Globalization and Inter-occupational Inequality in a Panel of Countries: 1983-2003

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Abstract

How does globalization affect inter-occupational wage inequality within countries? This paper empirically examines this issue by focusing on two dimensions of globalization, openness to trade and openness to capital, using a relatively new dataset on occupational wages. Estimates from dynamic models for 52 countries for the 1983-2002 period suggest that openness to trade contributes to an increase in occupational wage inequality within developed countries, but that the effect diminishes with an increased level of development. In the context of developing countries, the results suggest that the effect of openness to trade on wage inequality is insignificant and does not vary with the level of development. Our results also suggest that openness to capital does not affect occupational wage inequality in either developed or developing countries.

Key words: openness to trade; openness to capital; foreign direct investment; occupational wage inequality; panel data; dynamic model.

JEL codes: F15, F16, F23, J31, C33

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1. Introduction

Occupational wage inequality has increased in many developed and developing countries in the last two decades. Hence, there has been a growing debate whether globalization has contributed to the increase in wage inequality in these countries (for developed countries see Slaughter and Swagel, 1997, and Schott, 2001; for developing countries see Goldberg and Pavcnik, 2007, and Anderson, 2005; and for both developed and developing countries see Majid, 2004, and Milanovic and Squire, 2005). According to the standard Hecksher-Ohlin-Samuelson (H-O-S) model (Samuelson, 1953), increased trade may increase occupational wage inequality in developed countries but is expected to decrease inequality in developing countries.

Globalization has many different dimensions; outsourcing, immigration, and mobility of goods, services, and capital are some aspects that have been subject to empirical analysis. Analyses of globalization and wage inequality have historically been limited to single-country analysis as there has been no generally accepted comparable data on occupational wages across countries. However, recently the Occupational Wages around the World (OWW) database, which includes both cross-section and time series observations, became available.[1] It is a huge country-occupation-time matrix containing occupational wages for 164 occupations in more than 150 countries during the 1983-2003 period. Few studies analyzing the impact of globalization on wage inequality across

[1] The dataset can be accessed at the National Bureau of Economics Research (NBER) website http://www.nber.com. Another database, the University of Texas Inequality Project (UTIP), provides information on inter-industrial wage differential for 90 countries over the 1975-99 period. The dataset can be accessed at http://utip.gov.utexas.edu/

countries have since obtained evidence contrary to the predictions of the H-O-S theory (Majid, 2004; Milanovic and Squire, 2005).

In this paper, we further explore how increased trade and capital flows affect inter-occupational wage inequality across countries by using OWW data for 52 developed and developing countries covering the entire OWW period, i.e., 1983-2003. Compared to previous studies, we cover a relatively recent period when increased capital flows played an important role in the globalization process. We measure occupational wage inequality (or wage gap) as the ratio of wages of skilled to unskilled workers. Occupations are classified as skilled or unskilled based on educational attainment, which follows the International Standard Classification of Occupations 1988 (ISCO-1988). Given that the standard trade theory (Samuelson, 1953) predicts that increased openness increases wage inequality in developed countries and decreases wage inequality in developing countries, we perform a separate analysis for these two groups of countries by estimating several econometric models of both dynamic and non-dynamic character.

The results support the theoretical predictions regarding developed countries: openness to trade does contribute to an increase in occupational wage inequality by increasing the wage gap. The results also suggest that the increased inequality is more evident in developed countries found at the relatively lower levels of development (e.g., Portugal) and that the increase in wage inequality diminishes with increasing levels of development (e.g., Canada). In the context of developing countries, however, our results suggest that openness has an insignificant impact on wage inequality and that the effect of openness does not vary with the level of development. The results also suggest an

insignificant impact of openness to capital on occupational wage inequality in both developed and developing countries.

The remainder of the paper proceeds as follows. Section 2 presents a review of standard theory and relevant empirical literature on globalization and occupational wage inequality, and Section 3 presents a description of the econometric model and data used in the paper. Section 4 presents the econometric analysis and the results, and Section 5 concludes the paper.

