Trade and Wage Inequality in Developing Countries: South-South Trade Matters

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CHAPTER 3: TRADE AND WAGE INEQUALITY IN DEVELOPING COUNTRIES: SOUTH-SOUTH TRADE MATTERS

Abstract

The relationship between trade liberalization and inequality has received considerable attention in recent years. The first purpose of this paper is to present new results on the sources of wage inequalities in manufacturing taking into account South-South (S-S) trade. Globalization not only leads to increasing North-South (N-S) trade, but the direction and composition of trade has also changed. More trade is carried out between developing countries. We observe that increasing wage inequality is associated more to the South-South trade liberalization than to the classical trade liberalization with northern countries. A part of this increasing wage inequality due to S-S trade comes from the development of N-S trade relationship in S-S trade which increases wage inequality in middle income developing countries. The second purpose is to elucidate the link between the direction of trade and technological change. We explore the fact that S-S trade leads more to a technological change biased toward skill intensive sector. This increases wage inequality for all developing countries. This indirect effect is more important in low income countries.

JEL classification: F1, J3, O3

Keywords: International Trade, Wage Inequality, Skill-biased technical change

1 Introduction

The relationship between trade liberalization and inequality has received considerable attention in recent years. Integration with world markets bears the promise of prosperity in developing countries. Concerning inequality the predictions by economists would be that lower tariffs and transportation costs should push each country to specialize in the production of the goods for which it has a comparative advantage. Since unskilled labor is the abundant factor in the developing world and skilled labor the abundant factor in the developed world, globalization should therefore be associated with an increase in the relative demand for unskilled labor in poor countries, thereby resulting in a reduction in wage inequality. However, empirical evidence does not support this expected result. Studies on income distribution do not find clear cut results and studies on wages find mainly an increasing wage inequality during trade liberalization (often in Latin American countries). Faced with this unexpected result several studies provide explanations concerning wage inequalities during trade liberalization (Goldberg and Pavnick 2004). The main explanation used is the skilled-biased technological change incorporated in trade liberalization which favors the wage of skilled workers in North and South countries.

In this paper, I propose another explanation: the direction of trade. A developing country might trade with another developing country. Hence the impact on wage inequality in this case may not correspond to the classical Stolper-Samuelson result. Then, taking into account South-South (S-S) trade, we come back to the effect of skill-biased technological change in considering a sector-biased technological change rather than a factor-biased technological change.

Pursuing this reasoning, globalization not only leads to increasing North-South (N-S) trade, but the direction and composition of trade has also changed. More trade is carried out between developing countries, and more developing countries are now exporting manufactures. Indeed South-South trade now accounts for around two fifths of all developing country merchandise trade and around 12 per cent of global merchandise trade. Trade liberalization has underpinned this development, with average tariff levels around one-third of their 1983 levels. As developing country markets become more important for other developing countries, and future trade liberalization will mainly concern South-South trade[1], we need to examine closely their trade policies and their impact on inequality[2].

First, in accounting for heterogeneity in the South we might discover that upper middle income countries are the "Northern" countries among developing countries and this South-South trade will increase wage inequality in those middle-income countries. In this case, effects are only a transposition of classical North-South trade theory.

Second, trade liberalization with Northern or Southern countries could also bring inequality among workers if those who have the skills needed to adjust to the new technologies benefited from increased economic integration while the others were left behind. Here the question is how to link trade liberalization, technological change and wage inequality. Several studies link them, using skill-biased technological change. However, Haskel and Slaughter (2002) showed recently that,

[1] It is notable that around 70 per cent of tariffs faced by developing countries are levied by other developing countries.

[2] Here we restrict globalization to trade liberalization, outsourcing, immigration and capital account openness, as they affect trade flows in goods. A measure which could do a distinction between trade liberalization with a northern partner and trade liberalization with a southern partner does not exist (the tariffs by partner's country are available on TRAINS since 1989). So we mainly use a ratio of trade flows on output.

concerning the USA and UK, it was the sector-biased technological change and not the skill-biased technological change which matters to explain wage inequality. Taking this perspective, we explore if S-S trade increases more TFP in skill-intensive sectors than in unskill-intensive sectors comparatively to N-S trade.

Concerning inequality we only focus on wage inequality which is closest to the predictions of Stolper-Samuelson. Most previous studies on wage inequality concerned only country case studies (mainly Latin American countries) because of the lack of comparable wage data across countries. However developing countries are heterogeneous and it is difficult to obtain global results from country case studies. Studies on panels of developing countries used Gini coefficients which measure inequality in income and so include the revenue from capital and natural resources. Recently we have had access to a homogeneous dataset on inter industry wage inequality. So here we deal with wage inequality across industries and not between workers as usual in the literature on wage inequality.

More precisely, the primary purpose of this paper is to present new results on the sources of wage inequalities in manufacturing taking into account South-South trade. We use two trade ratios, the first one measures trade liberalization with developed countries and the second one measures trade liberalization with developing countries[3]. In including them successively and together in an estimation of wage inequality, we observe increasing wage inequality is more due to the South-South trade liberalization than to the classical trade liberalization with northern countries. In clustering our sample of developing countries according to

[3] In addition we replicate this test in using two indexes of trade policy openness for developing countries obtained from a gravity model of bilateral trade data.

their income we can observe if this effect is more important in middle income countries since in S-S trade the comparative advantage of middle-income countries shifted to goods of intermediate skill intensity.

The second purpose is to elucidate the link between the direction of trade and technological change, arguing that it might explain why we obtain different results for South-South trade and North-South trade on wage inequality. Studies that link trade liberalization and technological change assume that increasing imports of machines have increased wage inequality in developing countries by introducing skill-biased technological change (SBTC). Effectively using these machines requires skilled workers and increases the relative demand for skilled workers**.** Moreover it could increase the productivity and the remuneration of those skilled workers. However, Haskel and Slaughter (2002) demonstrate that in many cases it is the sector bias of SBTC that determines SBTC' effect on relative factor prices, not its factor bias. Rising (falling) skill premia are caused by SBTC that is concentrated in skill-intensive (unskill-intensive) sectors. Hence we observe if in developing countries, S-S trade increases more TFP in skill-intensive sectors than in unskill-intensive sectors comparatively to N-S trade. This could explain why S-S trade increases wage inequality in all developing countries and not only in middle income countries.

To anticipate our results, we observe first that increasing share of S-S trade increases wage inequality for all developing countries. Second a part of this increasing wage inequality due to S-S trade comes from the development of N-S trade relationship in S-S trade which increases wage inequality in middle income developing countries. Third, the fact that S-S trade leads more to a technological change biased toward skill intensive sector increase wage inequality for all developing countries. Fourth, this indirect effect is more important in low income countries.

The remainder of the chapter is organized as follows. Section 2 presents a literature review on trade liberalization and wage inequality in developing countries. Section 3 presents our approach for this paper. Section 4 presents the descriptive statistics on all aspects of S-S trade and N-S trade in our database which concerns 68 developing countries for 1976-2000 for 27 manufacturing industries and which is based on Nicita and Olareagga (2006). Section 5 presents the results concerning our assumption on the impact of S-S trade and N-S trade on wage inequalities with an OLS estimator and some robustness check. Section 6 presents the results with a GMM system estimator. Section 7 concludes.

2 Review of the Empirical Literature

2.1 Basic Stopler-Samuelson Theory

The crucial feature of the "standard" theory (i.e. factor endowment based theory) on the determinants of wage inequality is the correspondence between product prices and factor prices. This implies that an increase in the relative price of a good results in an increase in the relative return of the factor used intensively to produce that good. An extension to the above analysis considers capital, skilled and unskilled labour as the relevant factors of production. Hence if unskilled labor is the abundant factor in the South, the prediction of the theory is that the returns to unskilled labour should increase following trade liberalisation.

2.2 Evidence for Developing Countries

The experience of the East Asian newly-industrialised economies was a reduction in wage inequality after openness was introduced in the 1960s and 1970s. This was therefore consistent with "standard" trade theory

which predicts that trade liberalisation should benefit the locally abundant factor (Wood, 1994, 1997). However, the generality of this optimistic outcome has been challenged by a number of studies for countries that opened up to trade more recently, mostly for Latin America (see summary of results in tables 1a and 1b).

Robbins (1996), for example, examines the changes in the structure of wages after trade liberalisation in Chile and finds that, although the content of skilled labour in imports exceeds the content in exports, the returns to skilled labour grew following liberalisation. Cragg and Epelbaum (1996) find that the increase in the returns to education in Mexico contributed to the rise of relative wages of skilled workers and that this effect is highest in traded sectors. Feenstra and Hanson (1997) show that the American 'maquiladoras' in the north of Mexico caused a significant increase in the relative demand for skilled workers in the border region with the US. Robbins and Gindling (1999) investigate the changes in relative wages and in the supply and demand for skilled labour in Costa Rica before and after trade liberalisation. They find that the skill premium rose after liberalisation as a result of changes in the structure of labour demand. Beyer and al. (1999) use a time series approach and find a long-term correlation between openness and wage inequality in Chile. Hanson and Harrison (1999) examine the changes in both wages and employment of skilled and unskilled workers after trade liberalisation in Mexico. They find little variation in employment levels, but a significant increase in skilled workers' relative wages. They also show that foreign companies and those heavily involved in export markets pay higher wages to skilled labour. Finally, for Brazil, Green and al. (2001) find an increase in the returns to college education following trade liberalisation. However, contrary to studies for other developing countries, there was no apparent change in overall wage inequality. Recently, Galiani and Sanguinetti (2003) find that

import penetration explains a small part of wage premium in Argentina and Milanovic and Squire (2005) find that decreasing tariffs increase inequality both in inter industry wages and inter occupation wages in developing countries.

Thus, the evidence on trade liberalisations which have been implemented in the last two decades (mainly, but not exclusively, for Latin America), suggests a positive relationship between trade liberalisation and wage inequality. This finding is clearly contrary to the predictions of the traditional theory of international trade.

