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The effects of trade openness on income inequality - evidence from BRIC countries

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Abstract

In the last few decades, a lot of countries opened their economies to trade. And as a result, the share of world trade in world output increased from 33 percent in 1975 to 59 percent in 2013. These same years also witnessed an increasing income gap between developed and developing countries, in addition to income inequality within countries. I look into the relationship between trade openness and income distribution in greater detail in this paper. I conduct my analysis for the BRIC countries, namely, Brazil, the Russian Federation, India, and China. In my analysis, I find that an increase in trade as a percentage of GDP has in fact resulted in the worsening of the income distributions in these countries.

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1. INTRODUCTION

The effect of trade openness on income inequality has been an issue of considerable debate and concern for economists. In the last few decades, a lot of countries opened their economies to trade. And as a result, the share of world trade in world output increased from 33 percent in 1975 to 59 percent in 2013 (WDI, World Bank). These years witnessed an integration of individual economies into a global economy. These same years also witnessed an increasing income gap between developed and developing countries, in addition to income inequality within countries. Income inequality has been a major source of concern, especially in developing countries, like India and China, as they have larger vulnerable populations. They also have a generally lower standard of living. This means that the implications of income inequality are greater for developing countries. Hence, the relationship between trade liberalisation and income distribution is an important area of research.

Trade openness generally refers to the removal of trade barriers to international trade in goods and services, leading to the integration of domestic markets into a single world market. Sometimes countries trade with other countries but can still have a lot of restrictions imposed which cause a large amount of distortion, in addition to providing protection to domestic units. These restrictions can be subsidies, tariffs and non-tariff barriers like quotas. Advocates of open trade regimes claim that an open trade regime is beneficial in a lot of ways. Firstly, it results in fewer distortions as tariffs and subsidies generate a lot of dead weight loss, sometimes for both parties. Gains from open trade may come in the form of lower domestic prices, higher output and opportunities for exports resulting in increased income. Secondly, open trade also promotes transfer of technological know-how and foreign direct investments between countries. These do take place when trade is protected but are higher for open trade regimes.

Income distribution refers to how a country's total income is distributed amongst its population. A perfectly equal income distribution does not exist because individuals differ on the bases of skills, capabilities, levels of education attainment etc. Factors like economic growth, level of economic development, human capital, integration with the world economy, urbanisation, inflation and unemployment, demographic factors like the prevailing stage in the process of demographic development, the proportion of the economically active population, and political factors, have an effect on the income distribution. (see Kaasa, 2003).

I look into the relationship between trade openness and income distribution in greater detail in this paper. I conduct my analysis for the BRIC countries namely, Brazil, the Russian Federation, India and China. It has been observed that the levels of income inequality have not fallen significantly in these countries since they liberalised their trade regimes. In my analysis, I find that an increase in trade volumes has in fact resulted in the worsening of the income distributions in these countries. I also highlight the possible reasons behind this relationship. This paper is organised as follows. Section 2 is the literature review, followed by the empirical strategy in section 3. Section 4 deals with data, which is followed by the results in section 5 and then the conclusion in section 6.

2. LITERATURE REVIEW

Calderon and Chong (2001) use a dynamic panel data approach in their study of the relationship between trade openness and income inequality. They use data from 102 developed and developing countries, for the period 1960 to 1995. They use GMM estimation

