



## **Working Paper**

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# **THE EDUCATION BIAS OF 'TRADE LIBERALIZATION' AND WAGE INEQUALITY IN DEVELOPING COUNTRIES**

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## **ABSTRACT**

The aim of this paper is to examine the impact of increased trade on wage inequality in developing countries, and whether a higher human capital stock moderates this effect. We look at the skilled-unskilled wage differential. High initial endowments of human capital imply a more egalitarian society. When more equal societies open up their economies further, increased trade is likely to induce less inequality on impact because the supply of skills better matches demand. But greater international exposure also brings about technological diffusion, further raising skilled labour demand. This may raise wage inequality, in contrast to the initial egalitarian level effect of human capital. We attempt to measure these two opposing forces. We also employ a broad set of openness indicators to measure trade liberalization policies as well as general openness, which is an outcome, and not a policy variable. We further examine what type of education most reduces inequality. Our findings suggest that countries with a higher level of initial human capital do well on the inequality front, but human capital which accrues through the trade liberalization channel has inequalitarian effects. One explanation could be that governments in developing countries invest more in higher education at the expense of primary education in order to gain immediate benefits from globalization; thus becoming prone to wage inequality after increased international trade. Our results also have implications for the speed at which trade policies are liberalized, the implication being that better educated nations should liberalize faster.

## **Keywords**

trade liberalization, wages, economic disparity, skills development, education, human resources

JEL Classifications: F-15, I-3

# THE EDUCATION BIAS OF 'TRADE LIBERALIZATION' AND WAGE INEQUALITY IN DEVELOPING COUNTRIES\*

## 1 INTRODUCTION

The benefits of accelerated globalization since 1980 have been quite unequally distributed among developing nations, disadvantaging sub-Saharan Africa, and even Latin American countries in terms of either negative or indifferent growth rates (Murshed, 2003). This has occurred, despite the fact that most of these nations have become more open in the sense of rising shares of international trade in national income. Associated with this phenomenon of increasing openness is rising within-nation income inequality post-1980. Increased trade, particularly of the inter-industry variety, alters the composition of output in the economy away from non-traded goods towards traded products. This will impact on the functional distribution of income, usually raising the demand for the factor of production employed intensively in the traded sector. In the developed world it is skilled labour, and we have witnessed an increase in the skilled-unskilled labour relative wage premium. In many OECD countries this has meant a more unequal personal distribution of income. As far as developing countries are concerned, especially in those that export unskilled labour intensive manufactured goods, we would expect a fall in the skilled-unskilled labour relative wage premium leading to reduced inequality, since the unskilled are more numerous within the population. But this is generally not true, and inequality in the developing world has also risen, mirroring events in the OECD. What accounts for this paradox? It may be that developing countries have such vast quantities of unskilled labour that the unskilled wage will not respond to increased demand. This is certainly likely in cross-country studies where China and India are included. Alternatively, other less populous developing countries may be exporting relatively more skilled labour intensive products such as semi-conductors, or capital intensive commodities as is the case with fuels and minerals. Finally, an expansion in international trade may raise the demand for, and reward of, skilled labour even when the country in question is exporting unskilled labour intensive products due to skill shortages and other factor complementarities.

Many studies have tried to capture the relationship between trade liberalization and income inequality. A recent paper by Dollar and Kraay (2004) concludes that liberalization does not significantly affect the distribution of income, and at most the relationship is of neutral nature. However their results have been widely challenged, because of their methodology and variable choice (Ravallion, 2003; and Amann et al, 2002). Ravallion (2003) points out that increased openness can lead to a rise in the demand for relatively skilled labour, which tends to be more unequally distributed in poor relative to rich countries. Arbache, Dickerson and Green (2004) find that imported

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technology has raised the relative demand for highly skilled labour in Brazil and thus lowered the relative wages of less educated groups. Behrman, Birdsall and Szekely (2001) observe that inequality has increased in 7 out of 18 Latin American countries that initiated market reforms in the mid 1980s. Jayasuriya (2002), accepts that trade liberalization may have reduced consumption poverty in South Asia, but is sceptical about the so-called neutral distributional effects of liberalization. Many suggest that the distribution of the positive effects of liberalization is somewhat skewed towards urban households rather than rural ones, and to wealthy rather than poor households. See for example, Chen and Ravallion (2003), Cockburn (2001), Friedman (2000), Lofgren (1999). The evidence in this regard comes mainly from the Latin American region primarily because most of the economies there undertook rigorous reform policies in the mid 1980s following the debt crisis in that decade. Legovini, Bouillon and Lustig (2001) find that inequality in Mexico rose sharply between 1984 and 1994, and rising returns to skilled labour accounted for 20 % of the increase in the inequality in household income. Similarly, Hanson and Harrison (1999) find that the reduction in tariffs and the elimination of import licenses accounts for 23 % of the increase in the relative wages of skilled labour during 1986-1990, thus providing evidence for the role liberalization played in rising inequality in Mexico. Other country studies on Brazil, Chile, Colombia and Venezuela, also show that skilled workers received increased premiums after liberalization when compared to their unskilled counterparts (World Bank, 2001b). So the balance of the evidence points to increased globalization inducing greater income inequality.

Irrespective of the exact nature of the cause of trade induced inequality, it is sensible to presume that nations with higher stocks of human capital will experience less of the unequalising spiral consequent upon globalization and trade liberalization. Investment in education may yield a double dividend. It can not only promote growth, but also suppresses inequality by both bequeathing skills as well as moderating rises in skill-premia following an expansion of international trade. More generally, Tinbergen (1975) pointed out that changes in wage inequality are a result of the opposing forces that technological change (skilled labour demand) and education (skilled labour supply/ human capital) exert on relative wages. Eiche and Garcia-Penalosa (2001: 19) suggest that human capital accumulation plays a dual role in development because the stock of educated workers in an economy determines both the degree of income inequality and its rate of growth, making the parameters of the demand for and supply of labour crucial determinants as to whether inequality increases or decreases as an economy accumulates human capital.

The aim of this paper is to examine the impact of increased trade on inequality, and furthermore investigate whether a higher human capital stock moderates this unequalising aspect of international trade. We specifically look at the skilled-unskilled wage differential. High initial endowments of human capital, captured by data on average years of schooling say, imply a more egalitarian society compared to countries with a lower human capital endowment. When more equal societies open up their economies further, increased trade is likely to induce less inequality upon impact because the supply of skills better matches demand. But greater international exposure also

brings about technological diffusion, see Winters (2004), further raising skilled labour demand. This may raise wage inequality, in contrast to the initial egalitarian *level* effect of human capital. We attempt to measure these two opposing forces. An innovation of our paper is to employ a broad set of openness indicators to measure trade liberalization policies as well as general openness, which is an outcome, and not a policy variable. Another purpose of our analysis is to examine what type of education most reduces inequality. In settings of low human capital endowments, as measured by literacy or low primary school enrollment, a policy of relative neglect of primary in favour of expenditure on tertiary education may have a less than benign influence on inequality. Our sample of countries (see appendix 4) excludes developed nations and economies in transition because of higher stocks of human capital in those regions. The rest of the paper is organized as follows: section 2 presents the data and methodology, section 3 contains the empirical results, and finally section 4 concludes with some policy implications.

## 2 DATA AND METHODOLOGY

We employ the UTIP-UNIDO wage inequality ‘THEIL’ measure calculated by University of Texas Inequality Project (UTIP) based on UNIDO 2001. This data set is a set of measures of the dispersion of pay across industrial categories in the manufacturing sector, drawn from the Industrial database published annually by United Nations Industrial Development Organisation (UNIDO). The Theil index is decomposable (Conceicao and Galbraith, 2000). If individuals are grouped in a mutually exclusive, completely exhaustive way, overall inequality can be separated into a between group component and a within group component. Thus, there is no interaction between these two components and so one can consider these measures additively decomposable. Moreover, of all entropy based measures, the Theil Index is the one of only two measures for which the weights in the within-groups component add to one. Therefore, overall inequality is the result of adding the two independent components: inequality between groups and inequality within groups.