2.3 Heterogeneity among developing countries

First authors have accounted for heterogeneity among developing countries in human capital, arguing that some developing countries did not present a comparative advantage in unskilled labor. Thus, to explain the difference of liberalization in wage inequality between Latin American and Asian countries, Wood (1997) suggests that the timing of trade policy reform is important by making this point: when Latin American countries liberalized, they were no longer unskilled labor abundant, because India and China had already accessed international markets. Thus contrary to East Asian countries which liberalized earlier, at a time when they were unskilled labor abundant, Latin American countries were not relatively abundant in unskilled labor.

In the same vein, Davis (1996) presents a model in which the central hypothesis is that the availability of a country's factors of production should be assessed in relation to a group of countries with similar endowments, rather than in relation to the wider international economy. Thus, the availability of factors should be considered from a relative, and

not from an absolute, perspective. What matters in the model is the relative position of the country amongst other countries within its own cone of diversification. Each cone comprises countries with similar, though not identical, factor endowments. This gives each country a different comparative advantage inside its cone, leading to a specialisation of production. In this framework, trade liberalisation can raise the demand for skilled labour in a developing country as long as among the countries of its cone, it has a relatively high supply of skilled labor.

Several studies on wage in Latin America (Harrison and Hanson 1999) find that unskilled-labor intensive sectors were protected with the highest tariffs prior to trade reform. So those industries experienced the largest tariff reductions during trade reform. This puzzling fact shows that "the increase in the skill premium" is exactly what Stopler-Samuelson predicts: since trade liberalization was concentrated in unskilled-labor intensive sectors, and so the economy-wide return to unskilled labor should decrease.

2.4 Shifting industries from North to South

Second, trade liberalization benefits the unskilled-labor intensive industry in developing countries but leads also to the shift of industry activities intensive in unskilled labour from North to the South which could increase inequalities (notably through FDI). Two effects could increase relatively demand for skilled labor in developing countries during trade liberalization: the industry effect and the occupation effect.

The industry effect deals with the shift of skill-intensive intermediate goods production from developed to developing countries. The idea is that the flow of FDI changes the structure of production and increases the stock of capital of developing countries. Feenstra and Hanson

(1996) develop a model which assumes the production of a simple final good that requires a *continuum* of intermediate goods with varying proportions of skilled and unskilled labor. The model suggests that the stages of production which demand less skilled labour (by the measure of the advanced country) will be transferred to the less developed countries where unskilled labor is relatively cheaper. However, the kind of labor that is actually demanded is skilled when judged from the perspective of the developing countries.

The occupation effect deals with the fact that the rapid pace of change in the economy increased the demand for individuals that could enact change: managers and professionals, whatever the industry. Cragg and Epelbaum's work (1996) on Mexico reports that the occupation effect seems more relevant than the industry effect to explain wage inequality.

2.5 Skill-biased technological change

Thirdly, the main alternative explanation to demand shifts is the inclusion of technological change which complicates seriously the prediction. The inclusion of differences in technology in the wage literature deals with biased technological change. An additional effect of trade liberalisation is a rapid inflow of foreign technology as a result of both FDI and increased imports. As different recent models show, a skill-biased technological change can be indirectly and partly induced by trade policy [see for example, Thoenig & Verdier (2003), Acemoglu (2003) or Aghion et al. (2003)].

A large part of the literature argues that trade liberalization can increase wage inequalities via the import of machines. Authors argue that those imports increase the demand for skilled labor to use with these machines and improve the productivity of skilled worker as it includes a

skill-biased technical change (Harrison Hanson 1999, Gindling Robbins 2001, Attanasio and al. 2004).

Harrison and Hanson (1999) find that the trade reform did play a part but that other factors including foreign direct investment, export orientation, and technological change were also important. Beyer, Rojas and Vergara (1999) find a similar effect of trade reform on wage-inequality in Chile because skill-intensive, resource based industries expanded following liberalization. Arbache, Dickerson and Green (2001) find that following the extensive trade liberalization in Brazil in the 1990s, average wage in the traded sector fell compared to the non-traded sector (even after adjusting for education, experience etc.), and that the only category that was spared a decline were the highly educated because the returns to education went up. They argue that these results are consistent with the erosion of rents in the traded sector in the wake of opening up, and complementarity between new technologies brought in by globalization and skilled labor.

2.6 Industry wage premiums

Fourth, while most work has focused on potential explanations for the increasing inequality between skilled and unskilled workers, the skill premium alone cannot fully explain the increase in inequality in developing countries. Several studies consider industry wage premiums as an alternative channel through which trade liberalization may have contributed to wage inequality. Industry wage premiums refer to the part of worker wages that cannot be explained by observable worker characteristics such as gender, age, education, experience, etc., but can be attributed to workers' industry affiliation.

Trade-liberalization induced changes in industry wage premiums could contribute to increases in the wage inequality between skilled and

unskilled workers. If trade liberalization leads to declines in industry wage premiums, wage inequality between skilled and unskilled workers could increase if the industries with the largest tariff cuts are the ones employing a higher share of unskilled workers and if these industries had the lowest wage premiums prior to the reform.

Here evidence on how responsive industry wage premiums are to trade reforms is mixed. Some studies find no association between tariffs and industry wage premiums (Feliciano (2001) for Mexico, Pavcnik, Blom, Goldberg, and Schady (2004) for Brazil), while others find a positive association between tariff declines and industry wage premiums (Goldberg and Pavcnik (2004) for Colombia). Feliciano (2001) reports a positive association between declines in import licenses and industry wage premiums. Thus, in Colombia and Mexico, trade liberalization might have lead to increased wage inequality through the industry wage premium channel, especially since tariff cuts in these countries were the largest in unskilled-labor intensive industries and the sectors with the largest tariff cuts had the lowest wage premiums prior to the reform (Attanasio, Goldberg and Pavcnik (2004)).

2.7 Cross-countries studies

Notwithstanding the studies reviewed above, there remain important questions as to how far the conjecture that trade liberalisation may enhance skill demands can be generalised to all developing countries. Reconciling these results is difficult because they cover different countries and time periods (and could therefore be reflecting different relationships) and because they use different specifications and variable definitions. What is perhaps more disconcerting is the fact that the design of the surveys from developing countries often changes from year to year, making comparisons

across years difficult. One conclusion that emerges is that we should use cross-countries studies in order to use an homogeneous dataset and to allow country categorization between low and middle income countries which might be very important.

Recent studies use a cross-countries dataset (table 1b). Zhu and Trefler (2005) showed that the technological catch up that they measure with labor productivity (without linking it to imports), does not increase directly wage inequality but allows developing countries to be specialized in more skill intensive products in their exports and hence to increase wage inequalities indirectly[4].

All the cross-country studies use, the dataset from Freeman and Ostendorp (2001) which provides wage for different occupations in each industry and allows to measure wage inequality among workers in each industry. The coverage in all its dimensions, however, is problematic and fragmentary. Although there are 156 countries in total on 1983-1999, each country does not provide data (occupational wages) for every year. The yearly country coverage varies between 48 and 76. Occupations included also vary from country to country. Moreover for a given country even when it does provide the annual data, the occupational coverage is not necessarily uniform for each year. Using properly this dataset implies to seriously reduce the sample and exclude several low-income countries.

[4] A variation on this theme is the conjecture that, even if the technology to be transferred is neutral, the transitional process of transferring and installing new technologies may be skill-biased (Pissarides, 1997). In this case, the effect on the returns to human capital will be temporary and skilled workers benefit only during the transition period to the new, higher, technological level. Goldin and Katz (1998) reach a similar conclusion. They argue that the demand for skilled workers can follow a technological cycle. The demand rises when new technologies and machinery are introduced, but it declines once the other workers have learned to use the new equipment.

The recent study from Milanovic and Squire (2005) use also an inter-industry wage dispersion dataset. This approach allows using a larger sample since those data are easier to collect. However the implications are different since in doing this the wage inequalities are sector-based whereas they are skill-based in the other studies.

It is also of interest to examine the extent to which trade liberalisation is correlated to an increasing wage inequality, regarding the fact that South-South trade now accounts for around two fifths of all developing country merchandise trade. To address these issues, the following section presents some new evidence regarding the impact of trade liberalisation in a case of South-South trade relative to North-South trade.

Table 1a: Summary of recent country studies

Studies	Measure for wage inequality	Measure for trade openness	Alternative explanations	Main results
Feenstra & Hanson 1997 Mexico 1975-1988	Relative non production wage share		FDI by number of Maquiladoras	FDI increase non producer wages share so FDI increase wage inequality
Cragg & Epelbaum 1996 Mexico 1987-1993	Industries dummies and occupation dummies in wage equation	Comparison of traded sectors with non traded sectors		Occupation explains close to half of the wage inequality. Economy became more skill-intensive and that this effect was larger for the traded sector.
Robins 1996 9 developing countries 1974-1989	Wage skilled worker / wage unskilled worker	Just analysis by period	Financial openness and Technical Change by machinery imports	Trade liberalization sometimes rise wage inequality, both financial openness and skill biased technical change increase inequality.
Beyer, Rojas &Vergara 1999 Chile 1960-1996	Difference in return to education on wages	Trade Liberalization by Trade to GDP		Trade Liberalization has increased inequality.
Harrison & Hanson 1999 Mexico	Wage skilled worker / wage unskilled worker	Trade Liberalization by Industry	Technology change by machinery	Wage inequality rise after trade Liberalization, FDI and Technological change

