International Trade and Global Income Inequality

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Abstract In the popular media, trade is quite often being used as a whipping boy and blamed for increased worldwide inequality. Is trade actually a source of greater income inequality around the world? What does the data show? Is there any reason to suspect trade as a major villain on the international scene? Does the data show that there is correlation between trade and inequality? To address these questions, this paper uses regression analysis to investigate whether there is any association between either the amount or the spread of international trade and two important dimensions of global income inequality, namely — income inequality between and within nations.

Keywords: Income inequality; gini coefficient; within country inequality, between country inequality; trade

JEL Classifications: D63, D33

Introduction

This paper uses time series regression analysis on data from the last several decades of the twentieth century to examine the effect of international trade on global inequality. Trade among nations has increased around the globe. An argument voiced by the protesters at the World Economic Forum and often heard by the opponents of international trade is that trade is the cause of increased inequality around the world. The world itself is becoming more integrated through trade. Talk of globalization, of one world, of a global village is now common fare. To this effect, the world is treated as the unit of analysis in this paper. At issues is whether on balance, for the world as a whole, trade has implications for global inequality. While most international data is of poor quality, the subject matter is of such gravity and of such controversy that any attempt, even a crude attempt under severe data limitations, to look at whether or not there is any empirical basis for potentially presuming that a relationship exists between trade and inequality would certainly seem to be a worthwhile endeavor.

The relationship between trade and inequality matters for global economic welfare, for worldwide economic stability, and for global economic policy. To the extent that trade is a source of increased inequality, it lessens the welfare benefits of the higher overall worldwide income brought about by further trade. To the degree that more trade leads to greater inequality, or even to the degree that more trade is merely perceived as increasing inequality, more trade leads to increased social tension. To the measure that increased trade exacerbates inequality,
trade-enhancing policies will be harder to politically implement. They will be far more apt to be subject to popular resistance and rejection.

Two important dimensions of worldwide inequality in incomes are the inequality between nations and the inequality within nations. With regard to within country inequality, standard theory is consistent with almost any possible outcome. Trade may result in an increase, a decrease, or unchanged levels of within country inequality. Trade results in a reallocation of resources within countries. With greater trade, countries will specialize more in products in which they have a comparative advantage.

Developed industrialized countries have a relative abundance of skilled labor and will specialize in skill intensive products. Developing countries with a relative abundance of unskilled labor will have a comparative cost advantage in products that intensively utilize unskilled labor in production. In the developed countries increased trade will lead to an increase in within country inequality. In the industrialized countries, greater trade will cause an increase in the demand for skilled labor and a decrease in the demand for unskilled labor causing a rise in the wages of skilled workers and a fall in the wages of unskilled workers. In developing countries, the reverse process takes place, leading to a reduction in within country inequality. In these countries more trade will result in higher wages for unskilled workers and lower wages for skilled workers. The net result of increased trade for the world as a whole on within country inequality depends on the relative strength of the opposing forces in the two groups of countries. In less developed countries, it is fairly easy to envision nontraditional scenarios in which more trade leads to greater internal inequality. Trade may lead to a dual economy wherein a trading enclave benefits while the rest of the economy languishes. Trade may strictly benefit elitist groups, or solely the government, with little or no benefit to the population of the country as a whole.

Turning to inequality between countries, just as with trade and internal inequality, reasons can be given for completely opposite outcomes. It is quite possible for trade to lead to more inequality between countries if the trade is between partners of unequal strength leading to an undesirable dependency of the weaker partner on the stronger. This is likely to be the case between more developed and less developed countries. Most less developed countries find themselves in a weak bargaining position with regard to highly industrialized countries. Furthermore, the increased between-country inequality brought about by trade with unequal partners may have long-term staying power. The whole internal structure of a less developed country may be modified to accommodate its international business. This restructuring may occur both from natural processes brought about by trade with unequal partners or from subtle or blatant pressures from the stronger trading partners that are either tacitly or blatantly approved by elites both within and outside the government of the less developed country. Just like in international affairs, a strong player can exert pressure on other nations to change their behavior, in like fashion; the stronger partner in a trading relationship can exert pressure on the weaker partner to the advantage of the former.