Here we have decided to employ the Theil index or more specifically a measure of inequality in manufacturing pay between skilled and unskilled labour, instead of taking measures of absolute inequality which would capture the personal income distribution (GINI). This is motivated by several considerations. First, comparable and consistent measures of income inequality, whether on a household level or per head basis are difficult, almost implausible and generally fails to provide adequate or accurate longitudinal and cross-country coverage. By contrast, inequality of manufacturing pay, based on UNIDO Industrial Statistics provides indicators of inequality that are more stable, more reliable and more comparable across countries because UNIDO measures are based on a two or three digit code of International Standard Industrial Classification (ISIC), a single systematic accounting framework. Furthermore, manufacturing pay has been measured with reasonable accuracy as a matter of official routine in most countries around the world for nearly forty years (Galbraith and Kum, 2002).

Secondly, pay is major source of household income. Any change in wage inequality is reflected in income inequality. According to Fields (1980) pay inequalities in the manufacturing sector have been found out to be the driving force behind the evolution of inequality. Furthermore, as discussed above, processes of globalization through technological change raises the concentration of skilled workers in advanced sectors against unskilled worker in the backward sector. Since manufacturing is the sector most affected by modern technological change, income inequality would certainly have an inter-industrial feature that would show up in changing pay differentials between advanced and backward manufacturing industries (Galbraith and Kum, 2002).

Thirdly, our principal reason for using the UTIP-UNIDO wage inequality ‘THEIL’ measure is because we are more interested in the functional distribution of income. Changes in the functional distribution between skilled and unskilled labour, will in turn predictably impact on the personal income distribution in countries that are unskilled labour abundant. Inequality will rise as the skilled-unskilled labour wage premium increases and vice versa.

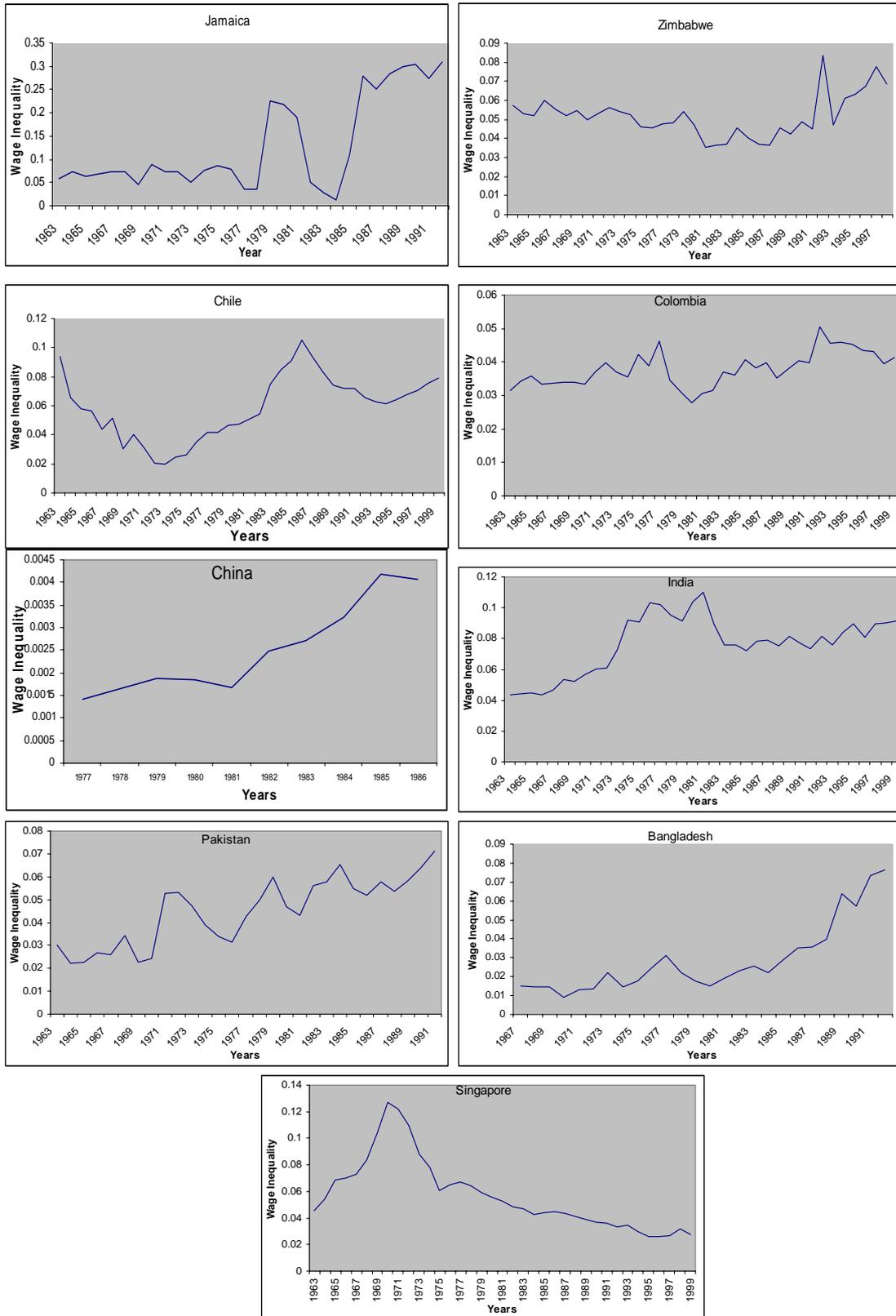
The UTIP- UNIDO wage inequality measure is the between-group component of Theil’s T statistic, an entropy measure whose functional form is defined as:

$$T = \sum \left(\frac{Y_i}{Y}\right)T_i + \sum \frac{Y_i}{Y} \log\left(\frac{Y_i/Y}{N_i/N}\right) = T^W + T^B \quad (1)$$

Where  $T_i$  and  $T$  indicate within-group and between-group inequality measures respectively.  $N$  and  $Y$  stand for total employment and total pay respectively, and subscript  $i$  denotes group identity. As mentioned, UTIP captures as their inequality measure, where groups are defined as categories within the UNIDO industrial classification codes. Like GINI, the Theil index range from 0 to 1. However, strictly speaking the  $T$ , which only captures a part of inequality, ranges from 0 to less than 1 (0.36 for the current UNIDO data set).

The UTIP data set provides Theil inequality measures for nearly 3200 country/year observations, covering over 150 countries during the period 1963 to 1999. Figure 1 illustrates trends in wage inequality between skilled and unskilled workers over time in selected developing countries and is representative of different regions. All the country graphs, except one, show that wage inequality has been on the rise in 1980s and 1990s. The only exception is Singapore which belongs to a group associated with the ‘East Asian Miracle’ of the 1980s. This miracle, however, was confined to a few countries, and is not representative of the developing world, as is evident from the graphs. Since 1980s and 1990s are associated with ‘Structural Adjustment Policies’ under which many developing countries embraced trade liberalization, it is safe to suggest that the above trends in wage inequality are related to these market reforms. Appendix 4 lists these countries, and the latest year for which the Theil wage inequality index was available for them.

Figure 1



Our basic model for wage inequality between skilled and unskilled workers based on integration will have 2 equations:

$$\begin{aligned} \text{Inequality} = f[\text{Integration}(\text{Openness}), \text{Skills}_0] & \quad (2) \\ (+) & \quad (-) \end{aligned}$$

$$\begin{aligned} \text{Inequality} = f[\text{Integration}(\text{TradePolicy}), \text{Skills}_0] & \quad (3) \\ (+) & \quad (-) \end{aligned}$$

Here wage inequality is a positive function of integration, which in turn is positively related to the degree of the openness of the economy in equation (2), or trade *policies* that promote greater openness in equation (3). The latter effect is often ignored in the literature, which only employs openness indicators. It should be noted, however, that openness is an outcome of trade and industrial policies and not a policy indicator per se. Wage inequality is also negatively related to the initial stock of skills in the economy as discussed above. A simple Heckscher-Ohlin or Stolper-Samuelson model would suggest that the overall returns to skill would decline, and with it incentives for education, when a skill-scarce developing country opens up (see Wood and Riddo-Cano, 1999). However, in a multi-dimensional Stolper-Samuelson model approximating reality, endogenous growth with increasing returns to R & D, a skill-bias in tradables, skill shortages, or unlimited supplies of unskilled labour, could all lead to an increase in returns to skill following greater integration (Arbache et al., 2004). Integration can also lead to the diffusion of more efficient education technologies which would further augment the level of skills in the economy (Winters, 2004). Thus the expected effect of openness and trade policy on wage inequality is positive in developing countries where majority of the population is unskilled and uneducated.

