Trade's Effect on Inequality

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RESUMEN

El renovado interés en la relación entre la desigualdad de ingreso y el comercio internacional ha fomentado el desarrollo de teorías nuevas. Este documento examina si los pronósticos de dos de estas teorías en conjunto con la mucho más antigua teoría de Stolper-Samuelson pueden ser apoyados por datos a nivel macroeconómico. Los resultados no proveen evidencia en apoyo de estas teorías. En lugar de eso, proveen una evidencia débil a favor de la apertura comercial como factor mitigante de la desigualdad del ingreso en los países desarrollados, a la vez que fomenta dicha desigualdad en los países en desarrollo. Cuando se aplica la técnica de variables instrumentales para corregir por la posible endogeneidad de las variables, estos resultados desaparecen. Sin embargo, una prueba de tipo de Hausman arroja sólo una diferencia insignificante entre resultados obtenidos por mínimos cuadrados ordinarios y por variables instrumentales. [***Palabras clave:*** comercio internacional, apertura comercial, desigualdad.]

ABSTRACT

Renewed interest in the relationship between trade and income inequality has encouraged the development of new theories. This paper examines whether the predictions of two of these theories along with the much older Stolper-Samuelson theory can be supported by macro data. The results provide no evidence in support of these theories. They instead provide weak evidence that openness decreases income inequality in developed countries while increasing inequality in developing countries. When an instrument is used to correct for possible endogenity, those results disappear. However a Hausman type test shows only an insignificant difference between the OLS and IV results.
[***Keywords:*** trade, openness, inequality.]

INTRODUCTION

The effect of trade on income inequality has long been of interest to economists. Until recently, any theoretical reasoning associated with this subject was generally limited to the Stolper-Samuelson theory. More recently Feenstra and Hanson (1996), and Tang and Wood (2000) have developed theoretical models explaining the relationship between trade and inequality. The Feenstra-Hanson model predicts that increased trade always accompanies more inequality. In the two remaining models, the effect that trade has on inequality depends in part, on the stage of the economic development of the country in question. Both models predict an increase in wage inequality in developed countries. Stolper-Samuelson predicts a decrease in wage inequality in developing countries while the Tang-Wood model predicts the effect on inequality will depend on the circumstances of the developing country. Wood (2000) provides a summary of the aforementioned theories.[1]

Most of the empirical literature on the topic of income inequality and trade examines their relationship in the U.S. The basic conclusion is that, although international competition may influence income inequality, a combination of other factors has also contributed to this increase. These factors include technology improvements, immigration, deregulation, tax changes, decreased real minimum wages, decreased spending on social programs, and decreased labor union power. Burtless (1996) compares the effect of increased trade on low skilled workers who work in sectors that experience international competition versus those sectors that do not experience such competition. He finds little evidence that low skilled workers in sectors that experience international competition suffer more than those that do not experience international competition.

Leamer (1993, 1996) maintains that the importance of trade has been underestimated and presents evidence that U.S. income inequality by sectors increased more in the 1970s than in the 1980s. The 1970s were a time of increased trade in the U.S. He argues that even if one accepts the premise that overall income inequality increased by a greater amount in the 1980s than in the 1970s, the effect of trade on income takes time to "ripple through the economy." He also provides some evidence that changes in labor demand in OECD countries are consistent with a trade explanation of inequality.

However, most of the empirical work from OECD countries suggests a different conclusion than that of Leamer. Bourguignon and Morrisson (1990) perform a cross-country study on the effect of protectionism on income inequality. They find that protectionism increases income inequality. Another perspective comes from Alesina and Perotti (1995). The authors find a positive relationship between relative income taxes and relative labor costs. They present a model in which taxation for the purpose of income redistribution is harmful in an open

economy since labor unions demand higher wages when taxes are increased. This hurts the country's competitive position and lowers employment. The effects of the redistribution programs on inequality are however, ambiguous, since both wages and unemployment increase. On the other hand, Gottschalk and Smeeding (1997) suggest a correlation between decreased inequality and a higher unemployment rate, which implies that institutional constraints do play a role. Dollar and Kraay (2001) exam the role that openness has on both growth and poverty. Although they do not find that openness effects inequality they find evidence that trade improves the welfare of the poor proportionally to other income classes.

This paper is an attempt to describe the general effect that globalization has on the income distribution of both developed and developing countries. Its contribution results from the examination of macro data both across time and countries in an attempt control for the endogenity of openness. This is done using a gravity model instrumental variable in the spirit of Frankel and Romer (1996). The results provide weak evidence that openness decreases income inequality in developed countries, which is in contrast the all three of the aforementioned models. Developing countries seem to have increases in inequality, which is predicted by Feenstra-Hanson and is possible in Tang-Wood while being in contrast to Stolper-Samuelson. These results however, are not robust when certain institutional control variables are added to the regression. These non-robust results do not seem to favor one theory over the others, but instead suggests that institutional factors play a larger role than does trade openness. In addition, when an attempt is made to control for the possible endogenity of openness, the trade coefficient becomes insignificant. A Hausman type test demonstrates that the IV results are not significantly different from the OLS results. This suggests that using the predicted value of a gravity model is not a good instrument for openness. This, I believe to be unlikely. Alternatively, it is probable that the OLS coefficients are not significantly biased and provide good estimates.

METHODOLOGY

The basic relationship between openness and inequality can be defined as:

1) $$\text{Income inequality} = a + b_1\text{openness} + b_2(GDP/L) + b_3[\text{openness}*(GDP/L)] + cX,$$

where openness will be measured by a country's trade share ((imports+exports)/GDP), (GDP/L) is per capita gross domestic product, and X is a vector of control variables.

If openness increases income inequality, b_1 (the coefficient of openness) will be positive. If openness increases income inequality by a greater amount in richer countries, the sign of b_3 (the coefficient of the cross product of openness

and GDP) will follow the same pattern as that of b_1. On the other hand, if openness causes income inequality to increase, but less so in richer countries b_3 will be negative. A cutoff level of (GDP/L) can be calculated. This calculation allows us to predict which countries will become more egalitarian with increased trade and which will become less egalitarian.

The gini coefficient is the main measure of income inequality used in this paper.[2] The problem with gini coefficients is that two distinct income distributions may result in the same gini coefficient. Because of this, two alternative measures of inequality are also used. Inequality is also measured by the ratio of the top quintile of the income distribution to the bottom quintile and by the amount of income that goes to the "Middle Class." The middle class is defined as those who fall between the 20th and 80th percentile of the income distribution.

Three specifications are used to test the effect of openness on inequality. The first specification uses an unbalanced panel data set to measure the effect of openness on inequality. The second specification estimates a cross-sectional regression using the average of the relevant variables over a 20 year time period. The last specification consists of an instrumental variables regression, using predicted openness derived from a "gravity model" as an instrument for openness. The data set used in this article was constructed by Deininger and Squire (1996) and will be explained in more detail in the Data section of this article.