2. Globalization and Occupational Wage Inequality

The standard model used to investigate the effects of openness to trade on wage inequality is the already mentioned H-O-S model (Samuelson, 1953), which is based on some quite restrictive assumptions[2] that are often not able to capture reality. However, the simple prediction of the model is intuitive and widely used in empirical studies to analyze the distributional effects of greater openness to trade. According to the model, unskilled labor-intensive developing countries will tend to specialize and export unskilled labor-intensive products while skilled labor-intensive and capital-endowed developed countries will specialize and export skilled labor-intensive products. Thus, increased trade, via the Stolper-Samuelson effect (Stolper and Samuelsom, 1941), should raise the wages of unskilled workers in developing countries and of skilled workers in developed countries. Hence, under certain assumptions, the model predicts a reduction in wage inequality in developing countries and vice versa in developed countries.

[2] See Goldberg and Pavcnik, 2007 for a discussion on this.

One example of the restrictive assumptions of the H-O-S model is the immobility of capital between countries, although trade liberalization is often accompanied by policies targeted to liberalize capital markets. In fact, the increased capital flows that began in the 1990s are along with trade playing an increasingly important role in the globalization process. The empirical evidence so far provides mixed views of the impact of increased trade and capital on wage inequality:[3] While increased trade may reduce wage inequality, increased capital flows, particularly foreign direct investment (FDI), may cause it to increase in a particular country. In a worst case scenario they may actually both increase wage inequality.

Capital is expected to flow to capital-scarce developing countries where the marginal product of capital is high (Mundell, 1957). Feenstra and Hanson (1995) develop a theoretical model to show that a flow of capital from North (a rich country) to South (a poor country) raises the relative wage of skilled workers in both countries. Depending on the nature of foreign investment and the level of development of the recipient country, wage inequality may either increase (see Taylor and Driffield, 2000, for evidence in the UK) or decrease (see Haddad and Harrison, 1993, for evidence in Morocco).[4]

Although labor markets in developed countries are relatively more integrated than in developing countries, perfect mobility of labor between sectors, as is assumed in the H-O-S model, is not realistic. Labor market rigidity causes a lack of labor reallocation between sectors, and greater openness should then affect wage inequality through changes

[3] For developed countries see Slaughter and Swagel, 1997, and Schott, 2001, and for developing countries see Anderson, 2005, and Goldberg and Pavcnik, 2007.

[4] See Slaughter (2002) for a discussion on several channels through which FDI can stimulate the demand for skilled workers.

in wages.[5] However, if wages are not as flexible as the H-O-S model requires, then changes in labor demand may increase transitional unemployment, resulting in an increase in the size of the informal sector. This potential problem of globalization has gained a lot of media and political attention.[6] Since workers are paid less in the informal sector, an increase in its size may keep real wages down, thus raising wage inequality.

There are several other important channels as well through which globalization may affect occupational wage inequality. A large number of studies have pointed to skilled-biased technological change (SBTC), linked to openness to international trade and capital either directly or indirectly, as one of the most important factors causing wage inequality to rise (Behrman et al., 2000; Esquivel and Rodriguez-Lopez, 2003; Pavcnik, 2003; Attanasio et al., 2004). Another channel through which globalization may affect wage inequality is the recent increase in outsourcing or trade in intermediate goods and services. Feenstra and Hanson (1999) find that in the 1979-1990 period, outsourcing was responsible for 17.5% to 40% of the increase in the relative wages of US non-production workers. In the general equilibrium model by Ekholm and Ulltveit-Moe (2007), the effect of offshoring (outsourcing abroad) depends on the relative influence of two forces: vertical specialization and competition. Greater vertical specialization may increase the skill premium and therefore wage inequality in industrialized countries. On the other hand, increased competition may reduce the wage premium and therefore wage inequality in these same

[5] A number of studies have reported a lack of labor relocation in developing countries (Currie and Harrison, 1997; Hansson and Harrison, 1999; Attanasio et al., 2004).

[6] See Goldberg and Pavcnik (2003) for a theoretical model and Attanasio et al. (2004) for empirical evidence.

countries. The recent fall in relative wages in US manufacturing was according to Ekholm and Ulltveit-Moe (2007) due to the dominance of the second force.