While the argument is framed on a country-by-country basis, the exchange may actually be between a large multinational corporation and a developing country. The single goal of business is to make profits. The ideal profitable opportunity for any business organization is to have economic agents who are willing and able to buy its products, but at the same time these agents are unable to produce the products themselves. That is to say that businesses are quite happy to have captive audience. Trade can also lead to increased inequality between nations if the increased trade is predominately limited to trade between rich countries leaving out poor
countries. This kind of restricted trade increases the income of the rich relative to the income of the poor, and, at the same time, increasingly isolates, and marginalizes the poor.

On the other hand, arguments can be made for why trade reduces the inequality between nations. To the extent that increased trade leads to greater integration between countries, it may accelerate the extent and speed of technological transfer and diffusion from rich to poor nations, thereby allowing for greater growth of poorer countries and a narrowing of the income differences between countries around the world. In addition, many countries, most notably the Asian tigers, have successfully used export led growth as the very means for growth and development. Trade might lead to a reduction in between country inequality due to convergence. The use of economic resources is governed by self-interest. In open economies, capital will tend to flow to labor rich countries until the rate of return on capital between countries, all other things being the same, is equalized. Technology will migrate with the capital so that originally lagging countries will tend to grow faster than their counterparts.

This paper is organized as follows. Following the present introduction, section 2 offers the literature review. Section 3 presents the various data sources and definitions. Section 4 furnishes the models used in the study. Section 5 discusses the empirical results while section 6 presents the summary and conclusions.

Literature Review

The literature on trade and inequality is anything but settled. Rather, it is extremely diverse and controversial. Some find that worldwide inequality has been increasing in recent decades, while others find it has been decreasing. One group holds that trade is the cause of increased inequality; while another feels that the lack of trade is the source of inequality. Here is just a quick flavor of some of the positions in a few articles.

Dollar and Kraay (2002) maintain that since 1975 there has been greater equality in worldwide income distribution. In their view, countries that engage in greater economic integration brought about by greater openness and participation in international trade and investment, experience higher rates of economic growth. From their perspective, non-integration and the lack of participation by poor countries in globalization is seen as a global problem. Within the framework of new growth theory, however, Wood and Ridao-Cano (1999) argue that trade may actually lead to divergence in growth rates across countries. This is because specialization on the basis of the Heckscher-Ohlin (Heckscher, 1919; Ohlin, 1933) theory requires poor countries to specialize in products that use the low growth factor of production and rich countries to specialize in products that use the high growth factor in production. An example of such a high growth factor of production is human skills or human capital.

Scott (2001) argues that globalization (trade liberalization) is insufficient to assure convergence of incomes between more developed and less developed countries. He maintains that immigration barriers of the highly developed countries both prevent wage equalization between countries from occurring by restricting the flow of labor from less to more developed countries and, at the same time, foster the maintenance of elitist governments and institutions in the less developed world by disallowing people to vote with their feet. As he sees it, it is these very institutions that need to be eliminated as a precondition for development and progress to occur.
Galbraith (2002) reviews the various theoretical positions regarding the relationship between inequality and growth. They are so varied that almost any possible stand exists along with its advocates. They run the gambit from considering inequality and growth as positively related, to viewing reductions in inequality as a precondition for development, to maintaining that inequality and growth are negatively related, all the way to the position that there is no relationship at all between inequality and growth. Galbraith views the empirical findings in support of theses alternative theories, mainly based on the Deininger and Squire (1996) data set, as confused and mixed.

Using his measures of inequality based on manufacturing pay data, which he considers to have some distinct advantages over the Deininger and Squire data set, Galbraith finds that there is a positive relationship between equality and economic growth. Using his data, he also finds that inequality has been trending upward over the last couple of decades. He attributes this unfavorable recent trend in inequality, not to increase in international trade, but to high global interest rates for developing countries brought about by conservative policy measures in a conservative environment.

Just at a time when world wide trade is becoming more prominent and much more controversial, in Goesling’s (2001) view there appears to be a fundamental shift taking place in the nature of world inequality. Goesling looks at recent trends in inequality within and across nations. Historically, prior to the industrial revolution, the major source of world inequality was the inequality within nations. The industrial revolution changed all this. Since the industrial revolution, between nations inequality has skyrocketed, making it the prominent source of worldwide inequality. However, recently Goesling finds there has been a fundamental change in the composition of global inequality. During the 1980’s through the 1990’s within nation’s inequality has been rising, while between nations inequality has been falling. Thus, reversing the long run trend since the industrial revolution, the data shows increasing significance of within nation’s inequality and a lessening of the import of between nation inequalities as a determinant of overall inequality.