The econometric form of the wage inequality model based on openness and trade policy is as follows:

$$\text{THEIL}_{1i} = \sigma_1 + \kappa_1 \text{OPEN}_i + \nu_1 \text{skills65}_i + \varepsilon_{1i} \quad (4)$$

$$\text{THEIL}_{2i} = \sigma_2 + \kappa_2 \text{TP}_i + \nu_2 \text{skills65}_i + \varepsilon_{2i} \quad (5)$$

Where is wage inequality in a country *i* for the decade of 1990s (the latest value available for the Theil index for every country is employed: see appendix 4 for the exact year), is the random error term, captures openness and is the indicator for the trade policy stance in 1980s respectively, and measures initial skill levels proxied by average years of schooling for the population aged 25 in 1965 (see appendix 3 for data details). Note that the skill acquisition parameter refers to a period well before the trade liberalizations episodes post-1980. We will employ a total of 17 measures of openness and 11 measures of trade policy to carry out multiple regression analysis for equations 4 and 5, respectively. The core openness variable is the overall trade share (the ratio of nominal imports plus exports to GDP), which has been extensively used in the literature (see Frankel and Romer, 1999; Acemoglu, Johnson and Robinson,

2001; Alcalá and Ciccone, 2002; Dollar and Kraay, 2002; and Rodrik et al, 2004). Two other measures of openness are trade penetration (*tars*) derived from World Bank's TARS system and overall import penetration (*Impen*) respectively. Following the study by Rose(2002), we have employed 8 different categories of trade penetration and import penetration respectively. However, these variables are an outcome and not policy variables as neither of these measures are direct indicators of trade policy of a country, pointing only towards the level of its participation in international trade. To that end we also employ, unlike in most studies, proxies measuring the trade policy stance. There are indicators of trade restrictiveness acting as measures of trade policy (Edwards, 1998, Greenaway et al, 2001, Rose 2002). Import tariffs as a percentage of imports (*Tariffs*), tariffs on intermediate inputs and capital goods (*Omti*), trade taxes as a ratio of overall trade (*Txtrg*) and total import charges (*Totgvo*), as well as sectoral categories of import charges (manufacturing, agriculture and resources) can all be considered as good proxies of trade restrictiveness and have also been employed in this study. Other measures which capture restrictions in overall trade are non-tariff barriers. We used 4 different categories of non-tariff coverage (*Nontar*), i.e, overall, manufacturing, agriculture and resources respectively, as well as non-tariff barriers on intermediate inputs and capital goods (*Owqi*) as 5 in total broader proxies of non-tariff barriers (see Rose, 2002). Since this data is episodic, our study must of necessity be cross-sectional rather than a panel data analysis.

There could be potential endogeneity problems associated with the dependent variable, wage inequality and the explanatory variable, openness/trade policy. First of all, openness when measured by the trade share of national income is not truly exogenous, but an outcome of other factors. Secondly, the degree of wage inequality between skilled and unskilled workers, or the country's relative factor endowments (Tavares, 1998) may determine a country's trade policy choices. Even under the aegis of structural adjustment policies, decisions regarding openness were gradually taken. It may be that more egalitarian labour abundant nations may choose to open up faster than less equal land (or mineral) abundant nations.

We need to instrument for the openness and trade policy variables' potential endogeneity with wage inequality. The literature establishes the predicted trade share following Frankel and Romer (FR) (1999) from a gravity equation as an appropriate instrument for openness/trade policy (see, Dollar and Kraay, 2002; Rodrik et al, 2004; Acemolgu, Johnson and Robinson, 2001; Hall and Jones, 1999). Furthermore, following Rodrik et al (2004), the distance from the equator has been chosen as the second instrument for openness/trade policy variables because the level of integration of an economy depends upon its location in the world map. Our Instrumental Variable (IV) regression model is a two stage least squares (2SLS) estimate beginning with:

$$OPEN_{1i} = \zeta_1 + \tau_1 FR_i + \psi_1 Disteq_i + \varepsilon_{3i} \quad (6)$$

$$TP_{1i} = \zeta_2 + \tau_2 FR_i + \psi_2 Disteq_i + \varepsilon_{4i} \quad (7)$$

Here stands for predicted trade shares from gravity equations computed by Frankel and Romer (1999), whereas (distance from the equator) is a proxy for geography. In the first stage, equation (6) and equation (7) have been used to generate predicted values of openness and trade policy variables by regressing them on the two instruments. The predicted openness and trade policy variables are then employed in equation (4) and equation (5) respectively, as the second and final stage of the regression analysis.

### 3 RESULTS

Before we carry out the IV analysis, it is informative to look at simple bivariate relations between integration (predicted trade shares and predicted tariff rates) with the Theil index. The first graph in figure 2 shows that increases in trade shares after liberalization leads to higher inequality, and the second graph also suggests that *decreases* in import tariffs exerts a negative and unequal distributional effect on wages. One of the reasons for the decrease in relative wages of unskilled labour, as tariffs fall, is that the heavily protected sectors in many developing countries tend to be industries that employ a high proportion of unskilled workers (Goldberg and Pavcnik, 2004).

Figure 2

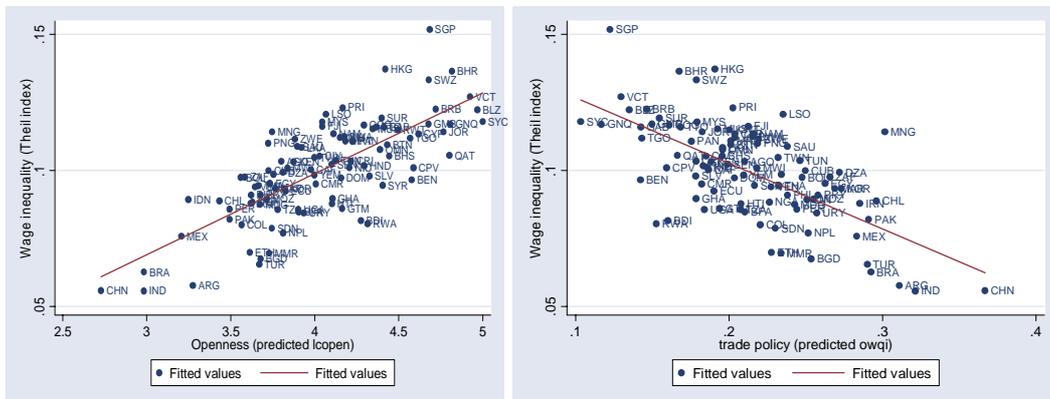


Table 1a and 1b (Appendix 1) gives IV regression results with 58 different specifications. The results confirm the findings of figure 2. All openness and trade policy variables carry expected signs, and nearly all of them are significantly related to wage inequality. It would, therefore, appear that trade liberalization does worsen the distribution of wages between skilled and unskilled labour in developing countries. We have also carried out a robustness test to further check the role of trade in increasing wage inequality by regressing 28 selected proxies of openness and trade policy on the Theil index in equation (4) and equation (5) with 5 more proxies of skilled labour (i.e., *skills60*, *skills70*, *skills75*, *skills80*, *skills85*). We found in all the 145

cases, trade exacerbates inequality; the relationship is significant in 112 cases out of these 145 (table 2, appendix 1).