for dynamic panel data models. They find that the volume of trade, and not the terms of trade, is associated with changes in income distribution. The real exchange rate and the intensity of capital controls have a negative effect on the income distribution. A real depreciation of the local currency decreases the Gini coefficient. This is attributed to an increase in competitiveness. Education is found to be an important factor in reducing inequality. They find that export orientation towards primary activities is associated with higher income inequality whereas export orientation towards manufacturing is associated with lower income inequality. The impact of volume of trade is positive and statistically insignificant for industrial countries whereas it is negative and significant for developing countries. Edwards (1997) identifies issues in the measurement of income distribution and trade openness. The results from a preliminary analysis on the relationship between trade policy and income distribution in a cross section of countries in the 1970's and 1980's are shown. The author checks whether there is evidence that more open countries have more unequal in-come distribution than those that have high protection levels. It is seen that, other things given, countries which had a more distorted external sector initially, did experience an increase in inequality. However, trade reforms had no effect on income distribution. A country might have a high share of trade in GDP even with high rates of distortions. It is found that the effects of trade policy differ in less developed and advanced countries, which is attributed to differences in factor endowments. Also, countries that reformed their education sectors during the previous decade experienced a reduction in inequality. He finds no evidence of a link between trade openness and increasing levels of income inequality. Wade (2004) questions the empirical basis of the neo-classical argument that the distribution of income has become more equal since the end of the Bretton Woods system and the wave of globalization. He also questions the claim that the number of people living in extreme poverty has fallen after almost one and a half century, which would show a reduction in the income gap. He finds that different measures yield different trends. Absolute income gaps are found to have increased (increase in income gap), which go together with an increase in poverty, unemployment, crime and overall slower economic growth.

Gourdon, Maystre and de Melo (2008) find evidence that the effect of trade liberalization on income distribution is conditional on the relative factor endowments of the trading partners. They use changes in tariff revenues to measure the degree of trade liberalization. They focus on variations within countries in response to changes in trade policy. They find that trade openness increases income inequality in countries which are well-endowed with highly skilled labour and capital or in countries that are well-endowed with labour that has very low education levels.

Some studies find that trade liberalisation has in fact increased income inequality thereby, worsening the income distribution. Galiani and Sanguinatti (2003) examined the impact of trade liberalisation on wage inequality in Argentina in the nineties. They observed that wage inequality was on the rise in the nineties. This coincided with a process of deep trade liberalisation in Argentina. Trade liberalisation is measured by the reduction in tariffs. While it may have encouraged economic growth, trade liberalisation at the same time may have hurt workers in industries that faced increased competition. They used micro data to check whether those sectors that were exposed to increased import penetration were the ones with increased wage inequality. They found evidence that wage inequality increased along with the process of trade liberalisation. It is also found that trade liberalisation increased the 'college wage premium' in the nineties, signifying a shift of demand from unskilled labour to skilled labour. Thus, a further gap in wages was created. This process can for the most part be explained by skill biased technological innovation. Also, increased trade with low-wage developing countries meant that demand for unskilled labour decreased, further hurting

unskilled labour. Hanson and Harrison (1999) find that the wage-gap in Mexico widened in the 1980s and this coincided with a heavy trade liberalisation in 1985, when Mexico joined the GATT. They use data for manufacturing plants from 1984 to 1990. They used reductions in tariffs to measure trade liberalisation. It was found that low-skilled workers were affected more than proportionately by the increased competition from imports. This is attributed to the fact that Mexico had high protection rates for low-skilled sectors, which were reduced significantly. Also, an increase in trade with countries more abundant in low skilled labour than Mexico further hurt the low skilled workers by decreasing demand for them. Meschi and Vivarelli (2007) studied the distributive consequences of international trade flows in developing countries. They use data from 70 developing countries for the period 1980 to 1999. They suggest that the interplay between trade liberalisation and the technology adopted is an important mechanism. This interplay determines the wage differentials in the concerned country. Skill biased technological innovation usually hurts low skilled workers in developing countries. They arrived at the conclusion that total aggregate trade flows are weakly related with income inequality. But they also found that once the trade flows are disaggregated with respect to their areas of origin and destination then only trade with high income countries worsens the income distribution in developing countries, as the technology transferred is usually skill intensive. It is implied that differences in technology between trading partners affects the income distribution. This happens to be true for both imports and exports.

Thus, I find that the evidence on the relationship between trade openness and income distribution is varied and the literature is without consensus on the issue. The results differ for developing and developed countries. They also differ on other bases like factor endowments, the kind of trade protection measures imposed, the type of industry involved in trade, the type of technology transferred and so on.

