redundancies from the SWIID dataset: U.S.S.R.; Andorra; Puerto Rico; Taiwan; Turks and Caicos; and Serbia and Montenegro (1988-1990 only).

[4]The following IMF codes were dropped from the summary statistics and analysis: 1-World; 50-APEC; 80-Export earnings: fuel; 92-Export earnings: nonfuel; 110-Advanced Economies; 170-Europe; 198-South African Common Customs Area (SACCA); 200-Emerging and Developing Countries; 205-Western Hemisphere; 349-Martinique; 353-Netherlands Antilles; 399-Western Hemisphere not specified; 405- Middle East; 406-Middle East and North Africa; 440- Middle East, North Africa, Afghanistan, and Pakistan; 505-Emerging and Developing Asia; 603- South African Common Customs Area (SACCA), 605-Africa; 608-SACCA excluding South Africa; 626-Asia not specified; 696-Reunion; 799-Africa not specified; 816-Faroe Islands; 839-French Territories: New Caledonia; 884-Europe not specified; 887-French Territories: French Polynesia; 892-Oceania not specified; 898-Countries & Areas, not specified; 901-CIS; 903-Emerging and Developing Europe; 910-Other Countries n.i.e.; 995-Euro Area (WEO); and 998-European Union.

[5]It bears noting that the data is not perfectly symmetrical (country A's exports to country B do not equal country B's imports from country A), hence the need for separate observations. This asymmetry can be due to a variety of reasons including transportation lags (exports are recorded in one year, while the corresponding imports are not recorded until the next), the underreporting of investment income (i.e. tax evasion), asymmetric valuation (where the export and import of the same good are valued at different prices), and issues of data quality.

[6]Omitted the following sub-national entities and redundancies from the summary statistics and analysis: Kosovo; Vietnam South; South Sudan; Germany West (1945,1990).

[7]Omitted the following sub-national entities and redundancies from the ICTD dataset: Hong Kong SAR, China; Kosovo; Macao SAR, China; Montenegro; Tuvalu; West Bank and Gaza

[8]These are the United States, Austria, Belgium, Denmark, Germany, Luxembourg, the Netherlands, Norway, Sweden, Switzerland, Finland, Iceland, Ireland, Singapore, the Czech Republic, Estonia, and Slovenia.

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Summary Statistics

Variable	Source	Function	Interval	Observations	Mean	S.D.	Min.	Max.	% Missing
Gini Coefficients	UNU-WIDER	DV	1867 - 2012	2,821	.38	.1	.16	.74	0%
Gini Coefficients	SWIID	DV	1960 - 2013	4,534	.37	.1	.16	.7	0%
Theil Index	UTIP	DV	1963 - 2008	6,624	.42	.07	.2	.6	43%
Imports (logged USD)	IMF	IV	1948 - 2013	1,395,481	14.67	3.63	-8.29	26.8	45%
Exports (logged USD)	IMF	IV	1948 - 2013	1,384,254	14.79	3.55	-14.15	26.68	47.4%
GDP (logged USD)	World Bank	Control	1961 - 2013	9,752	22.82	2.5	16.03	30.45	20.2%
GDP per Capita (USD)	World Bank	Control	1961 - 2013	9,752	5,681	10,963	35.3	112,028	19.22%
Inflation	World Bank	Control	1961 - 2013	9,752	27.94	371.82	-33.2	23,773	32.77%
Taxes									
- Capital Gains Tax (% GDP)	ICTD	Control	1980 - 2010	4,952	6.7	5.37	.04	35.6	24.7%
- Sales Tax (% GDP)	ICTD	Control	1980 - 2010	4,952	5.27	3.24	0	27	55.6%
Government	Polity IV	Control	1800 - 2013	15,842	-.47	7	-10	10	0%

Table 1

Three Measures of Economic Inequality
Correlation Matrix

MEASURE	Gini (UNU-WIDER)	Gini (SWIID)	Theil (UTIP)
Gini (UNU-WIDER)	1.0	-	-
Gini (SWIID)	0.81	1.0	-
Theil (UTIP)	0.60	0.77	1.0

Table 2

Difference of Means Tests:
Mean Economic Inequality as a Function of Import Penetration / Export Dependence

MEASURE	UNU-WIDER	SWIID	UTIP
Above Average Exports $\rightarrow$ Poor Countries:	.35	.317	.382
	(002)	(.002)	(.002)
Below Average Exports $\rightarrow$ Poor Countries:	.412	.399	.44
	(.002)	(.002)	(.001)
Observations:	2,560	4,134	3,464
t-Statistic:	16.4	30.37	25.49
Above Average Imports $\leftarrow$ Poor Countries:	.353	.323	.382
	(.003)	(.002)	(.002)
Below Average Imports $\leftarrow$ Poor Countries:	.412	.399	.442
	(.002)	(.002)	(.001)
Observations:	2,560	4,134	3,464
t-Statistic:	15.64	27.9	26.2