Furthermore, the results in table 1a and 1b show that initial skill endowments is negatively related to inequality showing that developing countries that are more educated to begin with do well on wage inequality. This is expected, and in line with the theory that countries where the skill endowment is more evenly distributed, are less prone to an adverse wage distributional effect (Fisher, 2001; Tuelings and van Rens, 2002; Eiche, 2001; Bourguignon and Morrisson, 1990; Tilak, 1989).

Figure 3 shows that trade liberalization also augments skills in developing countries. This is true because increased exposure to international trade is followed by technology transfer, which improves the general skill level. This means that part of the human capital stock is endogenous to the processes of openness, as hinted at by many endogenous growth models. Here a *change* in skilled human capital which is endogenous to integration will have its own independent effect on relative wages and inequality. And this effect will be different to that which is attributable to the *level* of human capital endowment/educated population in a country.

**Figure 3**

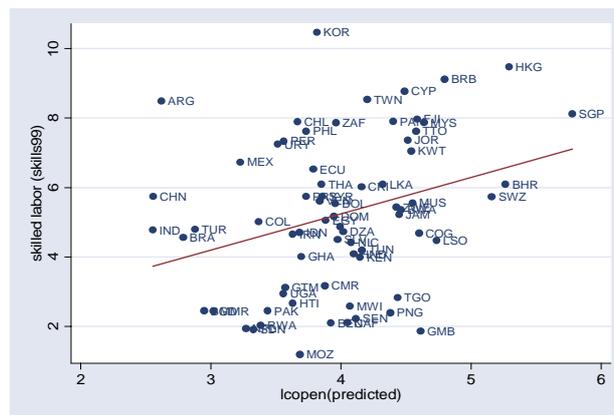


Figure 4 shows two graphs. The first one illustrates a simple relationship between skill levels in 1999 and wage inequality, and suggests that countries with higher stocks of skilled labour will have less inequality. The second graph has a different measure of skills in 1999 (based on predicted values; those skills that are acquired as a consequence of trade), conversely suggests that skill accumulation due to greater global integration raises wage inequality. This suggests that the skills that are directly accrued through the processes of trade, contributes to wage inequality. This is in line with Tinbergen's (1975) arguments, and our earlier discussion regarding the dual role of skilled human capital in the economy.



$$THEIL_{4i} = \lambda_2 + \Omega_2 Interaction(OPEN \times Skills99)_{hyr_i} + \rho_2 Skills65_i + \varepsilon_{6i} \quad (11)$$

$$THEIL_{5i} = \lambda_3 + \Omega_3 Interaction(TP \times Skills99)_i + \rho_3 Skills65_i + \varepsilon_{7i} \quad (12)$$

$$THEIL_{6i} = \lambda_4 + \Omega_4 Interaction(TP \times Skills99)_{hyr_i} + \rho_4 Skills65_i + \varepsilon_{8i} \quad (13)$$

Note that *skills65* represents initial skill endowments in 1965, whereas captures skill accumulation in 1999 - a point in time when earlier trade liberalization has had time to play a role in skill accumulation in developing countries through technology transfer. The interaction terms capture the effect of skills on inequality, while taking into account the extent to which each developing country is integrated with world markets. Average years of schooling is our first proxy for skills. Since there is evidence which suggests unequal investments in higher education are important determinants of increasing inequalities in developing countries (Barro, 1999), we also utilize average years of higher schooling in addition to average years of schooling as the second proxy for skilled labour. This gives us interaction terms based on two categories of skill levels. The interaction term

*Interaction(OPEN × Skills99)* and *Interaction(TP × Skills99)* are based on the first category of skills and represents the general skill level proxied by overall years of schooling in the total population at age 25 for 1999 and the interaction term *Interaction(OPEN × Skills99)<sub>hyr</sub>* and

*Interaction(TP × Skills99)<sub>hyr</sub>* are based on average years of higher schooling in the total population at age 25 for the same year. The later category will give us more specific information about the relationship between inequality and higher education. To investigate integration we employ six definitions of openness: *Lcopen*, *Impen1o*, *Impen2o*, *Tars1o*, *Tars2o* and *Open80* and 5 different proxies of trade policy namely *Tariffs*, *Owti*, *Txtrdg*, *Owqi*, and *Heritage*<sup>1</sup> (see Appendix 3 for detailed variable definitions).

Before obtaining the interaction terms, we have once again instrumented for openness, trade policy and skills in order to resolve the endogeneity problem which might exist between openness/trade policy and skill levels.<sup>2</sup>

$$OPEN_{2i} = \phi_1 + \theta_1 FR_i + \varepsilon_{9i} \quad (14)$$

$$TP_{2i} = \phi_2 + \theta_2 FR_i + \varepsilon_{10i} \quad (15)$$

$$Skills_i = \eta + \tau TLEX_i + \phi PTR_i + \varepsilon_{11i} \quad (16)$$

Note here that we are not exactly running a conventional two stage least square analysis where in the first stage the common instruments enter all the first stage equations. In our case there is no common instrument for openness/trade policy and Skills. For openness and trade policy variables we used the standard instrument namely predicted *FR* trade shares in an attempt to gauge how more liberalized trade policies modify the role of skills in

determining wage inequality (equation 14 and equation 15).<sup>3</sup> The two proxies for skills are instrumented by total public spending on education as a percentage of GDP (*TLEX*) and primary pupil-teacher ratio (*PTR*) in equation (16).

Table 3 (Appendix 1) shows results for our instrumental variables, shedding light on the robustness of instruments we have chosen. The results show that the *FR* instrument works well for openness proxies if we consider the *t* values. However, with the exception of *Lcopen* the coefficients and standard errors for all the openness proxies are large showing that they violate low-power over identification restrictions. In the case of trade policy indicators, though the *t* values are smaller, they are significant in most cases with smaller standard errors and coefficients, indicating the robustness of the *FR* instrument for trade policy proxies. Average years of schooling (*Skills99*) have a positive association with public spending on education (*TLEX*), and a negative relationship with pupil teacher ratio (*PTR*). Both these instrumental variables carry expected signs when related to basic education (*Skills99*), because on the one hand, governments in developing countries have lately been spending resources on primary education in order to improve literacy rates at the behest of donors, and on the other hand, a high pupil-teacher ratio is one of the main causes of school drop-outs.<sup>4</sup> The result for average years of higher schooling (*Skills99hyr*) when related to *PTR* is similar to that for basic education (*Skills99*). However, the relationship between *Skills99hyr* and *TLEX* is insignificant. This is because governments in developing countries either spend on basic education or on tertiary education, putting less emphasis on secondary education.

Table 4a and 4b (Appendix 1) show *Skills65* is negatively related to inequality for 15 out of 22 specifications of equations (10), (11), (12) and (13), confirming our earlier results that countries with a better *initial* school attainment do well apropos inequality. The coefficients for *Skills65* are, however, insignificant in the presence of post-liberalization skill levels that are interacted with openness/ trade policy proxies.

The results in table 4a demonstrate that *Interaction(OPEN × Skills99)* term enters the inequality equation insignificantly, and *Interaction(OPEN × Skills99)<sub>hyr</sub>* enters the inequality equation insignificantly in 4 out of 5 cases, being significant only in the case of *Lcopen*, suggesting limited role played by openness per se in determining wage inequality once we control for openness proxies for skill level. This result supports Dollar and Kraay (2004), who found that openness does not carry any significant effects on inequality. Nevertheless, the significance of *Lcopen* for *Interaction(OPEN × Skills99)<sub>hyr</sub>* implies that greater openness may only benefit those who have a minimum threshold level of skills, such as high school degree/ diploma. Whereas the insignificance of *Interaction(OPEN × Skills99)* suggests that basic education in itself as a target is not enough to contain wage dispersion when the economy begins to trade more with the outside world, perhaps there is a need for a balanced education policy in the South. The provision of the necessary higher/technical education should be done in a way so that it does not compromise the achievement of

primary education (see Boeren and Hotland, 2005). Primary education is the first step towards more skilled labour force, and it is a pro-poor policy as the overwhelming majority of the poor remain uneducated (Mamoon, 2005).