SPECIFICATION

Specification I

Specification I consists of estimating a Least Squares Dummy Variable (LSDV) regression, which includes a country specific time trend, dummy variables for the type of survey, as well as country fixed effects.

$$2) \quad g_{it} = a + b_1 openness_{it} + b_2(GDP/L)_{it} + b_3[openness*(GDP/L)]_{it} + \phi_i D_i + \theta_i t_i + \delta_1 d_1 + \delta_2 d_2 + \delta_3 d_3 + \omega_{it}$$

where g_{it} is the gini coefficient, i = 1,2,...,N (Number of countries), D_i =1 for country i and 0 otherwise, t_i =1,2,...,T_i for country i and 0 otherwise, and $\omega_{it} \sim iid(0,\sigma_\omega)$. d_1 is a dummy for income surveys, d_2 is a dummy for household surveys and d_3 is a dummy for gross income.

The dummy variables for the type of survey need to be included due to inconsistencies in the sample selection criteria and the definitions of income. Some of the gini coefficients are derived from income surveys while others are derived from expenditure surveys. Some use gross income while others use net income, and some use household measures while others use individual

measures. Instead of using a sub-sample, Deininger and Squire (1996) suggest adding the average difference (which they calculate to be 6.6) to those gini coefficients that are derived from expenditure surveys. Other differences are found by Li et al., (1998) to be less of a problem. They state "differences between coefficients defined on net and gross income and between household-based and individual based coefficients are not significant." Since the difference between expenditure and income gini coefficients seems to have decreased over time,[3] I add the difference for the 20-year period (4.8) instead of the difference for the 1947-1994 sample (6.6). In addition to this correction and in order to make sure differences in the underlining data do not cause problems, the dummy variables for the different types of surveys are included in this equation.

Specification II

Ideally, testing the effect of openness on income inequality across countries and time is the best way to assess their relationship. However, such a test is difficult because the panel used in specification I is highly unbalanced and the control variables are only found for certain periods. Consequently, most of the results I present use the average of the inequality measures from 1972 to 1992. For many of the countries, the data are only available for one or two years during this time period. This would create a problem except that Deininger and Squire (1996) and Li et al., (1998) find that gini coefficients in this data set show little variation over time. Li et al., (1998) also find that "91.8 percent of the variance is cross-country variance while only 0.85 percent is over-time variance." They use data from 1947 to 1994. Richer countries seem to have experienced inequality increases in the 1980s. Because of these differences in inequality trends and the Heckscher-Ohlin theory's implied contention that changes in inequality occur over a time horizon that is long enough to allow movement of capital, I will concentrate on the 20-year period from 1972 to 1992.

To help insure that changes over the time period do not present a problem, I use a LSDV regression similar to the one conducted by Li et al., (1998) to test for trends in the gini coefficients. Using this information, a dummy variable can be created to control for countries with either upward and downward trends in the cross-sectional regression.

With the 20 year unbalanced panel data set, I estimate a regression similar to equation 2 to test whether there is a significant time trend in any country with 3 or more observations. Using the countries that Deininger and Squire (1996) deem acceptable and that have 3 or more data points slightly changes the result.[4] The difference between equation 3 below and equation 2 is that openness, per capita income and their interaction term are dropped from equation 3.

The LSDV regression test by Li et al., (1998) is as follows:

3) $g\, g_{it} = \phi_i D_i + \theta_i t_i + \delta_1 d_1 + \delta_2 d_2 + \delta_3 d_3 + \omega_{it}$

To test whether a particular country experienced significant changes in inequality over time we need to test the following hypotheses.

H_0: $\theta_i = 0$, for i = 1, 2,...,N.

Examining Table 1, we see that 27 of the 75 countries with at least 3 years of data have a significant time trend. Of these countries, 14 have positive time trends while 13 have negative time trends. Some of the differences between this LSDV specification and that of Li et al., (1998) seems to come partially from the number of countries chosen.[5] However, the difference in the magnitude of the trends seems to suggest that inequality has changed by larger amounts in recent years.

TABLE 1
Dependent Variable: Gini Coefficients
Least Square Dummy Variable Regression

Dummy Variable	Expenditure Survey				Household Survey	Gross Income Survey			
Estimate	-2.23				0.55	1.29			
t-value	(-2.05)				(1.11)	(2.36)			
Country	Country Specific	t-value	Trend	t-value	Country	Country Specific	t-value	Trend	t-value
ARGENTINA	0.345	0.121	0.846	3.433	INDONESIA	15.678	4.511	-0.495	-1.904
AUSTRALIA	-0.137	-0.038	0.224	0.91	IRAN	20.040	5.949	-0.186	-0.515
AUSTRIA	0.661	0.126	-0.488	-1.102	IRELAND	4.439	1.102	-0.132	-0.384
BAHAMAS	17.246	6.141	-0.439	-2.677	ISRAEL	-4.120	-0.684	0.233	0.626
BANGLADESH	3.364	1.099	-0.057	-0.268	ITALY	5.604	2.126	-0.504	-2.869
BARBADOS	1.136	0.351	0.210	0.523	IVORY COAST	22.379	3.486	-0.479	-1.076
BELGIUM	9.859	3.672	-1.006	-5.271	JAMAICA	29.936	9.721	-0.711	-4.046
BOLIVIA	22.816	1.109	-0.265	-0.224	JAPAN	-2.020	-0.877	0.205	1.217
BRAZIL	14.549	5.937	0.478	2.877	JORDAN	-6.073	-1.138	0.976	2.65
BULGARIA	-13.481	-5.971	0.216	1.763	KENYA	28.357	9.047	-0.101	-0.411
CANADA	-2.311	-0.914	-0.083	-0.548	KOREA, REP.	7.249	2.225	-0.532	-2.105
CHILE	14.281	6.213	0.373	2.968	MALAWI	12.647	1.892	0.967	1.673
CHINA	-20.100	-6.128	0.814	4.197	MALAYSIA	14.873	6.028	-0.026	-0.137
COLOMBIA	18.304	7.487	-0.181	-1.182	MAURITIUS	12.078	1.741	0.003	0.008
COSTA RICA	13.225	4.971	-0.214	-1.07	MEXICO	16.777	4.629	0.228	0.961
CZECHOSLOVAKIA	-12.513	-4.635	0.099	0.603	MOROCCO	26.718	6.705	-0.824	-3.107
DENMARK	4.900	1.476	-0.880	-3.782	NETHERLANDS	-4.771	-1.709	0.038	0.217
DOMINICAN REP.	7.993	1.716	0.375	1.335	NEW ZEALAND	4.173	1.665	-0.180	-1.093
EGYPT	10.257	2.346	-0.164	-0.548	NIGERIA	-4.844	-1.275	0.919	3.314
ETHIOPIA	9.761	2.441	-0.237	-0.433	NORWAY	0.718	0.233	-0.417	-2.055
FINLAND	0.139	0.048	-0.574	-3.376	PAKISTAN	3.731	1.07	0.185	0.832
FRANCE	8.246	1.613	-0.920	-1.765	PANAMA	7.249	2.076	0.839	2.96
GERMANY, WEST	0.446	0.15	-0.341	-1.566	PERU	24.573	6.81	-0.759	-3.395
GHANA	22.369	1.085	-0.675	-0.627	PHILIPPINES	11.795	2.59	-0.066	-0.232
GREECE	11.692	2.65*	-0.127	-0.369	POLAND	-9.680	-3.587	0.061	0.394
GUATEMALA	-1.162	-0.169	1.517	3.312	PORTUGAL	6.689	1.795	-0.274	-1.199
HONDURAS	34.734	2.472	-0.789	-1.059	PUERTO RICO	4.995	1.048	0.666	1.769
HONG KONG	4.918	1.555	0.245	1.056	ROMANIA	-23.782	-0.799	0.764	0.502
HUNGARY	-11.578	-3.476	0.182	0.881	SINGAPORE	8.709	3.505	-0.033	-0.18
INDIA	7.893	3.023	-0.039	-0.283	SOUTH AFRICA	16.943	3.669	-0.006	-0.016