3. EMPIRICAL STRATEGY

In my paper, I use a modified version of the model used by Calderon and Chong (2001). Their choice of estimator is the Arellano-Bover / Blundell-Bond dynamic panel data estimator, also known as difference GMM estimation for dynamic panel data models. In my estimations, I use the system GMM estimator for dynamic panel data models. System GMM generates a set of moment conditions in addition to those generated in difference GMM, therefore augmenting the estimator. The model is dynamic i.e. the set of explanatory variables includes a lagged value of the dependent variable. Lagged levels of the dependent variables are used as instruments. The general equation estimated for income inequality is:

$$y_{i,t} = \beta_1 y_{i,t-1} + \beta_2 X_{i,t} + \eta_i + t_i + e_{i,t} \quad \textbf{(1)}$$

where, *'y'* is the dependant variable, *'$y_{i,t-1}$'* is the lagged value of *'y'*, *'X'* is the vector of other explanatory variables, *'η_i'* is the vector of country specific effects, built into the estimator, *'t_i'*, is the vector of time effects captured by a dummy variable and '$e_{i,t}$' is the error term. The country specific effects capture those unobserved country effects are used to proxy for those unobservable factors that vary from country to country but are constant over time such as cultural values and institutional factors. The time effects are included to proxy for the factors

that affect all countries in a given year and vary overtime like economic crises and oil prices. *'i'* and '*t'* refer to the country and time period, respectively.

I employ the following model to carry out my analysis. The aim of this model is to find out the effect of trade openness on income inequality from 1991 to 2013 in the BRIC countries. My core model consists of the following equation and two modifications applied to it, which follow later in this section.

First, I estimate equation (2) below:

$$gini_{it} = \alpha_0 + \beta_1 (gini_{i,\, t-1}) + \beta_2 (tot_{it}) + \beta_3 (reer_{it}) + \beta_4 (educ_{it}) + \beta_5 (trade_{it}) + \beta_6 log(gdpc_{it}) + Time_t + e_{it} \quad \textbf{(2)}$$

where, $gini_{it}$ is the gini coefficient of country i at time t, $gini_{i,\, t-1}$ is the lagged value of the gini coefficient, α_0 is the constant, *tot* is the terms of trade adjustment taken as a percentage of GDP, *reer* is the real effective exchange rate index, *educ* is the gross secondary school enrolment ratio, *trade* is total trade of goods and services (% of GDP), *log(gdpc)* is the natural logarithm of GDP per capita at constant prices, $time_t$ are time effects captured by a dummy variable for the years that saw a major economic crisis and e_{it} is the random error term.

Total volume of trade as a percentage of GDP is my measure of trade openness. This is the key variable of interest. The theory predicts that there should be a negative relationship between trade openness and income inequality but the empirical literature is mixed on this issue.

I then compare the effects of exports and imports on income inequality in order to check whether the distributional effects of trade differ if trade is disaggregated into imports and exports. The following equations are estimated:

$$gini_{it} = \alpha_0 + \beta_1 (gini_{i,\, t-1}) + \beta_2 (tot_{it}) + \beta_3 (reer_{it}) + \beta_4 (educ_{it}) + \beta_5 (imp_{it}) + \beta_6 log(gdpc_{it}) + Time_t + e_{it} \quad \textbf{(3)}$$

where, *imp* is the total imports of goods and services (% of GDP).

$$gini_{it} = \alpha_0 + \beta_1 (gini_{i,\, t-1}) + \beta_2 (tot_{it}) + \beta_3 (reer_{it}) + \beta_4 (educ_{it}) + \beta_5 (exp_{it}) + \beta_6 log(gdpc_{it}) + Time_t + e_{it} \quad \textbf{(4)}$$

where, *exp* is the total exports of goods and services (% of GDP).

I employ an additional model which uses total volume of trade (constant 2005 USD) as a measure of trade openness. The model estimated is as follows:

$$gini_{it} = \alpha_0 + \beta_1 (gini_{i,\, t-1}) + \beta_2 (tot_{it}) + \beta_3 (reer_{it}) + \beta_4 (educ_{it}) +$$

$$\beta_5 (tradevol_{it}) + \beta_6 log(gdpc_{it}) + Time_t + e_{it} \quad \textbf{(5)}$$

where, *tradevol* is total trade of goods and services (constant 2005 US$). Similar models are employed for total imports, (*impvol*) and exports, (*expvol*), both at constant 2005 US$.