1984-1990		Tariffs rate	imports, license Financial openness by FDI	increase this effect.
Gindling & Robbins 2001 Chile, Costa Rica 1974-1995	Standard Deviation of log wages wage 90th decile / wage 10th decile	Trade Liberalization by Average Tariff rate	Skilled biased technology change by machinery imports	Trade Liberalization and Technological change explains difference in inequality between 2 countries.
Green, Dickerson & Arbache 2001 Brazil 1981-1999	Mean log deviation of wages Return to education	Just analysis by period		Increase in education returns but no effect on wage inequality, no effect of trade liberalization.
Galiani & Sanguinetti 2003 Argentina 1993-1997	Difference in return to education on wages	Trade Liberalization by M to VA and X to VA in each industry		Import penetration explain wage premium but just a small part only.
Pavcnik 2003 Chile 1976-1986	Wage skilled worker / wage unskilled worker		Capital deepening Technology import	Capital deepening increases wage premium but adoption of foreign technology has no effect.
Esquivel 2003 Mexico 1988-1994 1994-2000	wage non production worker / wage production worker	Trade Liberalization by product prices	Technological Progress by labor productivity	Technological change increases wage inequalities and trade liberalization decrease wages inequalities in the first period.
Attanasio, Goldberg& Pavcnik 2004 Colombia 1984-1998	Std Deviation log wages wage 90th decile / wage 10th decile Industry dummies in wage equation	Trade Liberalization by M and X in each industry And Industry Tariffs	Skilled biased technology change by proportion of skilled workers	Trade Liberalization increase inequality through technology, and through growing informal sector (pay less).
Goldberg& Pavcnik 2005 Columbia 1984-1998	Industry dummies in wage equation	Trade Liberalization by Industry Tariffs		Tariff cuts decrease unskilled wages since the most protected workers were unskilled.
Mishra & Kumar 2005 India 1983-2000	Industry dummies in wage equation	Trade Liberalization by Industry Tariffs		Tariffs reduction increase wage, since tariff reduction is highest in unskilled worker intensive industry so Trade Liberalization reduce wage inequality.

Table 1b: Summary of recent cross-countries studies

Studies	Measure for wage inequality	Measure for trade openness	Alternative explanations	Main results
Freeman & Ostendorp 2001 83 countries 1983-1998	wage 90th decile / wage 10th decile	Trade Liberalization by Trade to GDP		Weak positive results
Rama 2003 103 countries 1983-1998	Standard Deviation of log wages Return to education	Trade Liberalization by Trade to GDP and Sachs Warner index	Financial openness by FDI	No significant effect
Zhu & Trefler 2005 20 developing countries 1985-1998 in 4 periods	wage non production worker / wage production worker	Trade Liberalization by the amount of exports	Technological catch up by the change in skill composition of exports	Trade Liberalization has no effect, technological catch up explains wage inequality only by changing composition exports
Milanovic & Squire 2005 118 countries 1983-1999 90 countries 1975-1999	Inter industry wage dispersion from UTIP Inter occupational wage dispersion from OWW	Trade Liberalization by global Tariffs		Trade Liberalization increases wage inequality in developing countries

3 South-South trade and wage inequality: a model

We explore two extensions relative to the existence of "South-South" trade and wage inequality in developing countries.

First, similarly to Wood (1997), we argue that South-South trade might explain increasing wage inequality in middle-income countries as they do not present a comparative advantage in unskilled labor intensive sectors in this South-South trade. Moreover, we also expect that increasing the share of South-South trade relatively to North-South trade could in crease wage inequality in low income countries, since imports should be less intensive in high skill-labor and exports more intensive in low skill-labor. It appears that we have to use a cross-countries dataset in order to categorize

countries according to their income. We choose to use an inter-industry wage dispersion dataset, as in Milanovic and Squire (2005), so we deal her with sector-based wage inequalities. We are comfortable with this approach since, in clustering industries by their intensity in skill-labor, we will observe which ones have an increasing wage relatively to the other sectors. We expect that in middle income countries wage in high skill-labor industries increase more rapidly that wages in low skill-labor industries.

This argument is also related to the wage industry premium explanation mentioned earlier and used in several studies on Latin American countries to explain wage inequality (Goldberg and Pavcnik (2005). If N-S trade leads to tariff cut and increasing importation in the high skill-labor industries and that S-S trade will lead mainly to tariff and increasing importation in the low skill-labor industries this could explain why S-S trade could increase more inter industry wage inequality than N-S trade.

Second, we explore if S-S trade and N-S trade have different impacts concerning sector-biased technological change. If S-S trade leads more to increasing competition in skill-intensive goods than N-S trade, it might bring technological change more biased towards skill-intensive sectors than N-S trade. Here again, using an inter-industry wage dispersion dataset is suitable regarding to our approach since we only focus on wages in each industry.

Leamer (1998) has made the argument in several papers that it is sector-bias, and not factor bias that is relevant for the income distribution. Skilled-biased technological change that is concentrated in unskilled-intensive sectors would benefit unskilled workers in the general equilibrium, while skilled-biased technological change concentrated in

skilled-intensive industries would benefit skilled workers. However, Leamer's argument rests on the assumption of fixed product prices, which is unlikely to hold during trade liberalization.

Recently, Haskel and Slaughter (2002) have considered the 'sector bias' of technological change. They present a model where it is the sector bias of technological change rather than the factor bias that determines the effect on relative wages, even in case of flexible prices (contrary to Leamer who assumed fixed prices). Technical progress in a sector will potentially raise profitability. If technical change occurs in the skill-intensive sector, then skilled wages must rise so that relative profitability falls back to its original level. If it occurs in the unskilled-intensive sector, then unskilled wages must rise. Note that all technical change matters (not only SBTC) since any advances might raise sector profitability. They test their model on UK and USA and find that decreasing wage inequality in 70's was due to SBTC in unskilled-intensive sectors and increasing wage inequality in 80's was due to SBTC in skilled-intensive sectors.

This suggests that researchers should look at skilled, unskilled and neutral technical change to see if there is an impact on wages. The impact of sector bias can be summarized: if prices or TFP grow faster in the skilled-intensive sectors, then skilled wages tend to rise relative to unskilled wages. But if prices or TFP grow faster in the unskilled-intensive sectors, then skilled wages tend to fall relative to unskilled wages. Thus, the appropriate empirical strategy is to examine whether price or TFP change is more concentrated in the skill- or unskilled-intensive sectors. This approach contrasts with studies that seek to document whether price or technical changes are occurring within sectors but not to compare across sectors.
In our framework of S-S trade and N-S trade we could attempt for a difference in sector biased according to the direction of trade.

On the export side, trade openness potentially increases innovation, knowledge and productivity by encouraging firms to find new ways to compete. Since for a developing country, N-S trade leads to export unskilled labor intensive goods, this would lead the country to improve its labor productivity in this unskilled–intensive sector to be competitive relative to other developing countries on the northern market. On the contrary, in case of S-S trade where countries trade relatively more in skilled-intensive products this would lead to increasing competition and labor productivity in those more skilled intensive industries.

4 South-South trade and wage inequality: A first look at the data

The exploration takes place with the data in relating to the econometric analysis of section 4. We use the database recently updated by Nicita and Olarreaga (2006). The database includes information on bilateral trade flows, production, labor, added value and wages in 101 countries over the period 1976 to 2004. The industry classification is the 3-digit level ISIC revision 2, which covers 28 manufacturing sectors.

Table 2 presents for three groups of developing countries (see Annex 1 for classification) the change between 1980 and 2000 in the direction of trade measured by total exports and total imports of manufactured products. We observe the expansion of South-South trade for all developing countries (roughly from 19-18% of exports and 9-12% of imports in 1980 to 35-50% of exports and 30-40% of imports in 2000). It seems that developing countries have really benefited from this expanded South-South trade, and it concerns mainly the middle income countries which multiplied their share of S-S trade by five.

Table 2: Expanding South-South trade by developing countries clusters

Export					*Import*			
North	**Mid. Up**	**Middle**	**Low**	***1980***	**Low**	**Middle**	**Mid. Up**	**North**
82.2	6.6	4.2	7.0	**Middle Up**	2.2	5.5	3.8	88.5
81.0	7.6	8.4	2.9	**Middle**	0.8	5.3	3.0	90.9
81.3	1.7	2.8	14.2	**Low**	4.0	4.2	1.5	90.2
North	**Mid. Up**	**Middle**	**Low**	***2000***	**Low**	**Middle**	**Mid. Up**	**North**
64.4	12.0	20.0	3.6	**Middle Up**	1.3	17.8	10.9	70.0
58.6	9.1	26.3	6.0	**Middle**	2.5	23.0	7.5	67.0
50.0	3.2	26.7	20.1	**Low**	4.8	30.8	5.3	59.1

4.1 Inter industry Specialization among developing countries

North-South relation in South-South trade

Table 3 presents the share of exports and imports according to three clusters of products classified by skill labor intensity (see Annex 2 for classification from UNCTAD). We see that in 2000 the richest developing countries appear to export relatively more skilled intensive goods "HSL" (54% of total exports) and export fewer unskilled intensive goods "LSL" (30%) than low income countries (respectively 22% and 57%). This evidence seems to be consistent with the notion of a ladder of comparative advantage as defined by relative factor endowments.

Table 3: Trade and Labor force by commodities clusters

		1980			***2000***		
	Goods	**Export**	**Import**	**Labor force**	**Export**	**Import**	**Labor force**
Middle Up	LSL	38.1	24.5	51.8	29.6	19.1	52.2
	MSL	18.6	21.8	29.3	16.6	18.3	26.6
	HSL	43.3	53.7	21.3	53.8	62.6	23.0
Middle	LSL	50.1	21.6	53.4	38.3	22.5	48.7
	MSL	15.9	21.7	29.3	21.2	21.8	27.7
	HSL	34.0	56.7	18.7	40.5	55.7	25.4
Low	LSL	68.9	28.4	60.0	57.2	23.3	56.5
	MSL	17.2	19.3	26.7	20.4	25.7	29.2
	HSL	13.9	52.3	14.3	22.4	51.0	17.8

Therefore, as Wood (1997) suggested, this helps explain increasing wage inequality in middle income countries since the opening of the low income half of the world is likely to have altered the comparative advantage of middle-income countries in unskilled-intensive sectors. This pattern has been reported for Columbia (Attanasio, Goldberg and Pavcnik (2004), Mexico (Hanson and Harrison (1999), Robertson (2000)) and Brazil (Pavcnik, Blom, Goldberg and Schady (2004)).