TABLE 1
continuation

Dummy Variable	Expenditure Survey				Household Survey	Gross Income Survey			
Estimate			-2.23		0.55			1.29	
t-value			(-2.05)		(1.11)			(2.36)	
Country	Country Specific	t-value	Trend	t-value	Country	Country Specific	t-value	Trend	t-value
SPAIN	2.136	0.668	-0.132	-0.593	TURKEY	14.586	3.998	-0.283	-0.88
SRI LANKA	6.234	1.818	0.086	0.336	U.K.	-6.240	-2.663	0.178	1.347
SWEDEN	9.156	3.846	-0.775	-5.73	U.S.A.	Excluded Dummy		0.164	1.245
TAIWAN	-3.025	-1.307	0.012	0.099	U.S.S.R.	-12.260	-1.648	0.303	0.622
TANZANIA	18.730	3.631	0.672	1.962	URUGUAY	12.206	2.897	-0.301	-0.999
THAILAND	7.148	2.275	0.413	2.181	VENEZUELA	6.074	1.885	0.340	1.471
TUNISIA	15.620	3.579	-0.039	-0.127	YUGOSLAVIA	-12.783	-5.224	0.639	4.014
					ZAMBIA	23.834	8.043	-0.312	-1.301

NOB	641	R^2	0.92
DF	489	Adjusted R^2	0.89
GROUPs	75	F-Value	35.4

Since the cross-sectional averages include all the different types of surveys, (expenditure vs. income, household vs. individual, and gross vs. net income) dummy variables cannot be used to control for the different types of surveys. These cross sectional regressions use the percentage of expenditure surveys, the percentage of household surveys, and the percentage of gross income surveys instead of dummy variables.

The resulting equation for specification II is as follows:

4) $$g_i = a + b_1 openness_i + b_2(GDP/L)_i + b_3[openness*(GDP/L)]_i + \phi_i D_i + \theta_i t_i + \delta_1 d_1 + \delta_2 d_2 + \delta_3 d_3 + \gamma_1 d_n + \gamma_2 d_p + cX + \omega_i$$

Where d_1, d_2 and d_3 are now the percentages, instead of dummy variables, d_n=1 if the country experiences a negative trend in inequality and 0 otherwise, and d_p=1 if the country experiences a positive time trend and 0 otherwise.

Specification III

Although one can think of many explanations for why openness and other control variables used in this paper may be endogenous with respect to inequality, none are particularly convincing. Nevertheless, there may exist a third factor that influences both openness and inequality. Therefore, I use an Instrumental Variable (IV) regression to correct for possible endogenity.

I estimate the IV regression in the following way. First a bilateral trade equation is estimated using a "gravity model." Frankel and Romer (1999) use this technique to examine the effect of trade on growth. This estimate uses geographic characteristics to predict trade between two countries. The characteristics in question are: land area and population of each of the two countries, the distance between the major city in each of the two countries, a

dummy for whether or not they border each other, and a dummy for whether the countries are land-locked. Following an equation similar to the one used by Frankel and Romer, the equation can be written as follows:

6) $$Openness_i = a_0 + a_1 \ln D_{ij} + a_2 N_i + a_3 A_i + a_4 N_j + a_5 A_j + a_6 (L_i + L_j) + a_7 B_{ij} + a_8 D_{ij} N_j + a_9 B_{ij} N_j + a_{10} GDP_j + a_{11} GDP_j D_{ij} + a_{12} GDP_j B_{ij} + e_{ij},$$

where D_{ij} is the distance between country i and j, N is population, A is land area, L is a dummy for landlocked countries, and B is a dummy for a common border between the two countries. Once the equations are estimated, the predicted values are then summed over each country to predict a country's total trade. The predicted estimate of openness is then included in the basic specification as an instrument, correcting the covariance matrix in a manner similar to two stage least squares.[6] Using a gravity model as an instrument has two advantages. First, it is a very good predictor of trade share. Second, geographic characteristics were determined long ago and therefore should have very little effect on policies that may affect inequality.

This technique has a drawback. Since bilateral trade data are constrained to certain years, the estimates will be restricted to averages around those years. Therefore the average of the 20-year period of the inequality measure is regressed on the average of predicted openness values for 1970, 1980, 1990 and 1992. The number of countries is also limited, which means that the bilateral trade equation will come from a different sample than that of the final equations. Therefore, I have to predict trade numbers for some countries that are not used in the bilateral trade regression. This is only a problem if the bilateral trade data are not a representative sample of the final data set. It is likely that the bilateral trade data set has a smaller percentage of less developed countries, which means the bilateral trade equation may be biased.

Since the results of this IV regression are insignificant, I use a Hausman type test to exam whether the IV coefficients differ significantly from the OLS estimates. The test involves estimating the following t-type statistic:

5) $$t = \frac{b_{IV} - b_{OLS}}{\sqrt{(V(b_{IV}) - V(b_{OLS}))}}$$

The results are presented in Table 12 near the end of the article.

DATA

Ideally, to examine income inequality one should examine what happens to income distribution at a micro level. Unfortunately micro level data sets vary a great deal across countries, both in how they are collected and in the quality of the data. For example, some studies measure gross household income while others measure individual net income. Another problem with income inequality data is

that many developing countries simply do not have acceptable data. Fortunately, a macro-data set has been constructed by Deininger and Squire (1996), which can be used to address some of the problems associated with inequality data.

The data on income inequality come from the Deininger and Squire database. Deininger and Squire (1996) take gini coefficients and income quintiles from different data sources and combine them into one database. Although this data set is the most comprehensive international data set on inequality, there are still some areas of concern. Given that they obtained their data from different sources, the quality and quantity of the data are not uniform across time or countries. However, they do rank the data by quality. I therefore use a subset of only "good" and complete data and compare these results with the results obtained using the entire database. There are other problems arising from the diversity of sources. Differences in the way the data are collected and differences in the samples selected may create problems. There are three main areas of concern: whether the underlining data measures income or expenditures, whether households or individuals were surveyed, and whether measures of gross or net income are collected. These potential problems are addressed in the paper with the use of dummy variables in the LSDV panel regression and the percentage of survey types used in the cross section average regressions.