A test for multicollinearity was conducted and it was not found to be high. I also conduct the Arellano-Bond test for autocorrelation and it does not pose a problem.

4. DATA – Variables and Descriptive Statistics

In my study, I make use of panel data for the BRIC countries, Brazil, Russian Federation, India and China for the period 1991 to 2013. All the variables that are used in my model are sourced from the World Bank's World Development Indicators 2015 and the Bank for International Settlements' database. Table 1 presents the description of the variables included in the model. Table 2 presents the descriptive statistics of the variables.

TABLE 1: DESCRIPTION

VARIABLE	DESCRIPTION	SOURCE
gini	GINI index (World Bank estimate)	WDI 2015
trade	Imports and exports of goods and services (% of GDP)	WDI 2015
imp	Imports of goods and services (% of GDP)	WDI 2015
exp	Exports of goods and services (% of GDP)	WDI 2015
tradevol	Imports and exports of goods and services (constant 2005 US$)	WDI 2015
impvol	Imports of goods and services (constant 2005 US$)	WDI 2015
expvol	Exports of goods and services (constant 2005 US$)	WDI 2015
tot	Terms of trade adjustment (calculated as % of GDP)	WDI 2015
reer	Real effective exchange rate index	WDI 2015, Bank for International Settlements

educ	School enrolment, secondary (% gross)	WDI 2015
gdpc	GDP per capita (constant 2005 US$)	WDI 2015

TABLE 2: DISCRIPTIVE STATISTICS

VARIABLE	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
gini	43.2334	9.6751	28.43	60.12
trade	39.41525	17.0631	15.58034	110.5771
imp	18.52681	7.177387	7.913944	48.2546
exp	20.88844	10.37628	6.705896	62.32246
tradevol	5.56E+11	7.41E+11	5.03E+10	3.73E+12
impvol	2.61E+11	3.32E+11	2.55E+10	1.69E+12
expvol	2.95E+11	4.12E+11	2.48E+10	2.03E+12
reer	85.76282	14.48871	47.1627	115.2939
educ	68.93045	18.63032	40.2383	97.18202
tot	1.0296	2.1899	-3.3363	7.9022
gdpc	2994.511	2057.679	398.3538	6922.792

Table 2 presents the descriptive statistics for all the variables. The dependent variable of the model, gini coefficient varies from a minimum of 28.43 for India to a maximum of 60.12 for Brazil, with a mean of 43.2334 and a standard deviation of 9.6751. The average country has a 'positive terms of trade adjustment as percentage of GDP' at 1.0296 percent with a standard deviation of 2.1899 percent. China has the lowest terms of trade adjustment factor at -3.3363 percent of GDP and Russia has the highest at 7.9022 percent of GDP. The real effective exchange rate index varies from 47.1627 for Russia to 115.2939 for China, with a mean of 85.76282 and a standard deviation of 14.4887. This shows that some currencies are highly appreciated while some are highly depreciated. The secondary school enrolment also varies quite a lot from 40.2383 percent for China to 97.18202 percent for Russia, with a mean of 68.93045 percent and standard deviation of 18.63032 percent. This shows that the BRIC countries differ greatly with respect to levels of education attainment. Trade as a percentage of GDP varies from a minimum of 15.5 percent for Brazil and 110.5 percent for Russia with a mean of 39.4 percent and a standard deviation of 17 percent, showing the different levels of

trade openness within the BRIC countries. The levels of imports and exports also vary greatly within the BRIC countries. Imports as a percentage of GDP vary from 7.9 percent for Brazil to 48 percent for Russia with a mean of 18.5 percent and a standard deviation of 7 percent. Similarly, exports as a percentage of GDP vary from 6.7 percent for Brazil to 62 percent for Russia with a mean of 20.8 percent and a standard deviation of 10 percent. The GDP per capita also varies from a level of USD 398.3538 for India to USD 6922.792 for Russia, with a mean of USD 2994.511 and a standard deviation of USD 2057.679. This shows that there is a large amount of disparity in the levels of per capita income within the BRIC countries. It can be said that the BRIC countries are fairly diverse with respect to the indicators chosen in my analysis.