Ghose (2000) analyzes data to see whether trade is responsible for three recent adverse developments. They are increasing international inequality, depressed employment and wages in the industrialized countries, and reduced global labor standards. He finds that increasing international inequality is not due to trade liberalization, but rather to its absence, especially in the area of primary commodities, along with the failure of poorer countries to develop adequate transportation and communication infrastructure.

Finally, Hanson and Harrison’s (1999) using data for 2,354 Mexican manufacturing plants during the 1980s (when Mexico undertook extensive trade liberalization reform) examined the effect of trade on internal inequality. They find a widening of the inequality between the wages of skilled and unskilled labor in Mexico.

Data Sources and Definitions

Two measures are constructed to account for worldwide within country inequality on an annual basis. They are the average country-by-country Theil index and the average by country Gini concentration ratio. The underlying basis for the average Gini measure is the Deininger and Squire (1996) data set. For a given year, the average Gini is calculated by averaging the country Gini coefficients from Deininger and Squire data set strictly using the Gini coefficients they
designate as high quality. The source of data for the average Theil inequality measure is the University of Texas Inequality project. For any given year, on a country-by-country basis, the Texas data provides the between groups component of the Theil statistic for industrial earnings across standard industrial classification codes. The average Theil used here is the simple average across the available countries for that particular year. It should be noted that these are very crude measures of worldwide within country income inequality. The average Gini is subject to missing values for the Gini coefficients for most countries and questionable accuracy even when it exists. For the thirty seven years from 1960 through 1996 for which the average Gini was computed, the range for the number of countries included in the average Gini for a given year go from a low of only three countries to a high of only thirty-six countries. This means that even in the best year, only the average of thirty-six countries is used for a measure of overall global within country inequality. The number of countries that enters the average on a given year depend on data availability, so that different countries will be used in the average for different years. While data accuracy and availability are less problematic for the average Theil index, it is far less comprehensive. It is just constructed for wage data solely from industries within the manufacturing sector. This implies that the agricultural and service sectors are left out.

Two aspects of global trade are used to investigate whether there is a statistical association between global trade and the various forms of income inequality. These include the average size of international trade across countries and the spread of international trade across countries. The average size is measured by the averaging the percentage of exports to GDP across countries using World Bank data. The spread of trade is the standard deviation across countries of the percentage of exports to GDP. The time period covered runs from 1965 through 1998 for equation (1) of table I and from 1965 through 1996 for equation (2) of table I.

The between-country income inequality measures are taken from Schultz (1998). Schultz calculates three measures of between-country inequality for 120 countries around the world for the period 1960 through 1989 using data on population from the United Nations and real GDP (1985 constant US dollar) from the Penn World Tables. Each measure of inequality is calculated twice. One is computed with real GDP using foreign exchange rates to obtain constant prices across countries. The second is generated using foreign trade purchasing power parity figures to obtain constant dollars across countries.

The Model

This study estimates the following regression equation for each of the within country inequality measures:

\[ Y_t = \alpha_0 + \alpha X_t + \mu_t \]  

(1)

where \( Y \) represents dependent variables consisting of measures of average within country inequality (i.e. AVERAGE THEIL and AVERAGE GINI). \( X \) represents the independent variables including the standard deviation of percentage of exports to GDP (SDXGDP) and the average percentage of exports to GDP (AVGXGDP). \( \mu \) is the error term. The regression coefficient on SDXGDP is expected to be negative. In contrast, the regression coefficient on AVGXGDP is expected to be positive.
We estimate the following equation for each of the between country inequality measures:

\[ H_t = \alpha_0 + \alpha.Z_t + \mu_t \]  

(2)

where \( H \) represents the endogenous variables including measures of between country inequality (i.e. VAR FX, VAR PPP, THEIL FX, THEIL PPP, GINI FX and GINI PPP). \( Z \) represents the regressors including SDXGDP and AVGXGDP. \( \mu \) is the error term. SDXGDP is expected to negatively influence between country inequality. However, AVGXGDP is expected to have a positive effect on between country inequality.