Although a Gini coefficient is traditionally used to analyze the changes in income inequality (see Edwards, 1997; Barro, 2000; Dollar and Kraay, 2002), its use in cross-country analysis is problematic since the coverage of income sources and taxes tends to differ across countries. To avoid this problem, more recent studies use wage inequality as a measure of income inequality (e.g., Te Velde and Morrisey, 2004; Milanovic and Squire, 2005). In general, wages constitute the major portion of the incomes of individuals, and hence income and wage inequality move in the same direction. Below we discuss the relevant previous studies that used the OWW database to analyze the impacts of globalization on wage inequality in several countries. However, the discussed studies use different methodologies and cover different time period.

Most studies on inter-occupational inequality use a measure of skill differential following Freeman and Oostendorp (2000). Their measure of wage inequality is based on decile earnings in the wage distribution for each country, and on the assumption that relatively high-paid occupations are also relatively high-skilled. More exactly, Freeman and Oostendorp (2000) first order the occupations in each country according to wage level, then divide the ordering into deciles, and finally use the mean wage in each decile to calculate a measure of dispersion as the ratio of the wages in the 90^{th} percentile to the 10^{th} percentile of the wage distribution. The advantage of this measure is that it utilizes a maximum amount of data in the OWW database. However, the problem with this approach, as noted in Freeman and Oostendorp (2000), is that the number of occupations varies across countries and time, which may influence the spread of wages.

To our knowledge, only a few studies use the OWW database to analyze the impact of globalization on wage inequality (Majid, 2004; Te Velde and Morrisey, 2004; Milanovic and Squire, 2005). Milanovic and Squire (2005) use the Gini coefficient as a measure of inter-occupational wage inequality and obtain weak evidence of reduced levels in rich countries and increased levels in poor countries in the 1984-1999 period. Majid (2004) uses standard deviation of log of wages as a measure of wage dispersion and finds increasing and decreasing wage inequality in developing and developed countries respectively in the 1983-1998 period. Measuring wage inequality as the ratio of skilled to low-skilled wage, Te Velde and Morrisey (2004) find decreasing levels in some, but not all, East Asian countries in the 1985-1998 period .

3. Econometric model and Data

This section outlines the empirical model, describes the data, and finally explains the choices of the explanatory variables used in the analysis.

The general specification of the empirical model is as follows, where the dependent variable, relative wage, is explained by openness to trade, openness to capital, and GDP per capita.

$$LnW_{it} = \alpha_1 LnW_{i,t-1} + \alpha_2 LnTRA_{it} + \alpha_3 LnCAP_{it} + \alpha_4 LnGDP_{it} + \alpha_5 LnTRA_{it} LnGDP_{it} + \alpha_6 LnCAP_{it} LnGDP_{it} + v_{it} + \mu_{it} \quad [1]$$

where LnW_{it} denotes the log of the ratio of skilled to unskilled wages in country *i* at time *t*. This ratio is the measure of inter-occupational wage inequality. The variable $LnW_{i,t-1}$ denotes a one period lag of the dependent variable, while $LnTRA_{it}$ and $LnCAP_{it}$ denote measures of openness to trade and openness to capital respectively. The coefficients

of these two variables are expected to have a positive sign for developed countries and a negative sign for developing countries. The variable $LnGDP_{it}$ denotes log of GDP per capita, used here as a proxy for the level of development. The two interaction variables, $LnTRA_{it}LnGDP_{it}$ and $LnCAP_{it}LnGDP_{it}$, denote the interaction between GDP per capita and openness to trade and the interaction between GDP per capita and openness to capital respectively. Finally, ν_i is the intercept and μ_{it} is a disturbance term where i indexes individual countries in a cross section and t indexes time.