The control variables come from the Penn World Tables 5.6 database along with other cross-country data sets. The bilateral trade data are that used by Frankel, Stein and Wei (1995); the data are originally from the United Nations trade matrix and include the years 1970, 1980, 1990, and 1992. The data set covers trade among 63 countries.

Each of the following control variables, except for population, has been identified in the literature as affecting inequality. Population is included because the number of people in the country may affect the variance of underlying data. Since gini coefficients are an estimate of the variation of income distribution, and population size can affect the variance of a distribution, it is likely that gini coefficients are affected by the size of the population. The growing inequality between skilled and unskilled workers has been well documented in recent years starting with Levy and Murnane (1992). Schooling affects the skill level of the population and therefore should have an effect on equality. Fortin and Lemieux (1997) identify declining unionization membership in the United States as a factor that influences inequality. Gottschalk and Smeeding (1997) identify institutional constraints and decreases in social welfare spending as factors that effect equality. I use non-military government consumption as a proxy for these factors as well as a dummy variable for socialist countries. These variables along with the percentage of revolutions and coups per year should proxy for government policies and changes in institutions. Development economists

have long held that there is a link between migration from rural to urban areas and inequality (Kuznets (1955) and Williamson (1997)),[7] therefore I am using the percentage of the population who live in urban areas as a control variable. Topel (1997) identifies cohort size as a factor that may effect equality. A large proportion of non-working age individuals is likely to increase gini coefficients. Therefore the percentage of the population between the ages of 16 and 64 is included as a control variable. Finally, Deininger and Squire (1996) identify the geographic region of the globe in which a country is located to be an important determinant of differences in inequality.

The actual control variables are the percentage of the school age population enrolled in secondary schooling in 1960 and 1970, the average years of schooling in 1980, a dummy for socialist countries, the number of revolutions and coups per year, the percentage of union members in the non-agricultural labor force, the percentage of the population living in an urban environment, the percentage of GDP that goes to non-military government consumption, and the estimated percentage of the population between 16 and 64 years of age. The population of the country is also used as a control variable. Finally, regional dummies are added.[8] Unfortunately schooling data do not contain values for enough socialist countries. As a result, this variable cannot be included in a regression that also includes the socialist dummy.[9]

Because of data limitations, some control variables are from different years. Data for union membership could be from 1985 to 1991 depending on the country.[10] Data for the percentage of the population living in urban areas are from 1995.[11] The data on the percentage of GDP that goes to non-military government consumption ends in 1989. In order to be able to run the 1992 first stage gravity model regression, an average for 1986 to 1989 is used. The percentage of the estimated population between 16 and 64 has the same problem, which forces me to use data for 1990 in the 1992 in first stage gravity model regressions.[12]

RESULTS

Table 2 presents the results obtained using specification I.[13] The coefficient on the openness variable is positive and significant while the cross product of openness and per capita GDP is negative and significant. This implies that richer countries experience less inequality (lower gini coefficients) as they increase trade while poorer countries become less egalitarian.[14] If perfect linearity is assumed, an increase in openness would increase the predicted gini coefficient for countries with real per capita income of less than 5,851 PWT international dollars, ceteris paribus, while decreasing the predicted gini coefficient for those countries with per capita income above this level. This value for international dollars is slightly below the 73rd percentile for the midpoint year of the data set

(1982), which means that a little more than 25 percent of countries in the sample would experience decreased gini coefficients with increased openness. To put this in perspective, in 1982 Mexico had a per capita income just above the cut off ($5942) while Cyprus had a per capita income just below the cut off ($5608).

TABLE 2
Dependent Variable: Gini Coefficients
Least Square Dummy Variable Regression

Variable	Trade Share	Per Capita GDP	Trade Share* Per Capita GDP
Coefficient	0.054	0.0006	-0.000009
t-value	1.93	2.087	-2.32
Dummy Variable	Expenditure Survey	Household Survey	Gross Income
Coefficient	-2.14	0.568	1.33
t-value	-1.93	1.12	2.39
Significant Positive Time Trends	13		
Significant Negative Time Trends	12		
NOB	617	R^2	0.91
DF	464	Adjusted R^2	0.89
GROUPs	73	F-Value	32.3

Table 3 provides OLS parameter estimates for the country averages in the twenty year time period using gini coefficients. Column 1 presents the basic specification, column 2 adds percentages representing survey types and dummy variables for those countries that are found to have a significant time trend. Column 3 adds population size, the number of revolutions and coups per year, a dummy for socialist countries, the percentage of the population that lives in urban areas, and regional dummies. Column 4 drops the socialist dummy and adds the proportion of the population enrolled in secondary schooling in 1960 and 1970, the average education level of the population in 1980, the percentage of the non-agricultural workforce who belong to unions, the percentage of GDP that goes to non-military government consumption, and the percentage of the population between 16 and 64 years of age. Except for column 4 the results presented in Table 3 are similar to those in Table 2, in that developed countries are predicted to decrease inequality as trade increases, while developing countries experience the opposite effect. The coefficients of interest in column 4 are similar to the other specifications but are insignificant. In general throughout the article, the specification with the most independent variables is the least robust. This maybe due to the low degrees of freedom, or simply that other variables besides trade are what in reality affect inequality.

Table 4 has the same specification as Table 3, but only includes those gini coefficients deemed "acceptable" by Deininger and Squire (1996). Although the results are similar to those in table 3, the estimates are far less robust.

TABLE 3
OLS: Dependent Variable
Gini Coefficients (All Observations)

Variables	Column 1	Column 2	Column 3	Column 4
Constant	39.8 (14.55)	35.6 (9.90)	38.4 (4.60)	57.1 (3.86)
Trade Share	0.140 (3.15)	0.144 (3.20)	0.10 (2.15)	0.076 (1.42)
Per Capita GDP	-0.0005 (-1.33)	-0.0005 (-1.14)	-0.0002 (-0.43)	-0.0006 (-1.10)
Trade Share * Per Capita GDP	-0.000014 (-2.61)	-0.000014 (-2.67)	-0.00001 (-2.16)	-0.000009 (-1.47)
% of Expenditure Measure Surveys		4.71 (1.62)	2.15 (0.78)	-7.35 (-1.63)
% of Household Surveys		5.29 (1.87)	0.63 (0.24)	6.98 (1.88)
% of Surveys that use Gross Income Dummy		1.36 (0.45)	0.89 (0.27)	4.75 (1.47)
Upward Trend Dummy		0.19 (0.08)	1.75 (0.80)	6.83 (2.55)
Downward Trend Dummy		-0.88 (-0.34)	-2.40 (-1.12)	-2.53 (-1.31)
Socialist Dummy			-1.37 (-0.53)	
Average Revolutions and Coups per Year			-1.46 (-0.41)	-11.47 (-2.55)
Population			-0.000002 (-0.21)	0.00001 (1.49)
% of Population that Reside in Urban Areas			0.006 (0.10)	0.04 (0.59)
% Unionized Non-Agricultural				0.04 (0.99)
% of Non-Military Government Consumption				0.06 (0.59)
% of Population Age 16 to 64.				-34.72 (-1.82)
Average Years of Schooling in 1980				0.19 (0.75)
Secondary School Enrollment in 1970				-4.69 (-0.46)
Secondary School Enrollment in 1960				-6.19 (-0.62)
Regional Dummies	No	No	Yes	Yes
R^2	0.35	0.38	0.69	0.90
Adjusted R^2	0.33	0.33	0.59	0.79
Degrees of Freedom	96	91	63	20

t-values are in parenthesis.