**Empirical Results**

This section discusses the empirical results of the study. Table 1 presents the results for the various within country measures of inequality. Column one of Table 1 lists the names of the two explanatory trade variables, SDXGDP, the standard deviation of percentage of exports to GDP across countries, a measure of the spread of trade across countries, and, AVGXGDP, the average percentage of exports to GDP across countries, a measure of the extent of world trade. Each subsequent column contains a regression equation. The first row numbers the equations and the second row identifies the measure of inequality used as the dependent variable in the equation. The last four rows give respectively, the adjusted R-squared value, the \( F \)-statistic, the probability associated with the \( F \)-statistic, and the number of observations (years) for the equations. The uppermost values in the rows in the center of the table are the estimated coefficients for the various equations. Underneath each estimated coefficient in parenthesis is the individual \( t \)-statistic. One to three asterisks may appear on an estimated coefficient. A variable significant at the ten percent level or better is given one asterisk, a variable significant at the five percent level or better is given two asterisks and a variable significant at the one percent level or better is given three asterisks.

Looking at Table 1, the results certainly suggest that trade matters with regard to within country inequality for the world. Regardless of the measure of average global within country inequality that is used, both the spread and extent of trade are statistically significant. The standard deviation of percentage of exports to GDP, SDXGDP, and the average percentage of exports to GDP, AVGXGDP, are both significant at the one percent level in the equation in which the average Theil is used as the dependent variable, and they are both significant at the five percent level when the average Gini is used as the dependent variable. The two variables explain forty six percent of the total variation in within country inequality measured by the average Theil and eighteen percent of the total variation in within country inequality as measured by the average Gini.

Whether one uses the average Theil or the average Gini as a measure of the average within country income inequality for the world, the two different time series regressions give consistent results with regard to the signs for the trade variables. While the extent of trade as measured by the average percentage of exports to GDP across countries has a positive effect on inequality (the greater the extent of trade the more inequality), the spread of trade as measured by the standard deviation of the percentage of exports to GDP has a negative effect (the greater the spread of trade the smaller the worldwide within country inequality).
Table 2 shows the regression results for the various measures of between country inequality. The inequality measures using foreign exchange conversion are labeled FX (i.e. VAR FX, THEIL FX, GINI FX). These are the odd numbered equations in table 2. The inequality measures using purchasing power parity are labeled PPP (i.e. VAR PPP, THEIL PPP, GINI PPP). These are the even numbered equations in table 2. Although the study uses both between country income inequality measures, it should be noted that purchasing power parity figures are superior in terms of accuracy. The rationale for this assertion is that government regulation of foreign exchange rates distorts foreign exchange rates from true market values. The first measure of between country inequality is the population-weighted variance (represented by VAR) in the log of per capita income across countries. The second measure of inequality is Theil's measure of entropy, which weights subgroups, in this case, countries, by their population (represented by THEIL). The third measure of between-country inequality is the Gini coefficient (represented by GINI).

The first measure of between country inequality in table 2 is the population-weighted variance in the log of per capita income across countries. This is labeled VAR in table 2. The second measure of inequality is Theil's measure of entropy, which weights subgroups, in this case, countries, by their population. This is labeled THEIL in Table 2. Finally, the third measure of across country inequality is the Gini coefficient. It is labeled GINI in Table 2. Table 2 is set up in exact fashion as Table 1 with each numbered column representing a time series regression and the body of the table showing the estimated coefficients for the explanatory variables.

Looking at Table 2, the results produce different outcomes depending on whether foreign exchange rates (the even numbered equations) or purchasing power parity (the odd numbered equations) is used to obtain constant dollars across countries. When foreign exchange rates are used, trade variables are significant at the five percent level, regardless of which of the three different measures of between country inequality are used, and, except for the trade spread variable in the first equation, they are significant at the one percent level or better. The signs of the two trade variables in the three odd numbered equations when using foreign exchange rate conversion are also consistent. The spread of trade (SDXGDP) has a negative sign in all three equations indicating that a greater spread of trade across the countries of the world reduces between country inequality. The extent of trade (AVGXGDP) has a positive sign suggesting that more world trade as measured by a higher average percentage of exports to GDP across countries leads to greater global between country inequality. When foreign exchange rates are used, the two trade variables explain anywhere from fifty-four to seventy percent of the variation in global between country inequality depending on which measure of between country inequality is employed.