Industry wage premium

Table 3 reveals that the distribution among sectors does not change a lot across countries and time, although middle-up income countries have less labor force in unskilled intensive sectors (52%) compared to low income countries (57%). And this lack of labor reallocation does not conform to traditional HO expectations where labor should reallocate from sectors with declining share to sectors with increasing share. This suggests that the adjustment of the labor market to trade liberalization occurred through relative wage adjustments and not through labor reallocation across sectors, thereby having an effect on the wage premium. In sum, if trade liberalization leads to declines in industry wage premiums, wage inequality between industries could increase if the industries with the largest tariff cuts are the ones employing a higher share of unskilled workers and if these industries had the lowest wage premiums prior to the reform.

Havrylyshyn (1985) finds that factor content characteristics are relevant in the trade of developing countries but observes that these characteristics vary according to the direction of trade. He finds that developing countries export more skilled and capital intensive products to the South than to the North while they import more skilled and capital intensive products from the North than from the South.

Table 4 details the shares of each product cluster: high skill labor intensive (HSL), medium skill labor intensive (MSL) and low skill labor intensive (LSL), in the bilateral trade flow between groups of countries. As Havrylyshyn (1985), we observe that exports from Southern countries to other Southern countries are more intensive in high-skilled labor (HSL) than exports to Northern countries (44,8% versus 38,2%) and less intensive in unskilled labor (33,5% versus 44,9%). At the same time, imports from Southern countries are more intensive in unskilled labor than from Northern countries (26, 4% versus 18,4%) and less intensive in skilled labor (46,2% versus 62,9%). The results hold when we decompose developing countries in three groups. Broadly speaking these ratios suggest that if South-South trade exports relatively less unskilled intensive products and imports relatively more unskilled intensive products, this may lead to increasing inequality relatively to North-South trade.

Table 4: factor content in South-South trade and in North-South trade

2000		Exports					Imports				
		North	South	Middle Up	Middle	Low	North	South	Middle Up	Middle	Low
South	LSL	44.9	33.5				18.4	26.4			
	MSL	16.9	21.6				18.7	27.4			
	HSL	38.2	44.8				62.9	46.2			
Middle Up	LSL	35.9		23.2	28.2	34.2	15.3		25.2	23.5	52.0
	MSL	15.3		20.2	18.2	19.2	16.1		25.0	22.2	14.8
	HSL	48.9		56.6	53.6	46.6	68.6		49.8	54.3	33.3
Middle	LSL	39.9		37.6	30.5	19.9	20.4		22.3	26.2	45.3
	MSL	18.9		22.5	22.9	26.0	18.4		28.5	31.3	16.7
	HSL	41.3		39.9	46.6	54.2	61.2		49.2	42.5	38.0
Low	LSL	69.0		56.8	53.1	43.5	19.1		33.7	28.5	38.8
	MSL	15.7		20.8	20.2	19.1	23.5		23.0	29.1	24.0
	HSL	15.2		22.4	26.6	37.3	57.4		43.4	42.4	37.2

So we observe the existence of a N-S trade relationship among S-S trade due to heterogeneity between developing countries. This is consistent

with increasing inter-industry wage inequality in middle income countries. However we observe also that S-S trade implies more imports of unskilled intensive products and fewer exports of unskilled intensive products than N-S trade for all sorts of developing countries (even low income). This could lead to increasing wage inequality for all developing countries and not only in middle income countries.

4.2 Sector biased technological change

To the extent that technological change is an endogenous response to intensified competition from abroad (see Acemoglu, 2003), one could argue that S-S trade was indirectly responsible for the increase in inter industry wage inequality[5].

Table 5 shows the correlation between shares by different partners, in export and in import, with TFP in three different clusters of industry for developing countries. TFP is computed as $TFP = \log Y - \alpha \log L - (1-a) \log K$, with an equal to labor's share. The capital stocks are derived from investment series using the perpetual inventory model with a 9% depreciation rate. The labor share is equal to the wage bill divided by the value of output. The coefficients are generally very low, however it seems that when the share of Northern partner in export and in import is highest the TFP in unskilled intensive sectors is also the highest, while when the share of middle income country is high (in exports or in imports) the TFP in unskilled intensive sectors is low. Moreover exports to low income country are positively correlated with high TFP in skilled intensive sectors.

[5] This argument is also related to Wood (1995) and to the more recent paper by Thoenig and Verdier (2003). See also the survey by Acemoglu (2003).

Table 5: Direction of trade and TFP in sectors: correlation

	Partners	TFP LSL	TFP MSL	TFP HSL
Exports	**North**	**0.143**	-0.040	-0.055
	Middle Up	-0.075	0.052	-0.005
	Middle	**-0.224**	-0.071	-0.087
	Low	0.060	0.089	**0.182**
Imports	**North**	**0.174**	0.017	0.022
	Middle Up	-0.009	**0.107**	**0.109**
	Middle	**-0.238**	-0.074	-0.092
	Low	-0.018	-0.042	-0.017

5 Econometric specification

5.1 Models

Now we test how South-South trade affects inter industry wage inequality in developing countries.

Model I

The basic regression equation to be estimated is the following:

$$Ineq_{ct} = \beta_1 Y_{ct} + \beta_2 FDI_{ct} + \beta_3 Educ_{ct} + \beta_4 \left(\frac{TradeS}{TradeN} \right)_{ct} + D_c + D_t + \varepsilon_{ct} \qquad (1.1)$$

c=1,...67 and t=1,...8

Where we expect that $\beta_2 > 0$, $\beta_3 < 0$ and $\beta_4 > 0$

We measure inter industry wage inequality in country c in the period t, $Ineq_{ct}$, using the standard deviation of the logarithm of wage by industry (alternatively using a Theil index in a robustness check). Explanatory variables include the supply of human capital in the economy ($Educ_{ct}$) which might affect the relative factor price of skilled and unskilled labor, and so the relative price of labor in skilled intensive industry and in unskilled intensive industry. We expect that an increase in the supply for skill will decrease inter industry wage inequality. We include also foreign direct investment (FDI_{ct}) which as Feenstra and Hanson (1997) showed could increase wages in industries intensive in skilled labor. FDI leads to a

transfer of productions from North to South which are skill intensive relatively to the South. Finally we add income per capita (Y_{ct}) to control for macro economic development which might act on wage inequality. The shares of trade to North ($TradeN_{ct}$) and to South ($TradeS_{ct}$) to total output in industries are respectively:

$$TradeN_{ct} = \frac{X_{ct}^{N} + M_{ct}^{N}}{Output_{ct}} \text{ and } TradeS_{ct} = \frac{X_{ct}^{S} + M_{ct}^{S}}{Output_{ct}}.$$

We use a within estimator in order to control for country specific heterogeneity D_c which might explain differences in wage inequality among countries. Moreover, in doing this, we are closer to a relationship in change rather than in level which is a more suitable specification.

We use three years averages period in order to control for serial correlations and we add dummies equal to 1 for the period after 1990 D_t, we do this since Humberto Lopez (forthcoming in Economics Letters) shows that the relationship growth and income inequality suddenly changed in the 1990s. All the coefficients present robust standard with the White correction.

In the robustness check, we will use the country-industry dimension of the database to test the model above on wages in unskilled-labor intensive industries and in skilled-labor intensive industries rather than on the index of wage inequality. We adopt quantile analyses where we estimate the initial econometric specification for the 25th quantile and 75th quantile in the distribution of wage by industry.

Model II: Country clusters

A way to test if the level of income in developing country is determining for the effect of S-S trade versus N-S trade is to test the equation (1.1) for different clusters of countries, low income, middle income and middle up income. Here we obtain the following specifications where we test the

impact of trade flows (in imports and exports) with three sorts of groups of countries P (middle up, middle, low):

$$Ineq_{c\in P,t} = \beta_1 Y_{c\in P,t} + \beta_2 FDI_{c\in P,t} + \beta_3 Educ_{c\in P,t} + \beta_4 \left(\frac{TradeS}{TradeN}\right)_{c\in P,t} + D_{c\in P} + D_t + \varepsilon_{c\in P,t} \quad \text{where P=1, 2, 3 } c = 1,...67 \text{ and } t = 1,...8 \quad (1.2)$$

Where we expect that $\beta_2 > 0$, $\beta_3 < 0$, $\beta_4 < 0$ if P = low and $\beta_4 > 0$ if P = middle up

Model III: Sector-bias

We investigate now the potential effect of sector biased technological change. In a first specification, we measure the sector biased technological change using a ratio of labor productivity in unskilled intensive sector on labor productivity in skilled intensive sectors.

We proceed in two steps. First in equation 1.3, we estimate the impact of S-S trade and N-S trade on the sector biased toward unskilled intensive industries, $USBTC_{ct}$, which is the ratio of Labor productivity in unskilled labor intensive sectors (LSL) to labor productivity in skilled labor intensive sectors (HSL)[6].

$$USBTC_{ct} = \alpha_1 Y_{ct} + \alpha_2 FDI_{ct} + \alpha_3 Educ_{ct} + \alpha_4 \left(\frac{TradeS}{TradeN}\right)_{ct} + D_c + D_t + \varepsilon_{ct} \quad (1.3)$$

$c = 1,...67$ and $t = 1,...8$

In the robustness check we deal with technological change using a TFP index which is more appropriate than labor productivity which is strongly correlated with the wage. However this considerably reduces our panel of developing countries.