TABLE 4
OLS: Dependent Variable
Gini Coefficients (Acceptable Observations)

Variables	Column 1	Column 2	Column 3	Column 4
Constant	40.1 (12.70)	31.7 (8.64)	36.7 (4.39)	34.5 (3.40)
Trade Share	0.124 (2.47)	0.092 (1.90)	0.047 (0.97)	0.078 (1.64)
Per Capita GDP	-0.0005 (-1.22)	-0.0051 (-1.14)	-0.0006 (-1.00)	-0.0005 (-0.81)
Trade Share * Per Capita GDP	-0.000012 (-2.09)	-0.000008 (-1.49)	-0.000006 (-1.25)	-0.000011 (-2.07)
% of Expenditure Measure Surveys		11.29 (3.81)	2.41 (0.83)	-9.53 (-2.05)
% of Household Surveys		3.75 (1.38)	0.88 (0.33)	2.94 (0.90)
% of Surveys that use Gross Income Dummy		7.23 (2.80)	5.08 (1.76)	7.99 (2.82)
Upward Trend Dummy		1.62 (0.58)	2.79 (1.18)	4.92 (1.51)
Downward Trend Dummy		-0.86 (-0.33)	-2.83 (-1.37)	-3.50 (-1.84)
Socialist Dummy			-3.80 (-1.39)	
Average Revolutions and Coups per Year			-1.68 (-0.44)	-14.58 (-2.59)
Population			-0.000003 (-0.33)	0.00002 (1.53)
% of Population that Reside in Urban Areas			0.03 (0.38)	-0.01 (0.12)
% Unionized Non-Agricultural				0.03 (0.60)
% of Non-Military Government Consumption				-0.15 (-1.07)
% of Population Age 16 to 64.				19.81 (1.52)
Average Years of Schooling in 1980				0.02 (0.08)
Secondary School Enrollment in 1970				-6.20 (-0.65)
Secondary School Enrollment in 1960				-5.52 (-0.63)
Regional Dummies	No	No	Yes	Yes
R^2	0.29	0.42	0.74	0.94
Adjusted R^2	0.26	0.35	0.65	0.83
Degrees of Freedom	80	75	49	13

t-values are in parenthesis.

As mentioned above, gini coefficients may be problematic given that two distinct income distributions may result in the same gini coefficient. As a result, two countries with very different income distributions appear equally egalitarian, even though one may have a higher concentration of income received by the upper class. Because of this, other measures of income distribution are used below. Although these measures may also present the same problem, it is unlikely that all the measures used below will suffer from this problem in the same manner. Consider for instance, two countries with equivalent gini coefficients but with one country having a higher concentration of income received by the upper class. This difference in income distribution will likely be captured by the ratio of the top to bottom quintiles of income distribution, or by the percentage of income earned by those who are considered middle class.

The specification in tables 3 and 4 is re-estimated in tables 5 and 6 using the ratio of the top quintile to the bottom quintile of the income distribution. The results obtained using this ratio is similar to those obtained using the gini coefficient. The same specification is then re-estimated using the percentage of income earned by the "middle class," measured as the income earned by those who fall between the 20th and 80th percentile of the income distribution. Tables 7 and 8 use the percentage of income earned by the "middle class" as the dependent variable. Tables 5 through 8 follow the same structure as tables 3 and 4 respectively. Although not as robust, the results in table 5 through 8 are very similar to those presented earlier, providing even more evidence that protectionist policies do not lower inequality in developed countries. When examining tables 7 and 8, the reader should keep in mind that unlike the other two measures of inequality, lower numbers of this "middle class" measure mean more inequality. Therefore the signs in tables 7 and 8 are reversed.

TABLE 5
OLS: Dependent Variable
Top Quintile /Bottom Quintile (All Observations)

Variables	Column 1	Column 2	Column 3	Column 4
Constant	7.48 (3.55)	6.20 (2.19)	12.83 (1.84)	22.68 (2.61)
Trade Share	0.07 (2.03)	0.067 (1.93)	-0.007 (-0.17)	0.017 (0.53)
Per Capita GDP	-0.00002 (-0.06)	-0.0001 (-0.33)	-0.0006 (-1.23)	-0.0004 (-1.26)
Trade Share * Per Capita GDP	-0.000007 (-1.75)	-0.000007 (-1.67)	-0.0000005 (-0.12)	-0.000003 (-0.81)
% of Expenditure Measure Surveys		0.49 (0.21)	-2.68 (-0.94)	-7.33 (-2.88)
% of Household Surveys		1.95 (0.86)	-1.09 (-0.43)	2.66 (1.21)
% of Surveys that use Gross Income Dummy		1.95 (0.81)	-1.58 (-0.51)	1.14 (0.56)
Upward Trend Dummy		3.70 (1.95)	5.55 (3.01)	6.28 (4.22)
Downward Trend Dummy		-1.19 (-0.69)	-2.12 (-1.34)	-1.33 (-1.28)
Socialist Dummy			-1.43 (-0.59)	
Average Revolutions and Coups per Year			-6.31 (-1.82)	-7.38 (-2.10)
Population			-0.000003 (-0.42)	0.000006 (1.06)
% of Population that Reside in Urban Areas			0.02 (0.45)	0.024 (0.69)
% Unionized Non-Agricultural				0.051 (1.79)
% of Non-Military Government Consumption				0.07 (1.13)
% of Population Age 16 to 64.				-25.92 (-2.47)
Average Years of Schooling in 1980				0.21 (1.51)
Secondary School Enrollment in 1970				-2.24 (-0.41)
Secondary School Enrollment in 1960				-2.66 (-0.50)
Regional Dummies	No	No	Yes	Yes
R^2	0.13	0.23	0.59	0.91
Adjusted R^2	0.09	0.15	0.43	0.78
Degrees of Freedom	80	75	49	13

TABLE 6
OLS: Dependent Variable
Top Quintile /Bottom Quintile (Acceptable Observations)