The even numbered equations, when purchasing power parity is used, give a totally different picture. The trade-spread variable (SDXGDP) is not significant at the ten percent level in any of the equations. The extent of trade (AVGXGDP) is significant at the ten percent level or better in each of the three equations, but contrary to the foreign exchange equations, it now has a negative sign meaning that greater world trade is associated with reduced global inequality.

The diagnostic tests (i.e. F-test and normality test) for the various income inequality measures are reported in Tables 1 and 2. The F-test is used to test the null hypothesis that all of the regression coefficients on the independent variables in an equation are zero. The normality test, on the other hand, tests the null hypothesis that the residuals are normally distributed. The results from the F-test suggest that the null hypothesis that regression coefficients on the regressors are zero should be rejected in all of the cases at least, at the 10 percent significance
level. However, the results from the normality test indicate that the null hypothesis of normality in the residuals should be accepted in all of the cases, as the \( p \)-values are all greater than the conventional levels of significance (i.e. 5 and 10 percent). In all, the diagnostic test results indicate that the equations used in this study possess the attributes of good econometric models.

**Summary and Conclusions**

This paper has used time series regression analysis to investigate the effect of international trade on global inequality. While one must keep in mind the poor quality of the inequality data, and, the fact that correlation does not necessarily imply causation and that correlation can be spurious, what, at least on face value, does the regression analysis suggest? What can tentatively be said about the relationship between the two dimensions of trade considered in the paper and the average income inequality within and between nations? What seems to be the case is that, at a minimum, the regression analysis does not rule out the possibility that the size of trade may actually have a negative effect on average inequality in the world. The results indicate that the size of trade is positively associated with worldwide inequality relative to the two different measures of average within country inequality. The results are mixed with regard to the association between the size of trade and average worldwide between country inequality depending on whether foreign exchange or purchasing power parity adjustments are made to render the between country inequality measures. When foreign exchange adjustments are made, more trade is associated with greater average inequality between nations, while with purchasing power parity adjustments are undertaken, more trade is associated with diminished average inequality between nations. This holds true regardless of the measure of inequality that is used.

Trade is a boon for the entire world, to the extent that it augments the overall global output and income. However, if on the other hand, trade is a source of increased income inequality, then, it becomes difficult to promote it politically. Under these circumstances, tough choices must be made. There is an undesirable trade-off between greater output and greater equality. In this case, governments are apt to compromise by retreating from a free trade position to a more protectionist stance. Furthermore, if greater trade is a cause of additional inequality, then trade is a real potential source of social unrest and conflict. This is particularly true in a scarcity world, in which ethnic, racial, and religious conflicts are rife, if and when the increased inequality from further trade runs along well-defined ethnic or national boundaries. Equity considerations are critical with regard to people’s notions of fairness. Equity must be given its dues. Equity considerations are important for social and political stability within nations and between nations.

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References


Table 1: Yearly Time Series Regressions of Average Within Country Inequality on Trade Measures

<table>
<thead>
<tr>
<th></th>
<th>(1) AVERAGE THEIL</th>
<th>(2) AVERAGE GINI</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>.0341***</td>
<td>32.9217***</td>
</tr>
<tr>
<td></td>
<td>(5.417)</td>
<td>(17.066)</td>
</tr>
<tr>
<td>SDXGDP</td>
<td>-.0008***</td>
<td>-1.2656**</td>
</tr>
<tr>
<td></td>
<td>(-4.891)</td>
<td>(-2.324)</td>
</tr>
<tr>
<td>AVGXGDP</td>
<td>0.0014***</td>
<td>0.2256**</td>
</tr>
<tr>
<td></td>
<td>(4.879)</td>
<td>(2.472)</td>
</tr>
<tr>
<td>RSQ</td>
<td>0.46</td>
<td>0.18</td>
</tr>
<tr>
<td>F-Stat</td>
<td>13.30</td>
<td>3.20</td>
</tr>
<tr>
<td>Prob(F-Stat)</td>
<td>(0.00)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>NT(CHSQ)</td>
<td>2.253</td>
<td>0.438</td>
</tr>
<tr>
<td>P-value</td>
<td>0.324</td>
<td>0.803</td>
</tr>
<tr>
<td>N</td>
<td>34</td>
<td>32</td>
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*** and ** indicate 1 and 5 percent significance level, respectively. SDXGDP = the standard deviation of percentage of exports to GDP and AVGXGDP = the average percentage of exports to GDP. RSQ = adjusted R², F-Stat = F-statistic, Prob(F-statistic) = probability for the F-statistic, NT(CHSQ) = normality test, p-value = probability associated with normality test, N = number of observations. The t-statistics are in parentheses. AVERAGE THEIL = average Theil within country inequality measure, AVERAGE GINI = average Gini within country inequality measure.