Let us now turn to the analysis of the effect of trade policy measures, leaving aside general openness outcomes. As noted earlier, general openness is an outcome of earlier policies, and it either does not significantly effect wage inequality, or it may even reduce wage disparities if openness is a consequence of policies promoting competitive industrialization. Table 4b shows that the interaction terms for trade policy variables.

*Interaction(Tp × Skills99)* and *Interaction(TP × Skills99)<sub>hyr</sub>* and always enter equation (12) and equation (13) significantly, with a negative sign. The significance of *trade policy* variables in contrast to general *openness* indicators suggests that labour market inequalities are more closely related to trade policies. The negative sign implies that more open trade policies worsen wage inequality. These findings are in line with the results shown in figure 4. The simple interpretation is that skills accrued through processes of liberalization seem to complement trade liberalization in worsening the gap between the haves and have-nots in developing countries. This may be due to a “protection” effect. Generally, developing countries protect unskilled-labour intensive goods prior to liberalization. So after liberalization the producers of unskilled intensive good face increased costs amid more outside competition, and their real wages and living standards decline in the absence of government subsidies.

Another way of looking at the results in table 4b is to consider government revenue effects. Decreasing tariffs may lead to a fall in public revenues, with serious repercussions for development expenditure, especially education spending. In this respect, we could say that there is complementarity between unequal education policies, which result is qualitative and quantitative constraints in the education sector, and a more open trade policy.

The literature suggests that in most developing countries skills are unevenly distributed (Ravallion, 2003). Thomas, Wang and Fan (2000) and Domenech and Castello (2002) find that Gini coefficient of the distribution of human capital in Sub Saharan Africa and South Asia are the highest (most unequal) in the world. Berthelemy (2004) arrives at the same conclusion not only for Sub Saharan Africa and South Asia, but also for Middle East and North Africa (MENA). Another important observation which can be made from table 4b is that the coefficients on *Interaction(TP × Skills99)<sub>hyr</sub>* are higher than the coefficients on *Interaction(TP × Skills99)*. This may indicate that the stock of highly skilled labour in developing countries is closely linked to free market policies in explaining the degree of wage inequality. In other words, either open-door policies, or a bias in educational expenditure in favour of higher education, exacerbates the skilled labour wage premium.

In the developing world, governments focus more attention on higher education compared to primary education. The distribution of public resources on education is highly unequal, as shown in Table 5 based on Chowdhury (1994). The higher education bias widens disparities in incomes among different skill levels, following greater trade liberalization. In many countries a

considerable proportion of public expenditures for education benefits middle and upper-income families, because richer groups are over-represented at all levels of education, particularly at the university level. From Table 5 we can gauge that in African countries, public expenditure per student on higher education is 28 (Francophone Africa) and 50 (Anglophone Africa) times greater than the level on primary education. For developing countries as a whole, only 7 % of the relevant population enrol in higher education.

**Table 5**  
**Public Expenditure per Student as a % of Per Capita GNP by Region**  
**(circa 1980)**

Region	Primary	Secondary	Higher
Anglophone Africa	18	50	920
Francophone Africa	29	143	804
South Asia	8	18	119
East Asian and Pacific	11	20	118
Latin America	9	26	88
Middle East and North Africa	2	28	150
Africa	14	41	370
Developing Countries	22	24	49

Source: Mingat and Tan (1985) cited in Chowdhury (1994).

As shown in Table 6 (appendix 2), the share of public spending on education in Latin America that is allocated to higher education has tended to be high -- more than 20 % on average, compared to 15 % on average in East Asia. Venezuela and South Korea are extreme examples of this phenomenon. While in the early 1990s Venezuela allocated 35 % of its public education budget to higher education, South Korea allocated just 8 % of its budget to post-secondary schooling. Public expenditure on education as a percentage of GNP was actually higher in Venezuela (5.1) than in Korea (4.5). However, after subtracting the share going to higher education, public expenditure available for basic education as a proportion of GNP was considerably higher in Korea (3.6) than in Venezuela (1.3).

Birdsall (1999) summarises the debate on education and inequality with reference to Latin America and East Asia:

By giving priority to expanding the quantity of education and improving quality at the base of the educational pyramid, East Asian governments stimulated the demand for higher education, while relying to a large extent on the private sector to satisfy that demand. In Latin America, government subsidies have disproportionately benefited high-income families whose children are much more likely to attend university. At the same time, low public funding of secondary education has resulted in poorly qualified children from low-income backgrounds being forced into private universities or opting out of the education system at higher levels. (p. 11)

## 4 CONCLUSIONS

In summary, our discussion suggests that the earning inequalities which we witness in developing countries have two important determinants. First there are significant entrenched inequalities in educational attainment. Second, increased international trade transforms these education inequalities into wage inequalities by favouring skilled labour over unskilled labour. In line with previous studies we have found that education may be central to explaining the increasing gap in relative wages between skilled and unskilled workers in developing countries. Though our analysis supports the argument that those countries with a higher initial level of human capital do well on the inequality front, it also suggests that human capital, particularly the part related to higher education, which accrues after trade liberalization has inegalitarian effects. Governments in developing countries tend to invest more in higher education at the cost of primary education in order to seize short-term benefits from globalization.

One reason for this bias in education policies in developing countries towards higher education may lie in the belief that elementary education has a very limited direct role in determining growth rates. According to Barro (1999) the rate of economic growth responds more to secondary or higher education levels rather than elementary schooling. International trade in manufactures and services is considered to be one of the key engines for growth. This often requires college graduates, or those who have at least finished high school. One reason why India and China have become havens for international outsourcing and trade is because they have managed to accumulate relatively educated and skilled human capital by investing in higher education.<sup>5</sup> In the last two years, the United States has lost two million manufacturing jobs to China, India and other third world countries, mainly in the Far East. Consequently, in 2001, the manufacturing sector in the USA had shrunk to just 18% of GNP from 48 % in 1950 and it is expected to recede to just 10 or 11% within the next 10 years.<sup>6</sup> Forrester Research, a market research firm predicts that at least 3.3 million white-collar jobs and \$ 136 billion in wages will shift from the US to low cost countries by 2015, whereas, most of them will find their way to Indian or Chinese centres.<sup>7</sup> Countries in the South that are set to benefit most from globalization are those that have transformed at least a *segment* of their labour force into relatively skill intensive by investing in higher education programmes. So it is no surprise that in order to participate in the race to be competitive, many developing countries have a tendency to invest in higher education at the cost of primary education to achieve greater growth. For example, Pakistan's current education policy is skewed towards higher education. In fiscal year 2003, the government increased its higher education budget to Rs 5 billion from Rs 800 million five years ago - an increase of nearly 400%. In 2004, the government doubled the previous year's expenditure on higher education. The budget for primary education, by contrast, increased by a meagre average of 4% per annum for the last few years. This apparent pro-growth higher education policy of Pakistan at the expense of primary education may very well accelerate growth, but it definitely excludes the poor and unskilled, and will subsequently lead to increased wage and income disparities in the country.

As noted earlier, governments in developing countries tend to focus their education policies on higher education in the anticipation that this investment will yield quick dividends in the current international business environment. Though they are right, they need to realize that promoting higher education at the cost of primary education breeds greater income inequality in the absence of countervailing policies, and is not pro-poor. Consequently, governments need to increase the mean level of human capital through a balanced education policy where primary education is given as much importance as higher education. An equitable education policy will decrease the skilled-unskilled wage premium, as the overall supply of low skilled and uneducated workers goes down and the supply of educated workers increases, as well as give rise to general equilibrium effects that reduce wage inequality. Also such policies are consistent with the millennium development goals (MDGs). We agree with the recent World Development Report (2006) which suggests that wider access to education and jobs could "level the economic playing field" and improve livelihoods.