Variables	Column 1	Column 2	Column 3	Column 4
Constant	7.00 (3.20)	5.32 (2.07)	12.1 (1.95)	13.64 (2.43)
Trade Share	0.071 (2.04)	0.055 (1.62)	-0.009 (-0.25)	-0.004 (-0.16)
Per Capita GDP	0.00004 (0.17)	-0.0001 (-0.46)	-0.0006 (-1.39)	-0.0007 (-2.10)
Trade Share * Per Capita GDP	-0.000007 (-1.73)	-0.000005 (-1.36)	-0.0000005 (-0.13)	-0.000001 (-0.38)
% of Expenditure Measure Surveys		1.12 (0.55)	-3.43 (-1.52)	-6.32 (-2.45)
% of Household Surveys		2.17 (1.18)	2.74 (1.35)	1.25 (0.69)
% of Surveys that use Gross Income Dummy		3.12 (1.81)	0.34 (0.16)	3.83 (2.45)
Upward Trend Dummy		2.56 (1.34)	4.14 (2.22)	3.80 (2.11)
Downward Trend Dummy		-1.15 (-0.66)	-1.97 (-1.33)	-2.00 (-1.90)
Socialist Dummy			-4.83 (-1.97)	
Average Revolutions and Coups per Year			-5.52 (-1.80)	-10.39 (-3.34)
Population			0.0000004 (0.05)	0.000002 (0.38)
% of Population that Reside in Urban Areas			0.02 (0.44)	-0.004 (-0.09)
% Unionized Non-Agricultural				0.01 (0.41)
% of Non-Military Government Consumption				-0.13 (-1.65)
% of Population Age 16 to 64.				12.32 (1.71)
Average Years of Schooling in 1980				0.01 (0.07)
Secondary School Enrollment in 1970				-2.25 (-0.43)
Secondary School Enrollment in 1960				0.48 (0.10)
Regional Dummies	No	No	Yes	Yes
R^2	0.11	0.23	0.63	0.93
Adjusted R^2	0.07	0.14	0.48	0.81
Degrees of Freedom	74	69	44	13

t-values are in parenthesis.

TABLE 7
OLS: Dependent Variable
% of Income Held by Middle 60% of the Income Distribution
(All Observations)

Variables	Column 1	Column 2	Column 3	Column 4
Constant	0.48 (22.79)	0.49 (17.31)	0.43 (6.40)	0.32 (2.35)
Trade Share	-0.0007 (-2.14)	-0.0007 (-1.98)	-0.0002 (-0.52)	-0.0005 (-0.92)
Per Capita GDP	0.000005 (1.77)	-0.000006 (2.01)	0.000009 (2.05)	0.000004 (0.77)
Trade Share * Per Capita GDP	0.00000007 (1.76)	0.00000007 (1.65)	0.00000003 (0.67)	0.00000005 (1.00)
% of Expenditure Measure Surveys		-0.0005 (-0.02)	0.05 (1.79)	0.10 (2.38)
% of Household Surveys		-0.03 (-1.53)	-0.007 (-0.30)	-0.03 (-0.82)
% of Surveys that use Gross Income Dummy		-0.01 (-0.55)	0.006 (0.20)	0.008 (0.25)
Upward Trend Dummy		-0.029 (-1.53)	-0.05 (-2.73)	-0.08 (-3.26)
Downward Trend Dummy		0.007 (0.43)	0.01 (0.83)	0.02 (1.19)
Socialist Dummy			0.02 (0.95)	
Average Revolutions and Coups per Year			0.04 (1.24)	0.03 (0.59)
Population			0.000000009 (0.09)	-0.0000001 (-1.18)
% of Population that Reside in Urban Areas			-0.0004 (-0.87)	-0.0004 (-0.70)
% Unionized Non-Agricultural				-0.0003 (-0.67)
% of Non-Military Government Consumption				-0.0004 (-0.43)
% of Population Age 16 to 64.				0.30 (1.81)
Average Years of Schooling in 1980				-0.002 (-1.12)
Secondary School Enrollment in 1970				0.04 (0.48)
Secondary School Enrollment in 1960				0.04 (0.46)
Regional Dummies	No	No	Yes	Yes
R^2	0.35	0.40	0.73	0.89
Adjusted R^2	0.32	0.34	0.63	0.75
Degrees of Freedom	80	75	49	13

TABLE 8
OLS: Dependent Variable
% of Income Held by Middle 60% of the Income Distribution
(Acceptable Observations)

Variables	Column 1	Column 2	Column 3	Column 4
Constant	0.48 (21.05)	0.50 (18.12)	0.44 (7.09)	0.42 (4.93)
Trade Share	-0.0007 (-1.98)	-0.0006 (-1.62)	-0.0001 (-0.28)	-0.0001 (-0.26)
Per Capita GDP	0.000005 (1.57)	0.000006 (1.76)	0.00001 (2.83) 83)	0.00001 (2.06)
Trade Share * Per Capita GDP	0.00000007 (1.61)	0.00000005 (1.25)	0.00000002 (0.46)	0.00000002 (0.48)
% of Expenditure Measure Surveys		-0.17 (-0.77)	-0.05 (-2.30)	0.09 (2.26)
% of Household Surveys		-0.01 (-0.62)	-0.02 (-1.22)	-0.005 (-0.18)
% of Surveys that use Gross Income Dummy		-0.03 (-1.73)	-0.006 (-0.26)	-0.05 (-1.99)
Upward Trend Dummy		-0.018 (-0.91)	-0.04 (-2.05)	-0.05 (-1.87)
Downward Trend Dummy		0.004 (0.21)	0.007 (0.48)	0.02 (1.47)
Socialist Dummy			0.47 (1.91)	
Average Revolutions and Coups per Year			0.03 (1.15)	0.08 (1.61)
Population			-0.00000004 (-0.58)	-0.00000008 (-0.88)
% of Population that Reside in Urban Areas			-0.0007 (-1.39)	-0.0004 (-0.61)
% Unionized Non-Agricultural				0.00009 (0.21)
% of Non-Military Government Consumption				0.0016 (1.36)
% of Population Age 16 to 64.				-0.11 (-1.05)
Average Years of Schooling in 1980				0.0009 (0.36)
Secondary School Enrollment in 1970				0.02 (0.25)
Secondary School Enrollment in 1960				0.007 (0.10)
Regional Dummies	No	No	Yes	Yes
R^2	0.30	0.36	0.76	0.93
Adjusted R^2	0.27	0.28	0.66	0.80
Degrees of Freedom	74	69	44	13

Finally, the regression is estimated using the predicted openness measure, derived from a gravity model, as an instrument. As mentioned above, gravity models are good predictors of actual trade share and their characteristics are unlikely to affect other determinants of inequality. Although the standard deviations are large, the mean difference between actual trade share and predicted trade share are rarely larger than 5 percentage points. It would be very hard to find a set of instruments that do a better job predicting trade share. Table 9 presents predicted as well as actual openness numbers.