[6] Unskilled Sector-Bias Technological Change $USBTC = \left[\frac{Labor\ \text{Pr}oductivity\ in\ LSL}{Labor\ \text{Pr}oductivity\ in\ HSL}\right]$

Then, in equation 1.4, we will test simultaneously the impact of S-S versus N-S trade and unskilled sector biased technological change on inter industry wage inequality.

$$Ineq_{ct} = \beta_1 Y_{ct} + \beta_2 FDI_{ct} + \beta_3 Educ_{ct} + \beta_4 \left(\frac{TradeS}{TradeN} \right)_{ct} + \beta_5 USBTC_{ct} + D_c + D_t + \varepsilon_{ct} \qquad \text{where } c = 1,...67 \text{ and } t = 1,...8 \qquad (1.4)$$

So we will get a direct effect of the direction of trade, β_4, and an indirect effect, through the sector biased technological change, $\alpha_4 * \beta_5$. In fact a proper test of the Haskel and Slaughter (2002) model should consist, in the second test, to use wage inequality among worker as interest variable, since it could appear obvious that increasing labor productivity in a sector relative to another increase relative wages in this sector.

In the section 7 we will use GMM system estimates to control for problem of endogeneity. The regression presented above poses some challenges for estimation. Most explanatory variables (trade openness and foreign direct investment) are likely to be jointly endogenous with wage inequality.

5.2 Data

We use the updated database of Nicita and Olarreaga (2006) which gives us data for bilateral trade, production and added value, and wages by industry. Data on wage inequality also comes from the database where we construct the standard deviation in the log of wages as in several studies (Gindling and Robbins 2001, Rama 2003, Attanasio and al. 2004).

Concerning trade openness we use two measures: a trade ratio on manufacture products (exports and imports of manufactured products on output in manufactured sectors). We also use, as robustness test, a constructed an adjusted trade ratio (closer to the notion of trade

liberalization) for N-S and S-S trade, based on a gravity model (see Annex 6).

We used the data from WDI (2004) to measure foreign direct investment and the data on education come from Barro and Lee (2000). Our sample consists of an unbalanced panel dataset of 67 developing countries. For each, the dataset includes at most 8 observations (and at minimum 2), consisting of 3-year averages spanning the 1976-2002 period. Among the developing countries, 22 are from Sub-Saharan Africa, 12 from Asia, 11 from the Middle East and North Africa, and 22 from Latin America and the Caribbean. Annex 1 provides the full list of countries in the sample.

6 OLS Results

6.1 South-South trade increases wage inequality for middle income countries

Table 6 shows results when we adopt the specification of equation (1.2) in using the standard deviation in log of wages (SDLW) by industry. Columns 1 to 4 present results.

The foreign direct investment tends to increase wage inequality as suggested by Feenstra and Hanson (1997). This FDI occurs in sectors often more skill intensive than in the mean of sectors in developing countries. We observe that this concerns only upper middle income countries (column 2) where FDI are more important and where skilled labor is more present. An interesting result concerns the impact of education level. Several studies (Zhu and Trefler 2005) find that the education level increase wage inequality whereas it should increase the supply of educated workers and decrease relatively their remuneration. This result holds when we do not control for time period, but if we add dummies for periods, as in Table 6,

this effect is no longer significant or is conform to the theoretical prediction (significantly negative).

In order to test the effect of the trade orientation, we include the ratio of trade with South relative to trade with North (TSS/TNS). We see that trade with southern countries increase wage inequality relatively to trade with northern countries, an increase of 1% in the share of south trade relative to north trade increase inter industry wage inequality by 0.027%.

Table 6: S-S Trade versus N-S Trade

	1	**2**	**3**	**4**
Sample	All	Upper Middle	Middle	Low
Wage inequality	**SDLW**	**SDLW**	**SDLW**	**SDLW**
GDP pc	-0.026	-0.104a	0.068	-0.094
	(0.67)	(2.68)	(0.95)	(1.38)
FDI	0.480	1.016a	0.060	0.737
	(1.59)	(2.99)	(0.12)	(0.69)
Education	-0.044b	-0.038	0.005	-0.107b
	(1.99)	(0.70)	(0.08)	(2.08)
TSS/TNS	0.027a	0.023b	0.034a	0.028c
	(3.44)	(2.24)	(2.63)	(1.77)
Dummy country	Yes	Yes	Yes	Yes
Dummy period	Yes	Yes	Yes	Yes
Observations	414	96	179	139
Number of countries	67	13	25	29
R-squared	0.19	0.51	0.13	0.25

All the estimations present robust standard errors. Absolute value of t statistics in parentheses. c significant at 10%; b significant at 5%; a significant at 1%.

A first candidate explanation for this result would be the existence of a North-South trade relationship (e.g. inter industry specialization), among developing countries. Therefore South-South trade would be increasing wage inequality for middle income countries (like for the North in N-S trade) and decreasing inequality for low income countries. We observe that this effect is more significant for middle income countries (column 2, 3) than for low income countries (column 4) as we could expect since low

income countries present a comparative advantage in unskilled labor relatively to all the other southern countries.

6.2 Sector biased technological change matter

Table 7 shows us the estimations of equation (1.3). We observe that trading with southern countries rather than with northern countries decreases the biased in technological change toward unskilled intensive sector (USBTC), although this effect is not significant for middle income countries. This comforts our assumption concerning the fact that S-S trade increases competition and labor productivity in mildly skill (MSL) and high skill (HSL) industries whereas N-S trade increases competition and labor productivity in low skill intensive (LSL) industries. However the within R squared in our regression is low, except for middle up income countries (column 2) so those results must be taken with caution.

Table 7: Effect of S-S and N-S trade on sector biased technical change

	1	**2**	**3**	**4**
Sample	All	Upper Middle	Middle	Low
	USBTC	**USBTC**	**USBTC**	**USBTC**
GDP pc	-0.146	0.249	-0.256	-0.079
	(0.73)	(0.89)	(0.81)	(0.20)
FDI	-1.658	-4.370	-1.855	4.936
	(0.71)	(1.40)	(0.41)	(1.14)
Education	0.248c	-0.617	0.063	0.336c
	(1.82)	(1.25)	(0.18)	(1.83)
TSS/TNS	-0.083b	-0.071c	-0.022	-0.175b
	(2.15)	(1.83)	(0.28)	(2.13)
Dummy country	Yes	Yes	Yes	Yes
Dummy period	Yes	Yes	Yes	Yes
Observations	414	96	179	139
Number countries	67	13	25	29
R-squared	0.09	0.32	0.08	0.10

All the estimations present robust standard errors. Absolute value of t statistics in parentheses. c significant at 10%; b significant at 5%; a significant at 1%.

Next we observe the impact of this sector biased technological change on wage inequality in table 8 (equation 1.4). As expected this sector biased technological change toward unskilled intensive sector decrease wage inequality across industries, for all group of countries. Once we account for the effect though sector biased technological change the results on S-S trade versus N-S trade holds for middle income countries. Here again there is not significant effect for low income countries meaning that for low income countries the increasing effect on wage inequality of S-S trade occurs only through the sector biased technological change, whereas for other groups of countries, they have both effect, direct and indirect.

Table 8: Direct and Indirect effects of N-S and S-S trade on wage inequality

	1	**2**	**3**	**4**
Sample	All	Upper Middle	Middle	Low
wage inequality	**SDLW**	**SDLW**	**SDLW**	**SDLW**
GDP pc	-0.071c	-0.070b	0.002	-0.186a
	(1.89)	(2.06)	(0.03)	(3.12)
FDI	0.291	0.713b	0.019	0.883
	(1.08)	(2.01)	(0.05)	(1.18)
Education	-0.043	-0.024	-0.032	-0.059
	(1.07)	(0.45)	(0.43)	(1.16)
USBTC	-0.078a	-0.048b	-0.062a	-0.137a
	(4.85)	(2.45)	(3.25)	(5.40)
TSS/TNS	0.023a	0.020c	0.031b	0.014
	(3.26)	(1.82)	(2.14)	(1.43)
Dummy country	Yes	Yes	Yes	Yes
Dummy period	Yes	Yes	Yes	Yes
Observations	414	96	179	139
Number countries	67	13	25	29
R-squared	0.30	0.55	0.18	0.52

All the estimations present robust standard errors. Absolute value of t statistics in parentheses. c significant at 10%; b significant at 5%; a significant at 1%.

The global effect (indirect and direct) of S-S trade relative to N-S trade is given in Table 9[7]. Hence we observe that being oriented toward S-S trade rather than N-S trade affect mainly directly the middle income countries since they not present a comparative advantage in unskilled labor and have decreasing wage premium in their unskilled intensive industry following trade liberalization. The effect through the sector biased technological change toward skilled intensive sectors is mainly important for the low income countries. This indirect effect is more important in low income countries (63% versus 37%) whereas in middle income countries the direct effect is the highest (around 90%). However the comparison between upper middle and middle income countries does not confirm our expectations since the direct effect is more important for middle income countries.

Table 9: Quantify the indirect and direct effect of S-S trade relative to N-S trade on wage inequality

Effect of SS/NS	All	Upper Middle	Middle	Low
Indirect effect	0.007	0.004	*0.002*	0.028
Direct effect	0.025	0.022	0.037	*0.017*
Total effect	0.032	0.026	0.039	0.045
Share Indirect	22%	15%	4%	63%
Share Direct	78%	85%	96%	37%

Calculated from table 7 and 8. Value in italics means that it is not significant

6.3 Quantile estimations on industries

We are also interested, as robustness test, in analyzing directly variation in wage by industry rather than through an index of wage inequality. Here we could use the mean wage for different clusters, as used

[7] calculated in using standard error of TSS/TNS multiplying by its coefficient in the first regression and by the coefficient in front of USBTC in the second (the indirect effect) and we add the standard error multiplied by its coefficient in the second regression as direct effect. For example, in the first column (all developing countries) with a standard error of 1.07 the indirect effect is 1.07*(-0.083)*(-0.078) = 0.007 and the direct effect is 1.07*0.023 = 0.025 meaning a global effect of 0.032.

for the descriptive statistics: unskilled labor intensive, mildly skilled labor intensive and high skilled labor intensive. However by doing this we loose information on changes among industries. That is why we adopt quantile analyses where we estimate the initial econometric specification for the 25th quantile and 75th quantile in the distribution of wage by industry. This allows us to test the impact on wage of both global –level orientation in trade and of sector-level orientation in trade. In this specification on wages by industry we use three years averages period in order to control for serial correlations and we also add dummies by industry and by period.