Our results also have implications for the speed at which trade policies are liberalized. Developing countries require time to adjust to an open regime because of their low skill level stocks; the implication being that better educated nations should liberalize faster. If skill levels were homogenously distributed, free trade would lead to a more equal and pro poor growth. In the immediate time frame, it would be wiser for developing economies to first look for regional trade agreements by following the model of European Union. The rationale for regional trade is that developing countries lie in a heterogenic plain where each country is located at different stages of the technical ladder. To climb the ladder, the more efficient way may lie in increased South-South trade rather than North-South trade in a regional framework as in the case of ASEAN (Association of South East Asian Network). Similar trade agreements would enable developing countries to slowly liberalize their economies, while at the same time enabling their work force to ascend the skill ladder (Mamoon, 2004).

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## NOTES

<sup>1</sup> The Heritage Foundation has created an index of overall "economic freedom", and the index runs from one (a score signifying institutions and policies most conducive to economic freedom) through five (least conducive).

<sup>2</sup> Since we are using skills for year 1999, there is high probability that there are endogeneity problems between skill levels and selected openness/ trade policy variables.

<sup>3</sup> It is useful to note that we also predicted Openness and Trade policy variables by regressing them on both *FR* and *Disteq*. The results did not change for most, but for *Owti* the interaction terms became insignificant; *Owti* represents tariffs on intermediate and capital goods, from the Sachs and Warner (1995) composite measure of openness. The Sachs-Warner criteria defines a country as open if (i) non-tariff barriers cover less than 40 percent of trade, (ii) average tariff rates are less than 40 percent, (iii) the black market premium was less than 20 percent during the 1980s, (iv) the economy is not socialist, and (v) the government does not control major exports through marketing boards. Rodriguez and Rodrik (2000) argue that in many cases the Sachs-Warner measures can be replaced by an Africa dummy. In which case, *Disteq* is not a good instrument for *owti* as well as *Open80*.

<sup>4</sup> See: <http://www.heros-inc.org/star-press-release.pdf> and [http://www.ecs.co.sz/cca/cca\\_5.html](http://www.ecs.co.sz/cca/cca_5.html).

<sup>5</sup> In other export areas such as textiles which use unskilled labour intensively, these countries vast populations dictate that the skilled-unskilled premia will not narrow even if the absolute real wages of the unskilled increases.

<sup>6</sup> <http://www.freenewport.com/us/useconomy.asp>

<sup>7</sup> <http://www.tribuneindia.com/2004/20040223/login/main1.htm>

## APPENDIX 1

**Table 1a**  
**IV Regression Results With Different Specifications<sup>^</sup>**

	1	2		1	2		1	2
lcofen	0.0297	0.039	impen2 m	0.0028	0.0024	tars1r	0.0039	0.0033
skills65	(1.19)	(2.19)**	skills65	2.32**	(2.07)**	skills65	(3.02)*	(2.48)**
F-test	1.42	4.14**	F-test	5.38**	2.94**	F-test	9.11*	4.19**
n	97	63	n	71	51	n	72	51
R <sup>2</sup>	0.03	0.08	R <sup>2</sup>			R <sup>2</sup>		0.21
impen1o	0.0021	0.0016	impen2 a	0.0109	0.009	tars2o	0.00047	0.0008
skills65	(2.4)**	(2.08)**	skills65	(2.23)**	(2.01)**	skills65	(1.62)	(2.07)**
F-test	5.74**	3.02***	F-test	4.97**	2.99***	F-test	2.62	2.98***
n	72	51	n	71	51	n	69	50
R <sup>2</sup>			R <sup>2</sup>			R <sup>2</sup>		
impen1 m	0.0035	0.002	impen2 r	0.0059	0.0038	tars2m	0.0012	0.0017
skills65	(2.46)**	(2.15)**	skills65	(2.28)**	(2.28)**	skills65	(1.67)***	(1.94)***
F-test	6.05**	3.14***	F-test	5.19**	3.55**	F-test	2.8***	2.57***
n	72	51	n	71	51	n	69	50
R <sup>2</sup>			R <sup>2</sup>			R <sup>2</sup>		
impen1a	0.0011	0.0095	tars1o	0.0012	0.0009	tars2a	0.0080	0.0039
skills65	(2.35)**	(2.09)**	skills65	(2.60)*	(2.15)**	skills65	(1.76)***	(1.53)
F-test	5.51**	2.99***	F-test	6.77*	3.17***	F-test	3.10***	1.88
N	72	51	n	72	51	n	69	50
R <sup>2</sup>			R <sup>2</sup>			R <sup>2</sup>		
impen1r	0.0107	0.0090	tars1m	0.0026	0.0018	tars2r	0.0009	0.0024
skills65	(1.98)**	(1.77)***	skills65	(2.23)**	(1.98)***	skills65	(1.34)	(2.32)**
F-test	3.94**	2.14	F-test	4.96**	2.7***	F-test	1.80	3.67**
n	72	51	n	72	51	n	69	50
R <sup>2</sup>			R <sup>2</sup>			R <sup>2</sup>		0.09
impen2o	0.0016	0.0012	tars1a	0.0051	0.0045	tariffs	-0.024	-0.0072
skills65	(2.37)**	(2.17)**	skills65	(2.09)**	(1.54)	skills65	(0.66)	(-1.36)
F-test	5.61**	3.23**	F-test	4.37**	1.95	F-test	0.44	2.20
n	71	51	n	72	51	n	64	48
R <sup>2</sup>			R <sup>2</sup>			R <sup>2</sup>		

\*, \*\*and \*\*\* denote significance at 1%, 5% and 10% level.

<sup>^</sup> For variable descriptions please refer to appendix 3.

**Table 1 b**  
**IV Regression Results With Different Specifications<sup>^</sup>**

	1	2		1	2
owti	-0.298 (-2.03)**	-0.254 (-1.87)***	owqi	-0.4228 (-1.29)	-0.02975 (-1.00)
skills65		-0.0132 (-1.48)	skills65		-0.016 (-1.29)
F-test	4.11**	2.42	F-test	4.59**	0.93
n	70	51	n	69	51
$R^2$			$R^2$		
totgvo	-0.0028 (-2.66)*	-0.0017 (-2.02)**	nontaro	-0.0022 (-2.20)**	-0.0018 (-1.77)***
skills65		-0.0111 (-1.28)	skills65		-0.0210 (-1.76)***
F-test	7.06*	2.51***	F-test	4.85**	1.96
n	69	49	n	69	49
$R^2$			$R^2$		
totgvm	-0.0026 (-2.65)*	-0.0015 (2.01)**	nontarm	-0.0022 (-2.10)**	-0.0019 (-1.70)***
skills65		-0.0118 (-1.34)	skills65		-0.022 (-1.73)***
F-test	7.02*	2.50***	F-test	4.85**	1.80
n	69	49	n	69	49
$R^2$			$R^2$		
totgva	-0.0027 (-2.75)*	-0.0018 (-2.10)**	nontara	-0.0026 (-1.97)**	-0.0027 (-1.52)
skills65		-0.071 (-1.29)	skills65		-0.0329 (-1.66)***
F-test	7.58*	2.70***	F-test	3.87**	1.49
n	69	49	n	69	49
$R^2$			$R^2$		
totgvr	-0.0049 (2.14)**	-0.0026 (-1.78)***	nontarr	-0.0016 (-2.42)**	-0.0009 (-1.81)***
skills65		-0.0045 (-0.46)	skills65		-0.009 (-1.13)
F-test	4.59**	1.97	F-test	5.87**	2.11
n	69	49	n	69	49
$R^2$	-	-	$R^2$		

\*, \*\*and \*\*\* denote significance at 1%, 5% and 10% level.

<sup>^</sup> For variable descriptions please refer to appendix 3.