TABLE 9
Actual vs. Predicted Trade Share

Variable	N	Mean	Std Dev	Minimum	Maximum
PREDICTED TRADE SHARE	123	69.36	24.62	25.43	152.77
ACTUAL TRADE SHARE	152	74.03	44.88	13.64	340.10
AVERAGE DIFFERENCE	123	0.0261	43.71	-77.28	256.68

COUNTRY	PREDICTED TRADE SHARE	ACTUAL TRADE SHARE	COUNTRY	PREDICTED TRADE SHARE	ACTUAL TRADE SHARE
ALGERIA	73.052	38.43	KENYA	73.025	55.22
AUSTRALIA	27.123	33.785	KOREA, REP	63.758	70.256
BAHAMAS		133.2	LAOS		
BANGLADESH	62.172	23.356	LUXEMBOURG	65.46	211.94
BARBADOS	83.542	138.36	MALAYSIA	65.071	102.892
BELGIUM	89.702	137.123	MAURITIUS	106.323	120.31
BOLIVIA	39.182	46.87	MEXICO	58.573	24.744
BOTSWANA	29.267	119.05	MOROCCO	53.505	54.095
BRAZIL	51.247	17.276	NEPAL	40.918	28.43
BULGARIA		85.163	NETHERLAND	105.734	101.788
CAMEROON	82.458	52.88	NEW ZEALAND	73.486	57.064
CANADA	46.076	50.883	NIGER	34.055	
CENTRAL AFRICA	33.44	33.56	NIGERIA	64.832	55.67
CHILE	70.128	57.79	NORWAY	75.442	85.237
CHINA	29.277	23.171	PAKISTAN	70.688	34.878
COLOMBIA	66.543	30.848	PANAMA	95.571	81.873
COSTA RICA	65.979	74.02	PERU	40.027	32.53
CZECHOSLOV	57.696	57.071	PHILIPPINE	52.332	54.19
DENMARK	103.552	65.528	POLAND	125.627	42.98
DOMINICAN	68.988	60.498	PORTUGAL	92.006	69.504
EGYPT	79.457	67.835	PUERTO RICO		139.67
EL SALVADO	62.682	76.37	ROMANIA		47.75
ETHIOPIA	74.485	29.29	RWANDA	33.38	32.34
FINLAND	71.314	57.975	SENEGAL	79.692	54.17
FRANCE	93.975	42.153	SEYCHELLES		138.62
GABON	86.118	100.15	SINGAPORE	96.473	351.03
GERMANY, W	131.406	51.758	SPAIN	85.052	37.376
GHANA	81.067	41.638	SRI LANKA	112.371	70.098
GREECE	90.445	47.937	SWEDEN	60.971	62.181
GUATEMALA	61.859	41.703	TAIWAN	49.351	94.256
GUINEA-BIS	82.072	61.77	TANZANIA	53.571	42.3
HONDURAS	54.322	65.374	THAILAND	73.659	61.017
HONG KONG	101.015	198.768	TRINIDAD	78.066	89.035
HUNGARY	49.748	74.583	TUNISIA	98.578	78.345
INDIA	26.583	15.435	TURKEY	86.304	31.3
INDONESIA	31.959	48.436	U.K.	89.072	53.075
IRAN	74.153	36.22	U.S.A.	51.09	18.326
IRELAND	91.097	101.73	U.S.S.R.	44.71	15.955
ITALY	74.655	43.78	UGANDA	32.063	23.09
IVORY COAS	80.644	65.558	VENEZUELA	87.499	51.77
JAMAICA	83.59	109.21	YUGOSLAVIA		51.402
JAPAN	82.849	24.253	ZAMBIA	27.158	70.595
JORDAN	84.144	103.965	ZIMBABWE	38.525	59

Tables 10 and 11 present the IV results using gini coefficients as the measure of inequality and predicted openness as the instrument. The format for these two tables is the same as tables 3 and 4. In general, these results do not support those presented earlier in the article. The sign of the effect of openness and the cross product of openness and per-capita GDP are in some cases reversed, but all the coefficients are highly insignificant. Using the other measures of income inequality in the IV regression provided similar non-robust results to those reported in tables 10 and 11.[15]

TABLE 10
Instrumental Variables (Instrument: Predicted Openness using Gravity Model)
Dependent Variable
Gini Coefficients (All Observations)

Variables	Column 1	Column 2	Column 3	Column 4
Constant	65.4 (1.08)	53.7 (1.87)	50.1 (0.95)	66.4 (3.25)
Trade Share	-0.35 (-0.31)	-0.158 (-0.50)	-0.034 (-0.56)	0.0008 (0.005)
Per Capita GDP	0.0018 (0.30)	-0.0006 (-0.13)	-0.0010 (-0.28)	-0.001 (-0.86)
Trade Share * Per Capita GDP	-0.00003 (-0.35)	-0.000004 (-0.13)	0.0000002 (0.43)	-0.000002 (-0.13)
% of Expenditure Measure Surveys		0.94 (0.17)	0.20 (0.02)	-6.20 (-1.21)
% of Household Surveys		6.67 (1.44)	-0.02 (-0.58)	6.30 (1.58)
% of Surveys that use Gross Income Dummy		-1.50 (-0.28)	-1.27 (-0.13)	4.41 (1.27)
Upward Trend Dummy		-1.04 (-0.25)	1.88 (0.78)	7.93 (2.15)
Downward Trend Dummy		-2.06 (-0.48)	-2.44 (-1.08)	-2.48 (-1.20)
Socialist Dummy			-2.90 (-0.40)	
Average Revolutions and Coups per Year			-4.80 (-0.32)	-13.8 (-2.46)
Population			-0.00001 (-0.28)	0.000007 (0.43)
% of Population that Reside in Urban Areas			0.042 (0.27)	0.03 (0.48)
% Unionized Non-Agricultural				0.07 (0.98)
% of Non-Military Government Consumption				0.03 (0.20)
% of Population Age 16 to 64.				-37.6 (-1.71)
Average Years of Schooling in 1980				0.08 (0.27)
Secondary School Enrollment in 1970				8.83 (0.76)
Secondary School Enrollment in 1960				-0.99 (-0.06)
Regional Dummies	No	No	Yes	Yes
R^2	0.00	0.04	0.64	0.89
Adjusted R^2	-0.03	-0.04	0.54	0.77
Degrees of Freedom	96	91	63	20

t-values are in parenthesis.

It should be noted that only using the data that Deininger and Squire (1996) deem acceptable also provides less robust results. There are two possible reasons why this could be the case. It may be that non-acceptable data biases the results. Alternatively, it could be that the smaller sample size, when using only acceptable data, biases the results. The smaller sample size decreases the amount of developing countries while only slightly changing the sample of developed countries.