Those results on the industry database where we estimate quantile regressions on wage by industry (Annex 4.1) comfort previous results. We show in columns 1 and 2 that South-South trade relatively to North-South trade decreases inequality for the 25th percentile of wage more than for the 75th percentile of wage (-0.063 versus -0.034) meaning that this increases wage inequality[8]. We observe the same impact on the different clusters of developing countries (columns 3 to 6), except for the low income countries (columns 7 and 8) where the impact is inversed[9]. As suggested in the previous part, low income countries present a comparative advantage in unskilled labor relatively to all the other southern countries[10]. The quantile estimations on Labor productivity (Annex 4.2) show, that South-South trade relatively to North-South trade increases more labor productivity in sectors where this labor productivity is already the highest and decreases labor productivity in low productivity sectors.

[8] An inter-quantile regression shows that a 1% increase in the share of south trade relative to north trade increases difference in wages between the 25th and 75th quantile of 0.029%.
[9] The interquantile regressions show that a1% increase in the share of south trade relative to north trade increases difference in wages between the 25th and 75th quantile of 0.050% and 0.048% respectively.
[10] An inter-quantile regression shows that a 1% increase in the share of south trade relative to north trade decreases difference in wages between the 25th and 75th quantile of 0.047%.

6.4 TFP rather than Labor productivity

In the previous estimates, we do not use a TFP index as measure of technological change since this considerably reduces our panel of developing countries. Moreover we do not have the capital stock and estimating this capital stock requires assumptions. I adopt the procedure of Keller (1997) for the perpetual inventory method which is very critizable since estimation of initial capital stock is based on gross fixed capital formation after the initial year. However if we deal with technological change, using TFP index is more appropriate than using labor productivity which strongly correlated with wage. Then we use the industry dimension of our database to apply our two steps strategy on the three clusters of industries (highly skill-intensive, medium skill-intensive and low skill-intensive) for 38 developing countries for which we have TFP in industries.

We observe in annex 5.1 that an increase in S-S trade relative to N-S trade increases TFP more in the high skill-intensive sector (HSL) than in the low skill-intensive sectors (LSL), and this effect is very huge for low income countries. Then when we include both TFP and trade in the second step (annex 5.2), we observe that the direct effect of S-S trade versus N-S trade is still important and for low income countries the indirect effect (through the TFP) is most important than for other group of countries. The measure of both impacts in annex 5.3 show that for upper middle income countries the direct effect represent 85% of total effect of S-S trade versus N-S trade whereas for low income countries the indirect effect represent roughly 40% of total effect.

6.5 Robustness check

We check the robustness of our results using other dataset and measure for wage inequality and openness to trade in Annex 7. The Theil index on inter-industrial wage differences, created by James Galbraith and associates covers on average about 90 countries annually over the period 1975-99. We also construct a new measure of trade openness based on a gravity model (annex 6) as suggested by Hiscox and Kastner (2002).

In column 1 we present the trade ratio for South-South trade and for North-South trade in industry for all developing countries rather than the previous ratio (S-S trade/ N-S trade). As expected S-S trade increases wage inequality whereas N-S trade decreases wage inequality (but not significantly). Then, in column 2, we use the Theil index on wage from UTIP database as output variable and the previous ratio (S-S trade/ N-S trade), the result are conformed to the previous results (column 1 of table 3.1). The columns 3 and 4 show that trade openness, measured by our index of trade liberalization, decreases wage inequality in developing countries in case of trade liberalization with northern partners and increases wage inequality in case of trade liberalization with southern partners, whatever is the index of wage inequality, standard deviation in log of wages (column 3) or Theil index from UTIP database (column 4).

We have also tried to use another approach to measure N-S trade versus S-S trade for developing countries[11]. We could consider S-S trade as openness with a partner less endowed in human capital (measure by the average years of education from Barro and Lee 2000), and N-S trade as openness with a partner more endowed in human capital. Then each developing country faces different partners for South and for North.

[11] Thanks to Marcelo Olarreaga and Mathias Thoenig for this comment

Unfortunately this approach gives no consistent results since the measure mainly captures the endowment of countries in human capital, e.g. country with low endowment in capital has mainly North partners so N-S trade.

7 GMM System

The regression presented above poses some challenges for estimation. The first is that most explanatory variables (trade openness and foreign direct investment) are likely to be jointly endogenous with wage inequality, so we need to control for the biases resulting from simultaneous or reverse causation. We use the generalized method of moments (GMM) estimators developed for dynamic models of panel data that were introduced by Arellano and Bond (1991). Blundell and Bond (1997) show that when the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences. And in our model education level or trade orientation for example are more persistent over time than the usual explanatory variables. To reduce the potential biases and imprecision associated with the usual difference estimator, we also use the GMM system estimator that combines the regression in differences and the regression in levels into one system (developed in Arellano and Bover, 1995, and Blundell and Bond, 1997).

We consider FDI and Trade Openness as likely endogenous variables so we use the second and third lag as instruments; Education and GDP per capita are assumed to be pre-determined, we use the first lag as instruments. Using lagged variables necessitates having an important number of observations. That is why we use a yearly database rather than the three years averages period database for this GMM estimator. Otherwise we loose too many observations.

The consistency of the GMM estimators depends on whether lagged values of the explanatory variables are valid instruments in the growth regression. We address this issue by considering two specification tests suggested by Arellano and Bond (1991). The first is a Sargan test of overidentifying restrictions, which tests the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. Failure to reject the null hypothesis gives support to the model. The second test examines the null hypothesis that the error term, is not serially correlated. As in the case of the Sargan test, the model specification is supported when the null hypothesis is not rejected. In the system specification, we test whether the differenced error term (that is, the residual of the regression in differences) is second-order serially correlated.

Table 10: S-S Trade versus N-S Trade

	1	**2**	**3**	**4**
Sample	GMM-SY All	GMM-SY Upper Middle	GMM-SY Middle	GMM-SY Low
wage inequality	**SDLW**	**SDLW**	**SDLW**	**SDLW**
GDP pc	-0.017	0.004	0.032	-0.005
	(0.88)	(0.30)	(1.63)	(0.14)
FDI	0.063	0.094a	0.133	0.174
	(1.18)	(4.20)	(1.36)	(0.87)
Education	0.002	-0.088a	0.058b	0.053
	(0.06)	(3.52)	(2.02)	(1.62)
TSS/TNS	0.047a	0.055a	0.029c	0.028c
	(4.58)	(10.22)	(1.72)	(1.72)
Dummy year	Yes	Yes	Yes	Yes
Observations	1036	280	466	290
Number country	61	13	24	24
Prob Sargan	0.77	0.74	0.53	0.13
AR2	0.61	0.48	0.43	0.90

Absolute value of t statistics in parentheses.
c significant at 10%; b significant at 5%; a significant at 1%.

The columns 1 to 4 in table 10 present results with the GMM-system estimator on the yearly dataset. We see that trade with southern countries

increase wage inequality relatively to trade with northern countries, an increase of 1% in the share of south trade relative to north trade increase inter industry wage inequality of 0.047%. We observe that this effect is more significant for upper middle income countries (0.055 in column 2,) than for lower middle income countries (0.029 in column 3) or low income countries (0.028 in column 4).

Table 11 shows that, as in the previous results, trading with southern countries rather than with northern countries decreases the bias in technological change toward un skilled intensive sector, and this effect is more important for low income countries (-0.201 in column 4) than for middle income countries (-0.169 in column 3) and for upper middle income countries (-0.107 in column 2).

Table 11: Effect of S-S and N-S trade on sector biased technical change

	1	**2**	**3**	**4**
Sample	GMM-SY All	GMM-SY Upper Middle	GMM-SY Middle	GMM-SY Low
	USBTC	**USBTC**	**USBTC**	**USBTC**
GDP pc	-0.001	0.086	-0.312	0.146
	(0.01)	(0.26)	(1.30)	(0.57)
FDI	-0.225	-0.338	-0.625	0.513
	(1.34)	(1.19)	(0.96)	(0.74)
Education	-0.410a	-0.152	-0.610c	-0.586a
	(3.03)	(0.30)	(1.81)	(4.89)
TSS/TNS	-0.090c	-0.107c	-0.169b	-0.201b
	(1.69)	(1.74)	(2.20)	(2.22)
Dummy year	Yes	Yes	Yes	Yes
Observations	1036	280	466	290
Number of country	61	13	24	24
Prob Sargan	1.00	1.00	1.00	1.00
AR2	0.54	0.67	0.82	0.40

Absolute value of t statistics in parentheses. c significant at 10%; b significant at 5%; a significant at 1%.

Table 12 shows here again that for low income countries (column 4) the increasing effect on wage inequality of S-S trade occurs mainly through the sector biased technological change, whereas for middle income countries (column 3), they have both effects, direct and indirect. In upper middle income countries (column 2) only the direct effect is significant.

Table 12: Direct and Indirect effects

	1	**2**	**3**	**4**
Sample	GMM-SY All	GMM-SY Upper Middle	GMM-SY Middle	GMM-SY Low
wage inequality	**SDLW**	**SDLW**	**SDLW**	**SDLW**
GDP pc	-0.019	0.003	0.003	-0.100a
	(0.98)	(0.12)	(0.10)	(3.13)
FDI	0.079c	0.091	0.099	0.454a
	(1.68)	(1.54)	(0.86)	(3.18)
Education	-0.025	-0.097	0.002	0.027
	(0.91)	(1.18)	(0.05)	(0.75)
USBTC	-0.059b	-0.011	-0.088a	-0.049c
	(2.53)	(1.62)	(3.55)	(1.85)
TSS/TNS	0.041a	0.057a	0.032c	0.010
	(4.47)	(3.57)	(1.89)	(0.97)
Dummy year	Yes	Yes	Yes	Yes
Observations	1036	280	466	290
Number of country	61	13	24	24
Prob Sargan	1.00	1.00	1.00	1.00
AR2	0.53	0.62	0.46	0.67

Absolute value of t statistics in parentheses.
c significant at 10%; b significant at 5%; a significant at 1%.