Table 3

Economic Inequality as a Function of Trade (DV = Gini Coefficient by UNU-WIDER)

Variable	I	II	III
Exports $\rightarrow P$ (% GDP)	-.127 *	-.126	-.183
	(.061)	(.067)	(.115)
Exports $\rightarrow R$ (% GDP)	.015	011	.078
	(.017)	(.019)	(.042)
Imports $\leftarrow P$ (% GDP)	.06	.101	.152
	(.06)	(.06)	(.124)
Imports $\leftarrow R$ (% GDP)	.004	-.037	-.017
	(.003)	(.025)	(.035)
GDP per Capita (USD)		-.0000004	.0000007 *
		(.0000003)	(.0000003)
Inflation		.000002	.00001
		(.000013)	(.00001)
Democracy [0, 1]		-.004	.008
		(.007)	(.012)
Autocracy [0, 1]		.011	.026
		(.009)	(.015)
Profits Tax (% GDP)			-.004 *
			(.001)
Sales Tax (% GDP)			.0002
			(.002)
Constant	.402 *	.413 *	.386 *
	(.003)	(.008)	(.018)
Observations	888	787	397
Groups (Countries)	150	145	109
F-Statistic	4.1	1.98	2.06
σ_{υ}	.081	.082	.084
σ_{ϵ}	.053	.051	.036
ρ	.699	.724	.841

Regression with fixed effects for country. Unit of analysis is country/half decade. * = p < .05

Table 4

Economic Inequality as a Function of Trade (DV = Gini Coefficient by SWIID)

Variable	IV	V	VI
Exports $\rightarrow P$ (% GDP)	-.211 *	-.255 *	-.185 *
	(.058)	(.058)	(.07)
Exports $\rightarrow R$ (% GDP)	.063 *	.044	.05
	(.023)	(.024)	(.028)
Imports $\leftarrow P$ (% GDP)	.244 *	.221*	.133
	(.065)	(.065)	(.077)
Imports $\leftarrow R$ (% GDP)	-.011	-.005	-.025
	(.019)	(.02)	(.023)
GDP per Capita (USD)		.0000006 *	.0000007 *
		(.0000002)	(.0000002)
Inflation		.000005	.00002 *
		(.000008)	(.000009)
Democracy [0, 1]		-.002	.001
		(.005)	(.007)
Autocracy [0, 1]		-.001	.018 *
		(.006)	(.009)
Profits Tax (% GDP)			-.002
			(.001)
Sales Tax (% GDP)			.002
			(.001)
Constant	.368 *	.369 *	.354 *
	(.003)	(.005)	(.011)
Observations	938	835	439
Groups (Countries)	152	147	111
F-Statistic	7.16	4.0	3.52
σ_{υ}	.087	.087	.087
σ_{ϵ}	.035	.033	.025
ρ	.858	.871	.924

Regression with fixed effects for country. Unit of analysis is country/half decade. * = p < .05

Table 5

Economic Inequality as a Function of Trade (DV = Theil Index by UTIP)

Variable	VII	VIII	IX
Exports $\rightarrow P$ (% GDP)	-.085 *	-.108 *	-.162 *
	(.043)	(.042)	(.076)
Exports $\rightarrow R$ (% GDP)	-.0001	-.025	-.004
	(.023)	(.024)	(.039)
Imports $\leftarrow P$ (% GDP)	.103 *	.014	.118
	(.052)	(.052)	(.083)
Imports $\leftarrow R$ (% GDP)	-.003	-.007	.006
	(.02)	(.022)	(.039)
GDP per Capita (USD)		.000001 *	.000001 *
		(.0000002)	(.0000003)
Inflation		.000002	-.00001
		(.000006)	(.00001)
Democracy [0, 1]		.016 *	.019 *
		(.004)	(.007)
Autocracy [0, 1]		-.01 *	-.003
		(.005)	(.01)
Profits Tax (% GDP)			-.0007
			(.001)
Sales Tax (% GDP)			.0003
			(.001)
Constant	.426 *	.425 *	.405 *
	(.003)	(.005)	(.013)
Observations	788	703	314
Groups (Countries)	134	125	94
F-Statistic	1.07	8.85	3.04
σ_υ	.063	.071	.074
σ_ϵ	.027	.025	.021
ρ	.843	.887	.924

Regression with fixed effects for country. Unit of analysis is country/half decade. * = p < .05

Table 6