TABLE 11
Instrumental Variables (Instrument: Predicted Openness using Gravity Model)
Dependent Variable
Gini Coefficients (Acceptable Observations)

Variables	Column 1	Column 2	Column 3	Column 4
Constant	58.1 (0.87)	43.0 (1.67)	23.2 (0.15)	25.4 (0.83)
Trade Share	-0.221 (-0.18)	-0.134 (-0.25)	0.211 (0.10)	0.149 (0.61)
Per Capita GDP	-0.002 (-0.31)	-0.0005 (-0.08)	-0.0007 (-0.46)	0.0002 (0.07)
Trade Share * Per Capita GDP	-0.00003 (-0.46)	-0.000002 (-0.02)	-0.00002 (-0.13)	-0.00002 (-0.71)
% of Expenditure Measure Surveys		11.46 (1.10)	1.99 (0.37)	-11.32 (-1.66)
% of Household Surveys		8.74 (0.44)	-0.43 (-0.02)	3.75 (1.60)
% of Surveys that use Gross Income Dummy		6.56 (0.43)	5.92 (0.23)	7.03 (2.03)
Upward Trend Dummy		2.59 (0.37)	2.01 (0.14)	4.01 (0.81)
Downward Trend Dummy		-2.18 (-0.37)	-3.22 (-1.31)	-4.07 (-1.70)
Socialist Dummy			-2.18 (-0.10)	
Average Revolutions and Coups per Year			1.79 (-0.03)	-13.40 (-1.76)
Population			0.000008 (0.05)	0.00002 (0.92)
% of Population that Reside in Urban Areas			-0.03 (0.02)	-0.005 (-0.38)
% Unionized Non-Agricultural				0.05 (0.64)
% of Non-Military Government Consumption				-0.12 (-0.69)
% of Population Age 16 to 64.				22.25 (1.35)
Average Years of Schooling in 1980				0.15 (-0.27)
Secondary School Enrollment in 1970				-4.98 (-0.51)
Secondary School Enrollment in 1960				-14.13 (-0.54)
Regional Dummies	No	No	Yes	Yes
R^2	0.00	0.10	0.69	0.93
Adjusted R^2	-0.04	0.01	0.58	0.80
Degrees of Freedom	80	75	49	13

t-values are in parenthesis.

The effects of the control variables on inequality are inconsistent throughout these regressions. The two variables that seem to have the most robust effects are the average number of revolutions and coups per year and the percentage of working age adults. Both of these variables seem to decrease inequality. The percentage of working age adults seems to have the greatest effect on inequality. This allows more family members to earn income and perhaps allow families to save. The revolutions and coups variable also has a larger coefficient than most of the other variables. This suggests that institutional factors are important in the reduction of inequality.

Finally, Table 12 presents the Hausman type test comparing the IV and OLS results. None of the IV coefficients on openness or on the cross product of trade openness and real per capita GDP are significantly different from their OLS equivalent in any of the specifications used. This suggests that using the predicted value of a gravity model is not a good instrument for openness. Since gravity models have been shown to be a good predictor of actual openness and geographic characteristics are likely to be exogenous, I believe another explanation to be more likely. Alternatively, it is probable that the OLS coefficients are not significantly biased and provide good estimates of the effect that trade has on inequality.

TABLE 12
Hausman Type Test

	All Data			
	Column 1	**Column 2**	**Column 3**	**Column 4**
Difference Between the Openness OLS and IV Coefficients	-0.49 (1.52)	-0.30 (0.48)	-0.14 (0.59)	-0.08 (0.16)
Difference Between the [Openness* (Real GDP) /POP)] OLS and IV Coefficients	0.00001 (0.0001)	0.00001 (0.00005)	0.00001 (0.00005)	0.000006 (0.00002)
	Acceptable Data			
	Column 1	**Column 2**	**Column 3**	**Column 4**
Difference Between the Trade OLS and IV Coefficients	-0.35 (1.25)	-0.22 (0.54)	0.16 (2.18)	0.07 (0.24)
Difference Between the [Openness* (Real GDP) /POP)] OLS and IV Coefficients	-0.00002 (0.00007)	0.000006 (0.0001)	-0.00002 (0.0002)	-0.000008 (0.00003)

Standard Errors are in parenthesis and take the form $\sqrt{V(B_{IV}) - V(B_{OLS})}$.

CONCLUSION

The effect of trade on income inequality has long been of interest to economists. Renewed interest in the Nineties has encouraged the development of new theories that attempt to explain this relationship. This article attempts to test whether two of these theories along with the Stolper-Samuelson theory can be supported by macro data. The Feenstra-Hanson model predicts that increased trade always accompanies more inequality. Both the Tang-Wood model and the Stolper-Samuelson theorem predict that increased trade will be accompanied by an increase in inequality in developed countries. Stolper-Samuelson predicts a decrease in wage inequality in developing countries while the Tang-Wood model predicts the effect on inequality will depend on the circumstances of the developing country. The results provide no evidence in support of any of the three theories tested. They instead provide weak evidence that openness decreases income inequality in developed countries while increasing inequality in developing countries. When an instrument is used to correct for possible endogenity, those results disappear and I am left with no discernible effect of trade on income inequality. However, these results are not significantly different from the OLS results. The results also hint that institutional constraints are far more important in determining inequality than increased trade. This is not to say that trade is not important. It is very likely that workers are displaced as a result of increased trade, but the literature suggests that economies as a whole are better off as a result of trade. This is true both in terms of having greater consumer choice and the possible growth that may be associated with trade.

NOTAS

1. Woods also combines the three aforementioned theories, unfortunately the situational complexity of his prediction put it beyond the scope of this paper, and a topic of further research.

2. A complete description of the inequality measures is presented later in the Data section.

3. Probably because of a shift from non-monetary transactions to monetary transactions.

4. Of the 22 out of 64 countries that have significant time trends, 8 have a positive trend while 14 have a negative trend.

5. They only used countries with at least 4 observations between 1947 and 1994. The reason for the difference in criteria is the smaller overall sample size used in this paper.

6. The covariance correction involves adding the following term to the basic instrumental variable regression. $(\partial b/\partial a)\Omega^{-1}(\partial b/\partial a)'$, where Ω^{-1} is the covariance matrix of the first stage regression and $(\partial b/\partial a)$ is a matrix of the derivatives of the second stage coefficients with respect to the first stage.

7. Kuznets is probably the seminal paper in the area while Williamson summarizes the relationship between industrialization and inequality.

8. The regions included are the following: Africa, Middle East, Asia, Eastern Europe, Western Europe, Caribbean and Central America and South America.

9. Data on schooling, revolution and coups per year and socialist countries are from King and Levine's World Bank Data Set and are originally from other data sets.

10. Data on union membership is reported in the *1997-1998 World Labour Report* published by International Labour Organization.

11. Data for the percent of the population who lives in an urban environment is from the *World Population Report for 1996* published by the United Nations.

12. Data for the non-military government consumption and the percentage of adults are from the Penn World Tables data set.

13. This specification uses all countries with 3 or more years of gini coefficient data.

14. Using only Deininger and Squires

(1996) "acceptable" data does produce a positive coefficient on the cross product. However, the t-statistic is of the order of .3 and therefore provides little evidence in general support of any of the theorems mentioned.

15. Not reported.

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