The global effect (indirect and direct) of S-S trade relative to N-S trade is given in Table 13. The indirect effect is more important in low income countries (50%) than in the middle income countries (31%) and upper middle income countries (2%).

Results for upper middle and middle income countries are more in line with our expectations with the GMM estimator than with the OLS estimator.

Table 13: Quantify the indirect and direct effect

Effect of SS/NS	All	Upper Middle	Middle	Low
Indirect effect	0.006	*0.001*	0.015	0.013
Direct effect	0.046	0.062	0.034	*0.013*
Total effect	0.052	0.063	0.049	0.026
Share Indirect	11%	2%	31%	50%
Share Direct	89%	98%	69%	50%

Calculated from table 11 and 12. Value in italics means that it is not significant

8 Conclusions

This chapter addresses the puzzle why the wage skill gap often increased in developing countries when they liberalized their trade. Faced with this result, authors have improved their empirical assessment and their theoretical approach to studying the consequences of trade liberalization. They account notably for skill biased technological change during trade liberalization. Here we propose another explanation: the direction of trade. In a context where globalization does not only lead to an increase in North-South trade but also in South-South trade, it seems important to account for this change in the direction of trade when analyzing the impact on inequality. South-South trade account now 40% of merchandise trade in developing countries.

Our main results are first that increasing share of S-S trade increases wage inequality whereas N-S trade tends to decrease inter industry wage inequality for all developing countries. Second a part of this increasing wage inequality due to S-S trade comes from the development of N-S trade relationship in S-S trade which increases wage inequality in middle income developing countries (which are the North in this S-S trade). Third, the fact that S-S trade leads more to a technological change biased toward skill intensive sector increase wage inequality for all developing countries

(included low income countries). Fourth, whereas for middle income country the impact of S-S trade on increasing wage inequality is mainly direct (through the fact that they are the North in this S-S trade), for low income countries it is the indirect effect through the sector biased technological change which impact more on wage inequality.

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APPENDICES

A.1: *List of countries included in the sample 1976-2000*

	Countries	observations
Middle Up Income Countries	Argentina	7
	Barbados	7
	Chile	8
	Costa Rica	7
	Israel	5
	Korea, Rep.	7
	Malaysia	8
	Mauritius	7
	Mexico	8
	Panama	8
	Trinidad & Tobago	8
	Uruguay	8
	Venezuela, RB	8
Total	**13**	**96**

	Countries	observations
Middle Income Countries	Algeria	7
	Bolivia	8
	Brazil	4
	China	4
	Colombia	8
	Dominican Rep.	4
	Ecuador	8
	Egypt, Arab Rep.	8
	El Salvador	7
	Fiji	7
	Guatemala	8
	Honduras	7
	Indonesia	8
	Iran, Islamic Rep.	8
	Jamaica	7
	Jordan	8
	Morocco	8
	Peru	7
	Philippines	8
	South Africa	8
	Sri Lanka	7
	Syria	8
	Thailand	8
	Tunisia	7
	Turkey	7
Total	**25**	**179**

	Countries	observations
Low Income Countries	Bangladesh	7
	Benin	2
	Burundi	2
	Cameroon	7
	Central African Rep	6
	Congo	4
	Ethiopia	3
	Gambia, The	3
	Ghana	6
	Guyana	2
	Haiti	3
	India	7
	Ivory Coast	5
	Kenya	8
	Liberia	2
	Madagascar	5
	Malawi	7
	Nepal	5
	Nicaragua	4
	Nigeria	6
	Pakistan	7
	Papua New Guinea	5
	Rwanda	5
	Senegal	7
	Sierra Leone	2
	Tanzania	4
	Togo	5
	Zambia	4
	Zimbabwe	6
Total	**29**	**139**

A.2: *Classification of Isic Industry according to Skill Intensity*

Label	3-digit ISIC	Content
Low Skill Labor Intensive (LSL)	311	Food products
	321	Textiles
	322	Wearing apparel, except footwear
	323	Leather products
	324	Footwear, except rubber or plastic
	331	Wood products, except furniture
	332	Furniture, except metal
	356	Plastic products
Medium Skill Labor Intensive (MSL)	313	Beverages
	314	Tobacco
	341	Paper and products
	342	Printing and publishing
	355	Rubber products
	361	Pottery, china, earthenware
	362	Glass and products
	369	Other non-metallic mineral products
	371	Iron and steel
	372	Non-ferrous metals
	381	Fabricated metal products
High Skill Labor Intensive (HSL)	351	Industrial chemicals
	352	Other chemicals
	353	Petroleum refineries
	354	Miscellaneous petroleum and coal products
	382	Machinery, except electrical
	383	Machinery, electric
	384	Transport equipment
	385	Professional and scientific equipment

A.3: *List of variables*

Label	Content	Sources
Theil	Theil index on inter industry wage inequality	UTIP (2004)
SDLW	Standard Deviation of log wages per Industry (measure inter industry wage inequality)	Nicita and Olarreaga (2006)
Wage	Wage by industry	Nicita and Olarreaga (2006)
FDI	Foreign Direct Investment	WDI (2004)
GDPpc	GDP per capita in power parity purchase (PPP)	Pen WorldTables (2005)
Capital	Capital per Worker	Easterly and Levine (1999) & Kraay and al. (2000)
Arable Land	Land arable per labor force (Cereal-land; Crop-land; Forest-land)	WDI (2004)
Mining & Fuel	Index Isham and al. (2005) base on net exports	Comtrade (2002)
Education	Average years of schooling in the population over 15 years old	Barro and Lee (2000)
Infrastructure	Principal component analysis on road per km², telephone lines per workers, power Gigawatt per worker	Caning (19996) and Calderon and Serven (2004)
Density	Population on Surface	WDI (2004)
Tariffs	Import duties comprise all levies collected on goods at the point of entry into the country. In % of Imports	WDI (2004)
(X+M)/Gdp	Output trade ratio	WDI (2004)
Index South	Adjusted Trade ratio on bilateral trade with South Countries	Calculate by author
Index North	Adjusted Trade ratio on bilateral trade with North Countries	Calculate by author
Trade South (TSS)	Imports from South and Export to South on Added Value in manufacturing industry	Nicita and Olarreaga (2006)
Trade North (TNS)	Imports from North and Export to North on Added Value in manufacturing industry	Nicita and Olarreaga (2006)
TSS/TNS	Openness biased toward South	Calculate by author from Nicita and Olarreaga (2006)
Labor productivity	Added value per Labor	Nicita and Olarreaga (2006)
USBTC	Ratio of Labor productivity in Low Skill Labor intensive industry on Labor productivity in High Skill Labor intensive industry	Calculate by author from Nicita and Olarreaga (2006)
Tot Factor Productivity (TFP)	The TFP is calculated un logs as the difference between output and factor use: log TFP = logY - $\boldsymbol{a}$ log L - (1-a) log K, with a equal to labor's share. The capital stocks are derived from investment series using the perpetual inventory model with a 9% depreciation rate. The labor share is equal to the wage bill divided by the value of output.	Calculate by author from Nicita and Olarreaga (2006) with Mathias Thoenig method

A.4: *Quantile Regressions*

A.4.1: S-S Trade versus N-S Trade

	All		Upper Middle		Middle		Low	
	1 Wage (25th)	**2** Wage (75th)	**3** Wage (25th)	**4** Wage (75th)	**5** Wage (25th)	**6** Wage (75th)	**7** Wage (25th)	**8** Wage (75th)
GDP pc	0.7754a	0.6408a	1.1335a	0.9397a	0.5147a	0.4593a	0.7402a	0.4648a
	(18.47)	(18.32)	(15.79)	(15.51)	(11.18)	(7.87)	(9.69)	(6.09)
FDI	-0.7924c	-1.7228a	-1.3815b	-2.0310a	1.0674b	-2.1947a	-7.5166a	-5.0562a
	(1.84)	(4.93)	(2.58)	(3.90)	(2.07)	(3.62)	(7.36)	(5.67)
Education	0.0628	0.1941a	-0.0524	-0.0317	0.1511a	0.4718a	-0.0823	-0.1682b
	(1.35)	(4.87)	(0.49)	(0.31)	(3.02)	(6.95)	(1.25)	(2.45)
TSS/TNS	-0.0630a	-0.0339a	-0.0577a	-0.0076	-0.1551a	-0.1066a	0.0971a	0.0503a
	(5.72)	(3.76)	(2.63)	(0.42)	(12.48)	(6.86)	(5.68)	(2.92)
D industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
D period	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-5.2705a	-3.6806a	-7.8395a	-5.6404a	-3.5532a	-3.1540a	-3.7993a	-2.4101a
	(20.98)	(17.50)	(12.76)	(10.48)	(9.95)	(6.79)	(10.81)	(6.90)
Observations	9181	9181	2295	2295	4102	4102	2784	2784
R^2	0.56	0.56	0.54	0.54	0.57	0.57	0.56	0.56

A.4.2: Effect of S-S and N-S trade on sector biased technological change

	Labor Productivity (25%)	Labor Productivity (75%)
GDP pc	0.758	0.531
	(18.08)***	(10.05)***
FDI	-2.680	-1.600
	(6.05)***	(3.09)***
Education	0.169	0.252
	(3.48)***	(4.34)***
TSS/TNS	-0.018	0.032
	(1.64)	(2.49)**
Dummy industry	Yes	Yes
Dummy country	Yes	Yes
Dummy period	Yes	Yes
Constant	-4.778	-2.497
	(12.72)***	(5.25)***
Observations	9181	9181

A.5: Total Factor Productivity (TFP)