Table 2. Annual Time Series Regressions of Average between Country Inequalities on Trade Measures

<table>
<thead>
<tr>
<th></th>
<th>(1) VAR FX</th>
<th>(2) VAR PPP</th>
<th>(3) THEIL FX</th>
<th>(4) THEIL PPP</th>
<th>(5) GINI FX</th>
<th>(6) GINI PPP</th>
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<tr>
<td>C</td>
<td>1.4663***</td>
<td>1.1878***</td>
<td>.7836***</td>
<td>.6454***</td>
<td>.6276***</td>
<td>.5861***</td>
</tr>
<tr>
<td></td>
<td>(15.327)</td>
<td>(23.943)</td>
<td>(14.128)</td>
<td>(29.560)</td>
<td>(56.640)</td>
<td>(94.128)</td>
</tr>
<tr>
<td>SDXGDP</td>
<td>-0.065**</td>
<td>.0032</td>
<td>-.0060***</td>
<td>.0008</td>
<td>-.0013*</td>
<td>.0003</td>
</tr>
<tr>
<td></td>
<td>(-2.118)</td>
<td>(1.433)</td>
<td>(-3.344)</td>
<td>(1.153)</td>
<td>(-3.599)</td>
<td>(1.313)</td>
</tr>
<tr>
<td>AVGXGDP</td>
<td>.0269***</td>
<td>-.0052†</td>
<td>.0158***</td>
<td>-.0024*</td>
<td>.0030†</td>
<td>-.0011***</td>
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<tr>
<td></td>
<td>(5.020)</td>
<td>(-1.883)</td>
<td>(5.092)</td>
<td>(-1.996)</td>
<td>(4.875)</td>
<td>(-3.107)</td>
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<td>RSQ</td>
<td>0.70</td>
<td>0.15</td>
<td>0.59</td>
<td>0.21</td>
<td>0.54</td>
<td>0.47</td>
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<td>F-Stat</td>
<td>25.09</td>
<td>2.60</td>
<td>16.09</td>
<td>2.86</td>
<td>13.07</td>
<td>9.60</td>
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<td>Prob(F-Stat)</td>
<td>(0.00)</td>
<td>(0.10)</td>
<td>(0.00)</td>
<td>(0.07)</td>
<td>(0.00)</td>
<td>(0.00)</td>
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<td>NT(CHSQ)</td>
<td>0.247</td>
<td>2.358</td>
<td>0.501</td>
<td>1.756</td>
<td>0.056</td>
<td>1.491</td>
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<tr>
<td>P-value</td>
<td>0.884</td>
<td>0.308</td>
<td>0.778</td>
<td>0.416</td>
<td>0.972</td>
<td>0.474</td>
</tr>
<tr>
<td>N</td>
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<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

***, ** and † indicate 1, 5 and 10 percent significance level, respectively. SDXGDP = the standard deviation of percentage of exports to GDP and AVGXGDP = the average percentage of exports to GDP. RSQ = adjusted R², F-Stat = F-statistic, Prob(F-statistic) = probability for the F-statistic, NT(CHSQ) = normality test, p-value = probability associated with normality test, N = number of observations. VAR FX, THEIL FX, and GINI FX are between country inequality measures constructed with exchange rate. VAR PPP, THEIL PPP, and GINI PPP are between country inequality measures constructed with purchasing power parity.