**Table 2**  
**Inequality Trade Nexus**

Openness/ Trade Policy	(dependent variable) Theil Index (T)					
	$T_{skills60}$	$T_{skills65}$	$T_{skills70}$	$T_{skills75}$	$T_{skills80}$	$T_{skills85}$
<i>lcopen</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>impen1o</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>impen1m</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>impen1a</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>impen1r</i>	Significant	Significant	x	Significant	Significant	Significant
<i>impen2o</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>impen2m</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>impen2a</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>impen2r</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>tars1o</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>tars1m</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>tars1a</i>	x	x	x	x	x	Significant
<i>tars1r</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>tars2o</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>tars2m</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>tars2a</i>	x	x	x	x	x	x
<i>tars2r</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>tariffs</i>	x	x	x	x	x	x
<i>owti</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>txtrg</i>	x	x	x	x	x	x
<i>totgvo</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>totgvm</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>totgva</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>totgvr</i>	Significant	Significant	Significant	Significant	Significant	Significant
<i>owqi</i>	x	x	x	x	x	x
<i>nontaro</i>	Significant	Significant	x	Significant	Significant	Significant
<i>nontarm</i>	Significant	Significant	x	Significant	Significant	x
<i>nontara</i>	x	x	x	x	x	x
<i>nontarr</i>	Significant	Significant	Significant	Significant	Significant	Significant

- significant at 1%, 5% and 10% level.

Note: The skills, which range from 1960 to 1985, represent the base line skills or initial factor endowments and thus are assumed to be exogenous in our wage inequality equation (eq.3). Here, the openness and trade policy variables are the only ones which are instrumented for on FR trade shares and Disteq.

**Table 3**  
**Regression Results for Instrumental Variables**

Instruments	Independent Variables												
	lcopen	Impen1o	Impen2o	Tars1o	Tars2o	Open80	Tariffs	Owti	Txtrdg	Owqi	Heritage	Skills99	Skills99(HYR) <sup>a</sup>
Logfrankrom	0.524 (13.41)*	16.70 (7.85)*	19.38 (7.73)*	28.65 (7.53)*	41.58 (3.90)*	0.213 (2.97)*	-1.025 (-0.90)	-0.068 (-3.47)*	0.0037 0.63	-0.056 (-1.77)***	-0.363 (-2.15)**		
TLEX												0.22 (1.59)***	-0.0001 (-0.01)
PTR												-0.140 (-8.32)*	-0.012 (-6.34)*
N	147	95	94	95	92	60	97	97	54	95	94	64	64
F	179.1*	61.5*	59.6*	56.7*	15.2*	8.80*	0.81	12.04*	0.40	3.13***	4.64*	51.8*	24.9
R <sup>2</sup>	0.55	0.40	0.40	0.37	0.14	0.13	0.0084	0.11	0.0077	0.03	0.04	0.63	0.44

\*, \*\*and \*\*\* denote significance at 1%, 5% and 10% level.

<sup>a</sup> Higher Education

**Table 4a**  
**Interaction Terms for Openness Variables**

Independent Variables	Dependent Variable: Theil Index											
	Specifications for ( <i>Skill</i> <sub>99</sub> )						Specifications for ( <i>HigherEducationSkill</i> <sub>99</sub> )					
	1	2	3	4	5	6	1	2	3	4	5	6
Interaction(Lcopen x Skill99)	-0.0023 (-1.53)											
Interaction(Lcopen x Higher EducationSkill99)							-0.041 (-2.14)**					
Interaction(Impen1o x Skill99)		0.00002 (0.17)										
Interaction(Impen1o x Higher EducationSkill99)								-0.0007 (-0.40)				
Interaction(Impen2o x Skill99)			0.00003 (0.31)									
Interaction(Impen2o x Higher EducationSkill99)										-0.0004 (-0.23)		
Interaction(Tars1o x Skill99)				0.0006 (0.09)								
Interaction(Tars1o x Higher EducationSkill99)											-0.0005 (-0.56)	
Interaction(Tars2o x Skill99)					0.00002 (0.34)							
Interaction(Tars2o x Higher EducationSkill99)												-0.0001 (-0.17)
Interaction(Open80 x Skill99)						0.001 (0.12)						
Interaction(Open80 x Higher EducationSkill99)												-0.07 (-0.42)
Skills65	-0.0009 (-0.12)	-0.0092 (-1.21)	-0.0088 (-1.21)	-0.009 (-1.17)	-0.0096 (-1.29)	-0.0091 (-1.19)	0.001 (0.23)	-0.0071 (-0.90)	-0.007 (-0.92)	-0.0006 (-0.84)	-0.008 (-1.04)	-0.006 (-0.86)
N	38	38	38	38	38	38	38	38	38	38	38	38
F	2.01*	0.80	0.47	0.79	0.84	0.79	3.18**	0.87	0.02	0.92	0.80	0.90
R <sup>2</sup>	0.10	0.04	0.04	0.04	0.04	0.04	0.15	0.04	0.04	0.04	0.04	0.04

\*, \*\*and \*\*\* denote significance at 1%, 5% and 10% level.

**Table 4b**  
**Interaction Terms for Trade Policy Variables**

Independent Variables	Dependent Variable: Theil Index									
	Specifications for ( <i>Skills</i> <sub>99</sub> )					Specifications for ( <i>HigherEducationSkills</i> <sub>99</sub> )				
	1	2	3	4	5	1	2	3	4	5
Interaction(Tariffs × Skill99)	-0.0013 (-2.66)*									
Interaction(Tariffs × Higher EducationSkill99)						-0.017 (-2.87)*				
Interaction(Owti × Skill99)		-0.0619 (-2.65)*								
Interaction(Owti × Higher EducationSkill99)							-0.9076 (-2.89)*			
Interaction(Txtrdg × Skill99)			-0.306 (-1.66)***							
Interaction(Txtrdg × Higher EducationSkill99)								-5.105 (-2.24)**		
Interaction(Owqix Skill99)				-0.006 (-2.76)*						
Interaction(Owqi × Higher EducationSkill99)									-0.952 (-2.96)*	
Interaction(Heritage × Skill99)					-0.004 (-2.70)*					
Interaction(Heritage × Higher EducationSkill99)										-0.056 (2.90)*
Skills65	0.0034 (0.007)	-0.0016 (-0.25)	-0.002 (-0.03)	-0.0001 (-0.02)	0.003 (0.44)	0.0037 (0.50)	-0.0001 (-0.02)	0.002 (0.29)	0.0011 (0.16)	0.0037 (0.49)
N	38	38	38	38	38	38	38	38	38	38
F	4.49*	4.46*	2.23**	4.76*	4.59*	5.10*	5.15*	3.40*	5.36*	5.16*
R <sup>2</sup>	0.20	0.20	0.11	0.21	0.21	0.22	0.22	0.16	0.23	0.22

\*, \*\*and \*\*\* denote significance at 1%, 5% and 10% level.

## APPENDIX 2

**Table 6**  
**Budget Allocated to Higher Education, 1990-94**

<b>EAST ASIA</b>	<b>%age of Overall Education Budget</b>
Malaysia	17
Thailand	17
Indonesia	18
Korea, Rep.	8
<b>Average (simple)</b>	<b>15</b>
<b>LATIN AMERICA</b>	
Argentina	17
Brazil	26
Chile	20
Colombia	17
Costa Rica	31
Dominican Republic	11
Ecuador	23
Honduras	20
Mexico	14
Uruguay	25
Venezuela	35
<b>Average (simple)</b>	<b>22</b>

Source: UNDP (1997) citing BIRDSALL, Nancy, "Education: the People's Asset", CSED Working Paper No. 5, 1999

## APPENDIX 3

### Data and sources

**Black:** Black Market Premium, Year: 1985. Source: Rose (2002).

**Disteq:** Distance from Equator of capital city measured as  $\text{abs}(\text{Latitude})/90$ . Source: Rodrik, Subramanian & Trebbi (2002)

**Heritage:** Heritage Foundation Index, Source: Rose (2002).

**Skills60:** Average Schooling Years in the total population at 25, Year: 1960. Source: Barro R & J. W. Lee data set, <http://post.economics.harvard.edu/faculty/barro/data.html>