A.5.1: Effect of S-S and N-S trade on sector biased technological change

Countries	Developing			Upper middle		Low	
Skill intensive	LSL	MSL	HSL	LSL	HSL	LSL	HSL
	TFP	**TFP**	**TFP**	**TFP**	**TFP**	**TFP**	**TFP**
GDP pc	1.0849a	1.1320a	1.4076a	0.7515a	1.0878a	2.2330a	2.2267a
	(12.57)	(12.52)	(11.71)	(7.95)	(6.09)	(7.38)	(6.22)
Education	-0.1116	-0.2806a	-0.3316b	0.0378	-0.6868b	-1.1146a	3.0431a
	(1.10)	(2.65)	(2.36)	(0.24)	(2.46)	(2.68)	(5.43)
FDI	0.1716b	0.1993a	0.1544	0.0171	-0.2546b	-2.8683a	-2.5677b
	(2.47)	(2.70)	(1.54)	(0.32)	(2.40)	(2.91)	(2.34)
TSS/TNS	-0.0223	0.0589b	0.0883a	0.0391	0.1030	0.1041	0.3944a
	(0.98)	(2.47)	(2.77)	(1.21)	(1.58)	(1.08)	(3.50)
Dummy industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dummy country	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dummy period	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4489	6003	4107	1334	1242	885	719
Number	292	389	275	80	79	71	62
R-squared	0.17	0.21	0.23	0.39	0.32	0.23	0.35

Annex 5.2: Direct and Indirect effects of N-S and S-S trade on wage inequality

Countries	Developing			Upper middle		Low	
Skill intensive	LSL	MSL	HSL	LSL	HSL	LSL	HSL
	wage	**wage**	**wage**	**wage**	**wage**	**wage**	**wage**
GDP pc	0.6374a	0.5108a	0.5967a	0.9686a	0.7404a	0.2743	0.0859
	(2.95)	(2.62)	(2.59)	(5.08)	(3.33)	(1.42)	(0.94)
Education	0.0138	-0.1214	-0.1398a	0.1143	-0.1766c	0.3972c	0.4191a
	(0.34)	(1.02)	(2.77)	(1.27)	(1.71)	(1.93)	(2.47)
FDI	0.0127	0.0219	0.0691c	-0.1315a	-0.1023a	0.0604	0.6560c
	(0.45)	(0.78)	(1.93)	(2.27)	(2.61)	(0.22)	(1.95)
TSS/TNS	-0.0784a	-0.0858a	-0.0596a	-0.1283a	-0.1071a	0.0218	0.0345
	(2.88)	(3.44)	(2.93)	(2.33)	(1.97)	(0.75)	(1.32)
TFP	0.2275a	0.1332a	0.1129a	0.3395a	0.1329a	0.1231a	0.0731a
	(3.74)	(3.59)	(4.47)	(4.48)	(2.85)	(3.32)	(2.23)
Dummy industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dummy country	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dummy period	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4489	6003	4107	1334	1242	885	719
Number	292	389	275	80	79	71	62
R-squared	0.42	0.36	0.36	0.58	0.54	0.39	0.47

Annex 5.3 Quantify the effects Effect of 1% increase in the ratio TSS/TNS[12]

	Developing			Upper middle		Low	
	LSL	MSL	HSL	LSL	HSL	LSL	HSL
Direct	-0.0784	-0.0858	-0.0596	-0.1283	-0.1071	*0.0218*	*0.0345*
Indirect	*-0.0051*	0.0078	0.0100	*0.0133*	*0.0137*	0.0128	0.0288
Total	- 0.0835	-0.0780	-0.0496	-0.1150	-0.0926	0.0346	0.0633

[12] value in italic indicates that it is not significant

A.6: *Adjusted trade openness index*

The basic gravity model posits that the volume of trade between two nations is an increasing function of the incomes of those nations and a decreasing function of the distance between them. Although we include other variables, including whether the countries share a common border and/or a common language are often added to the model. Frankel and Romer (1999) use it to estimate the natural openness in a country. By implication, the model should also be able to help us in identifying abnormal or distorted patterns of trade and estimating the extent to which these are due to the trade policies of particular nations. The basic form of the gravity model can be expressed in log-linear form as

$$\ln\left(\frac{(M+X)_{ijt}}{Y_{it}}\right) = \alpha_{it} + \beta_1 \ln Y_{jt} + \beta_2 \ln(P_{it} * P_{jt}) + \beta_3 Dist_{ijt} + \beta_4 \ln K_{ijt} + \beta_5 \ln N_{ijt} + \beta_6 \ln T_{ijt} + \beta_7 \ln H_{ijt} + \beta_8 \ln(R_{it} * R_{jt}) + \beta_9 Z_{ij} + \varepsilon_{it}$$

Where $(M+X)_{ijt}$ represents total trade flow between country *i* and *j*, Y_{it} and Y_{jt} denote national income, P_{it} and P_{jt} are total population, $Dist_{ijt}$ is the distance between economic centers of each country. Z_{ij} represents dummies including whether the countries share a common border and/or a common language, are landlocked or exporter of oil. The Heckscher-Ohlin (HO) model of trade suggests that trade flows should vary with the character of each nation's factor endowments relative to trading partners. That is why we include variables that represent differences in factor endowments between countries. K_{ijt}, N_{ijt}, T_{ijt} and H_{ijt} are differences in factor endowments between countries *i* and *j* in physical capital per labor, mineral/fuel resources per labor, arable land per labor and human capital per labor. We include also the remoteness since a country's trade with any given partner is dependent on its average remoteness to the rest of the world (Anderson and Van Wincoop 2003). Let R_i and R_j, denote the remoteness of j and i, equal to GDP-weighted of distance.

In order to evaluate the distorting effects of each country's policies in each year we include a country year dummy α_{it} for country *i* in year *t*. The country-year dummy variables stand in for the (unmeasured) relative openness of trade policy orientations. A similar approach has been used to gauge the effects of regional trade agreements on trade flows by using dummy variables for pairs of nations in the same regional bloc as

a proxy for regionally specific discriminatory policies. Here the set of estimated coefficient α_{it} provides the amount of trade flows due to distorting effects of each country's policies in each year when compared to the mean for the entire sample.

The yearly data set is a panel of bilateral trade flows for 91 countries over the period 1975-1998. The data on trade flows come from Andrew Rose (2004) based on the CD Rom "Direction of Trade" from IMF. The measure of income is the real GDP in 1995 dollar from WDI (2004). The measure on distance comes from CEPII. Measure on capital per worker comes from Easterly and Levine (1999) and Kraay and al. (2000), the measure on arable land par person comes from WDI (2004) and the average years of schooling in the population over 15 years old comes from the Barro and Lee (2000) database. The measure for natural resources is the index from Isham and al. (2005) base on net exports share on fuels and minerals/

To check the robustness of our approach, we also estimate the previous model on imports to country *i* from *j*. So we have four estimations in OLS where columns 1 and 2 deal with total trade flows (imports and exports) with southern and northern countries respectively, column 3 and 4 deal with imports flows.

	1		**2**		**3**		**4**	
	S-S		**S-N**		**S-S**		**S-N**	
	(Xij+Mij)/GDPi		(Xij+Mij)/GDPi		Mij/GDPi		Mij/GDPi	
		t		t		t		t
GDP j	.8434706	136.58	1.088825	171.48	.8407659	121.89	1.096644	177.21
Distance ij	-1.567697	-128.38	-1.362507	-69.93	-1.599144	-124.18	-1.269562	-63.49
Remoteness j	13.9901	22.32	-11.43796	-14.96	18.12565	23.98	-13.30967	-17.02
Difference in K/L	-.0504299	-4.23	.5902252	15.89	-.050749	-3.79	.6914029	18.07
Difference in AT/L	.2561743	31.34	.0847337	8.54	.2553133	29.18	.0775922	7.76
Difference in MF/L	.236932	5.63	-.1345675	-4.56	.2708983	5.88	-.0973902	-3.16
Difference in Ed/L	.2308808	9.26	.4954804	11.30	.2830758	7.70	1.143677	18.50
GDPj/POPj	.4689212	36.31	.0703882	1.11	.4851791	32.83	.2897272	4.30
Common border	.1728211	4.64	-.8173135	-6.00	.1034525	2.59	-1.046493	-8.60
Colonial relation	.1860693	2.24	.8976046	29.58	.2208701	2.64	.7736648	24.96
Common colons	1.076913	32.42	-.0895179	-1.44	1.140991	32.10	-.2606428	-4.37
Common language	.2126735	9.65	.4332245	20.65	.2323986	10.10	.4174662	19.95
Island	-.1108155	-3.78	.2906113	9.56	-.1338648	-4.38	.206694	6.60
landlockness	-.1997701	-6.50	-.0450844	-2.21	-.204416	-5.54	-.0849352	-4.18
R^2								
Observations								

***A.7**: Alternative measures for wage inequality and trade openness*

	1	**2**	**3**	**4**
Sample	Fixed effect Developing	Fixed effect Developing	Fixed effect Developing	Fixed effect Developing
Index of wage inequality	SDLW	Theil	SDLW	Theil
GDP pc	-0.061	-0.376	-0.058	-0.402
	(1.39)	(2.23)**	(1.28)	(1.84)*
FDI	0.509	4.174	0.146	2.534
	(1.33)	(2.33)**	(0.40)	(1.54)
Education	-0.068	0.070	-0.038	0.204
	(2.02)**	(0.44)	(0.76)	(1.05)
Open SS			0.023	0.066
			(2.74)***	(2.34)**
Open NS			-0.041	-0.121
			(3.83)***	(2.61)***
Trade SS	0.026			
	(3.11)***			
Trade NS	-0.022			
	(1.57)			
TSS/TNS		0.093		
		(2.43)**		
Dummy period	Yes	Yes	Yes	Yes
Constant	0.862	4.184	0.758	3.703
	(3.32)***	(3.58)***	(2.77)***	(2.64)***
Observations	406	388	329	313
Number	67	67	52	52
R-squared	0.20	0.23	0.23	0.26