5. RESULTS

The results of my analysis are presented in the following table 3. In models 1 and 4, I estimate the effects of trade on income inequality, using trade as a percentage of GDP and total volume of trade in US$, respectively. In the following models 2, 3, 5, and 6 trade is disaggregated into imports and exports, respectively. In models 2 and 3, imports and exports are measured as a percentage pf GDP and in models 5 and 6, the total volume of imports and exports in US$ is the chosen measure.

TABLE 3: RESULTS

Dependent Variable: gini coefficient						
	model1-trade	model2-imp	model 3-exp	model4-tradevol	model 5-impvol	model 6-expvol
lagged gini	0.06306	0.0206	0.1062	-0.1394	-0.1037	-0.1435
	(0.696)	(0.897)	(0.436)	(0.360)	(0.452)	(0.406)
trade	0.2935**	-	-	-	-	-
	(0.034)					
imp	-	0.5699**	-	-	-	-
		(0.028)				
exp	-	-	0.1843***	-	-	-
			(<0.00)			
tradevol	-	-	-	2.51e11***	-	-
				(<0.00)		

impvol	-	-	-	-	4.56e-11***	-
					(<0.00)	
expvol	-	-	-	-	-	4.81e-11***
						(<0.00)
tot	-0.4879	-0.2082	-0.316	-0.2339	-0.5006	-0.064
	(0.422)	(0.689)	(0.586)	(0.626)	(0.319)	(0.889)
reer	0.2898*	0.1421*	0.166***	0.1448	0.0973	0.181
	(0.064)	(0.097)	(0.001)	(0.151)	(0.202)	(0.141)
educ	-0.0359	-0.1894	0.0649	-0.1023	-0.2193**	0.0402
	(0.803)	(0.262)	(0.690)	(0.355)	(0.048)	(0.689)
log(gdpc)	-2.4244	-1.5568	3.1397	-18.04***	-15.93***	-16.969***
	(0.678)	(0.79)	(0.741)	(<0.00)	(<0.00)	(<0.00)
crisis	-2.822**	-2.123***	-2.586**	-2.624**	-2.253**	-2.951
	(0.049)	(0.007)	(0.039)	(0.07)	(0.024)	(0.133)
prob>chi2	<0.00	<0.00	0.1766	<0.00	<0.00	<0.00
Number of observations	23	23	23	23	23	23

Note: ***, ** and * denote statistical significance at 1%, 5% and 10% level, respectively. P-values are reported in parentheses.

The results of my analysis show that trade openness (as measured by trade as a percentage of GDP) and income inequality (as measured by the gini coefficient), are positively and significantly related, at the 5% level of significance. This implies that an increase in trade openness has increased the gini coefficient in the BRIC countries. This result holds for my core regression and also when I use the total volume of trade to measure trade openness. This finding is in contrast to Calderon and Chong (2001), who find that the volume of trade reduces gini coefficient. The terms of trade adjustment as a percentage of GDP is negatively and but statistically insignificantly correlated with the gini coefficient. I find that this result is similar to the findings of the core model of Calderon and Chong (2001). The real effective exchange rate is positively and significantly related to the gini coefficient when I use trade, exports, and imports as a percentage of GDP but it becomes insignificant in the rest of the regressions. This implies that an increase in the real effective exchange rate has resulted in an

increase in the gini coefficient. This result is similar to that of Calderon and Chong (2001), who find that a positive correlation between real exchange rates and inequality. I find that the per capita income is negatively and very significantly related to the gini coefficient in three out of my six regressions. An increase in the per capita income seems to have decreased income inequality in the BRIC countries. This result is opposite of that of Calderon and Chong (2001). This could be due to a rise in the income of all sections of society rather than just the upper strata. The dummy for crisis shows that an economic crisis has reduced the gini coefficient and it has a highly significant relationship, which is counter-intuitive. Education is negatively related to gini, which is expected as an increase in education levels should decrease income inequality. This result is similar to that of Calderon and Chong (2001). But my coefficient is insignificant for all the regressions except one. The past values of gini coefficient are positively correlated to the value of the gini coefficient in the period observed but do not seem to be significantly correlated.