**Skills65:** Average Schooling Years in the total population at 25, Year: 1965. Source: Barro R & J. W. Lee data set, <http://post.economics.harvard.edu/faculty/barro/data.html>

**Skills70:** Average Schooling Years in the total population at 25, Year: 1970. Source: Barro R & J. W. Lee data set, <http://post.economics.harvard.edu/faculty/barro/data.html>

**Skills75:** Average Schooling Years in the total population at 25, Year: 1975. Source: Barro R & J. W. Lee data set, <http://post.economics.harvard.edu/faculty/barro/data.html>

**Skills80:** Average Schooling Years in the total population at 25, Year: 1980. Source: Barro R & J. W. Lee data set, <http://post.economics.harvard.edu/faculty/barro/data.html>

**Skills85:** Average Schooling Years in the total population at 25, Year: 1985. Source: Barro R & J. W. Lee data set, <http://post.economics.harvard.edu/faculty/barro/data.html>

**Skills90:** Average Schooling Years in the total population at 25, Year: 1990. Source: Barro R & J. W. Lee data set, <http://post.economics.harvard.edu/faculty/barro/data.html>

**Skills95:** Average Schooling Years in the total population at 25, Year: 1995. Source: Barro R & J. W. Lee data set, <http://post.economics.harvard.edu/faculty/barro/data.html>

**Skills99:** Average Schooling Years in the total population at 25, Year: 1999. Source: Barro R & J. W. Lee data set, <http://post.economics.harvard.edu/faculty/barro/data.html>

**Skills99hr:** Average Years of Higher Schooling in the Total Population at 25, Year: 1999. Source: Barro R & J. W. Lee data set, <http://post.economics.harvard.edu/faculty/barro/data.html>

**Impen1o:** Import Penetration: overall, 1985. Source: Rose (2002).

**Impen1m:** Import penetration: Manufacturing, 1985. Source: Rose (2002).

**Impen1a:** Import Penetration: Agriculture, 1985. Source: Rose (2002).

**Impen1r:** Import Penetration: Resources, 1985. Source: Rose (2002).

**Impen2o:** Import Penetration: overall, 1982. Source: Rose (2002).

**Impen2m:** Import penetration: Manufacturing, 1982. Source: Rose (2002).

**Impen2a:** Import Penetration: Agriculture, 1982. Source: Rose (2002).

**Impen2r:** Import Penetration: Resources, 1982. Source: Rose (2002).

**Lcopen:** Natural logarithm of openness. Openness is given by the ratio of (nominal imports plus exports to GDP (in nominal US dollars), Year: 1985. Source: Penn World Tables, Mark 6.

**Logfrankrom:** Natural logarithm of predicted trade shares computed following Frankel and Romer (1999) from a bilateral trade equation with 'pure geography' variables. Source: Frankel and Romer (1999).

**Nontaro:** Non- Taiff Barriers Coverage: Overall, 1987. Source: Rose (2002).

**Nontarm:** Non- Taiff Barriers Coverage: manufacturing, 1987. Source: Rose (2002).

**Nontara:** Non- Taiff Barriers Coverage: agriculture, 1987. Source: Rose (2002).

**Nontarr:** Non- Taiff Barriers Coverage: resources, 1987. Source: Rose (2002).

**Open80:** Sachs and Warners (1995) composite openness index. Source: Rose (2002).

**Owqi:** Non Trade barriers Frequency on intermediate inputs, Capital goods, 1985. Source: Rose (2002).

**Owti:** Tariffs on Intermediate and Capital Goods, 1985. Source: Rose (2002)

**Ptr:** Pupil Teacher Ratio, Primary, Year: 1999, Source: WDI (2002)

**Tars1o:** TARS Trade Penetration: overall, 1985. Source: Rose (2002).

**Tars1m:** TARS Trade Penetration: manufacturing, 1985. Source: Rose (2002).

**Tars1a:** TARS Trade Penetration: agriculture, 1985. Source: Rose (2002).

**Tars1r:** TARS Trade Penetration: resources, 1985. Source: Rose (2002).

**Tars2o:** TARS Trade Penetration: overall, 1982. Source: Rose (2002).

**Tars2m:** TARS Trade Penetration: manufacturing, 1982. Source: Rose (2002).

**Tars2a:** TARS Trade Penetration: agriculture, 1982. Rose (2002).

**Tars2r:** TARS Trade Penetration: resources, 1982. Rose (2002).

**Tariffs:** Import Duties as %age imports, Year:1985. Source: World Development Indicators (WDI), 2002.

**Theil97:** UTIP-UNIDO Wage Inequality THEIL Measure - calculated based on UNIDO2001 by UTIP, Year: 1997. Source: University of Texas Inequality Project (UTIP) <http://utip.gov.utexas.edu>.

**Tlex:** Public Spending on Education, Total (as a percentage of GDP), Year: 1999, Source: WDI (2002)

**Totgvo:** Weighted Average of Total Import Charges: overall, 1985. Source: Rose (2002)

**Totgvm:** Weighted Average of Total Import Charges: manufacturing, 1985. Source: Rose (2002)

**Totgva:** Weighted Average of Total Import Charges: agriculture, 1985. Source: Rose (2002)

**Totgvr:** Weighted Average of Total Import Charges: resources, 1985. Source: Rose (2002)

**Txtrg:** Trade taxes / trade, 1982. Source: rose (2002)

## APPENDIX 4

### List of Countries for Theil Index

Afghanistan (1988)	El Salvador (1997)	Malaysia (1997)	Somalia (1986)
Algeria (1997)	Equatorial Guinea (1990)	Mauritania (1978)	South Africa (1997)
Angola (1993)	Eritrea (1988)	Mauritius (1997)	Sri Lanka (1994)
Argentina (1996)	Ethiopia (1997)	Mexico (1997)	St. Vincent and the Grenadines (1994)
Bahamas, The (1990)	Fiji (1997)	Moldova (1994)	Sudan (1972)
Bahrain (1992)	Gabon (1994)	Mongolia (1994)	Suriname (1993)
Bangladesh (1990)	Gambia, The (1981)	Morocco (1997)	Swaziland ((1994)
Barbados (1997)	Ghana (1995)	Mozambique (1994)	Syria (1997)
Belize (1992)	Guatemala (1997)	Myanmar (1997)	Togo (1981)
Benin (1981)	Haiti (1988)	Namibia (1994)	Thailand (1994)
Bhutan (1989)	Honduras (1994)	Nepal (1996)	Tonga (1994)
Bolivia (1997)	Hong Kong, China (1997)	Nicaragua (1985)	Trinidad and Tobago (1994)
Botswana (1997)	India (1997)	Nigeria (1994)	Tunisia (1997)
Brazil (1994)	Indonesia (1997)	Oman (1997)	Turkey (1997)
Burkina Faso (1981)	Iran, Islamic Rep (1993)	Pakistan (1996)	Taiwan (1997)
Burundi (1990)	Iraq (1985)	Panama (1997)	Tanzania (1990)
Cameroon (1997)	Jamaica (1990)	Papua New Guinea (1989)	Uganda(1988)
Cape Verde (1993)	Jordan (1997)	Paraguay (1991)	United Arab Emirates (1985)
Central African Republic (1993)	Kenya (1997)	Peru (1994)	Uruguay (1997)
Chile (1997)	Korea, Rep. (1997)	Philippines (1997)	Venezuela (1994)
China (1985) Colombia (1997)	Kuwait (1997)	Puerto Rico (1997)	Western Samoa (1972)
Congo, Rep. (1988) Costa Rica	Lesotho (1994)	Qatar (1994)	Yemen (1986)
(1997) Cote d'Ivoire (1997) Cuba	Liberia (1985)	Rwanda (1985)	Zambia (1994)
(1988) Cyprus (1997)	Libya (1980)	Saudi Arabia (1989)	Zimbabwe (1997)
Dominican Republic (1985)	Macao, China (1997)	Senegal (1997)	
Ecuador (1997)	Madagascar (1988)	Seychelles (1988)	
Egypt (1997)	Malawi (1997)	Singapore (1997)	