When I disaggregate trade into imports and exports, I find that both imports and exports are positively related with income inequality. The relationship for both imports and exports is statistically significant at the 5% and 1% levels of significance, respectively. In case of both, the results for the other variables hold as before. The coefficients for the terms of trade adjustment, education and per capita income remain insignificant, except education becomes significant when using the absolute import volume. The coefficient for per capita income remains negative and insignificant when I use imports and exports as a percentage of GDP but becomes significant when I use the total volume of imports and exports. The coefficients for the real effective exchange rate remains positive and significant when I use imports and exports as a percentage of GDP but becomes insignificant when I use the absolute volume of imports and exports. The crisis dummy remains negative and significant, becoming insignificant when the absolute volume of exports is used.

The results yield some important implications. It seems that an increased volume of trade has worsened the income distribution in the BRIC countries. Also, even when trade is disaggregated into imports and exports, the results do not change for either of them. Some previous studies have found that the impact of exports and imports on income distribution has differed (Galiani and Sanguinatti (2003)). The positive relationship between trade volume and gini coefficient can be due to multiple reasons. Firstly, a country can have high levels of income inequality to begin with. This problem may be worse in the presence of other inherent country specific factors which make it harder to tackle the problem, like cultural or political issues. Brazil, for example had high levels of income inequality to begin with. So, even if income inequality is falling, the impact of this fall might be low. Secondly, the increased volume of trade may have benefitted a small percentage of population. As the four BRIC countries were mostly labour-abundant and capital-scarce, with the possible exception of the Russian Federation, trade accompanied by skill biased technological innovation may have hurt a greater proportion of population than that it benefitted (Meschi and Vivarelli (2007)). Another way to look at this would be from the factor endowment perspective. Countries that are abundant in unskilled and less educated labour may experience a worsening of the income distribution due to skill biased technological development (Gourdon, Maystre and de Melo (2008)). A third explanation could be high levels of protection existing before trade liberalisation. Industries that had received high levels of protection in the past may not have been able to cope with the increased competition from international markets, post-liberalization. This might result in domestic industries losing their competitiveness and making workers worse off (Harrison (1999)).

6. CONCLUSION

This paper explored the effect of trade openness on income inequality in the BRIC countries using system GMM. The model is a modified version of Calderon and Chong (2001). My results differ from their results in some aspects. They found trade openness reduced income inequality. I found that there is a positive and significant relationship between trade openness and income inequality. An increase in trade openness has very significantly increased income inequality in the BRIC countries in the period from 1991 to 2013. When I test separately for the effects of imports and exports, the relationship remains positive and highly significant. This difference in the sample of countries used may be responsible for differing results.

Other variables had diverse effects on income inequality. The terms of trade adjustment as a percentage of GDP is negatively but insignificantly related to the gini coefficient. I have found that an increase in the real effective exchange rate has resulted in an increase in the gini coefficient in three out of my six regressions. An increase in the per capita income on the other hand, decreases income inequality. The relationship between education levels and inequality is insignificant. Contrary to economic theory, an economic crisis seems to have improved the income distribution.

Thus, it can be concluded that increased trade openness has worsened the income distribution in the BRIC countries. This can be attributed to multiple factors like the relative factor endowments and the levels of protection prevailing before the liberalisation, discussed in the previous section. The relationship between trade liberalisation and income inequality can be diverse, as has been observed from the literature on the issue. Therefore, trade liberalisation should not be dismissed outright as a harmful policy, especially for developing countries.

A limitation of my study is that the results are not entirely comparable to Calderon and Chong (2001), as I use only four countries in my analysis and their study covers 102 countries. It also does not account for other liberalising reforms except trade. Therefore, the two studies must be compared with caution.

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