3.1 Inter-occupational wage inequality

The International Labor Organization (ILO) has conducted a survey since 1924 called the "October Inquiry" to collect data on wages by occupation across countries. However, the data lacks comparability across occupations and countries since different countries report wages differently. While some countries report national data, others report data from major cities or urban areas, and while some countries report national averages of earnings, some report minimum wages or collectively bargained wages. Moreover, while some report multiple wage figures, others report only monthly, weekly, or daily wages. In addition, some countries report wages separately for males and females, while others report them together. The number of reported occupations also varies across countries and years.[7]

Fortunately, Freeman and Oostendorp (2000) managed to standardize the ILO October Inquiry data into the previously described OWW, where wages are reported as

[7] For a detailed description of the heterogeneity in October Inquiry data and the standardized procedure, see Freeman and Oostendorp (2000).

monthly averages for males in national currencies. The data used in this study is a subset from the OWW including 15 developed and 37 developing countries and covering the 1983-2003 period. It is an unbalanced panel in which there are several missing values. Only countries with data for at least two occupations in each of the skilled and unskilled categories for at least three consecutive years are included in the analysis.

As suggested by Freeman and Oostendorp (2000), we have used the base calibration with county-specific uniform weighting to get the nominal wages for the occupations. The occupations are found in most countries for most of the time period, and are classified as either skilled (19 occupations) or unskilled (15 occupations) according to the skill levels used in ISCO-88. The ISCO-88 uses education categories with reference to the International Standard Classification of Education 1976 (ISCED 76) to approximate skill levels.[8] Following this, an unskilled worker is at the first ISCO skill level (major group 9: elementary occupations). This corresponds to ISCED category 1 which comprises primary education. Skilled workers are at the fourth ISCO skill level (major group 2: professional) which corresponds to ISCED categories 6 and 7, which comprises a university or post graduate university degree or equivalent. A list of skilled and unskilled occupations with the corresponding ISCO-88 codes used in this paper is reported in Tables 1 and 2 of

[8] However, in ISC0-88, skills necessary to perform a job can also be acquired by informal training and experience. For instance, the 2nd skill level (e.g., skilled agricultural or fishery workers/plant and machine operator) corresponds to the ISCED categories 2 and 3, which comprise the first and second stages of secondary education. Following ISCO-88, on-the-job training may supplement this education.

Appendix 1. Inter-occupational wage inequality is measured by the ratio of wages of skilled to unskilled workers for the same occupations in all countries.[9]

3.2 Explanatory Variables

As said in the introduction, globalization has many different dimensions; outsourcing, immigration, and mobility of goods, services, and capital are some aspects that have been subject to empirical analysis. In this paper we consider two dimensions of globalization: openness to trade and openness to capital. We separate the sample into developed and developing countries, since globalization, particularly openness to trade, is expected to increase wage inequality in developed countries and reduce it in developing countries.

The pool of developed countries is made up of the 24 high-income OECD nations.[10] However, only 15 of the 24 are used in the analysis. The other nine were excluded due to several reasons. Occupational wages are not reported in the OWW for Switzerland, Greece, and Spain, and data is available for only one year for France and Luxemburg and for only two years for Ireland. No skilled occupational wages are reported for the chosen occupations in this study for Belgium and Iceland, and for Japan there is only one recorded unskilled occupational wage throughout the period.

[9] Te Velde and Morrisey (2004) use a similar measure of wage inequality for five countries. However, they define relative wage as the ratio of the wages of skilled to low-skilled workers where low-skilled workers corresponds to first and second ISCO skill level.

[10] Countries are classified according to the World Development Indicator 2006. The countries included in this study are reported in Tables 3 and 4 in Appendix, while the low-and middle-income developing countries not included in the OWW are reported in Table 5.

The beginning developing countries group includes 116 low- and middle-income nations outside Europe and Central Asia and the Middle East. Although the OWW reports occupational wages for 65 of these, only 46 have wages reported for at least three consecutive years. After excluding another nine due to lack of available data on openness measures, we are left with a sample of 37 developing countries.

Satisfactory measures of openness to trade and openness to capital are still not available. Hence, while reduced tariff and non-tariff barriers generally indicate reduced trade protection, these policy variables (particularly the non-tariff barriers) are difficult to measure (although obtaining data for them is even more difficult). The most commonly used proxies for measuring the consequences of trade policies are the outcome-based measures exports and imports, or the sum of them as a percentage of GDP. An increase in the ratio over time indicates reduced trade protection. The limitation of these measures is obvious; an increase in the ratio can be influenced by other factors used in the empirical analysis, thus creating an endogeneity problem.

We use "trade as a percentage of GDP" as a proxy to measure openness to trade (Openness 1). [11] The data for this proxy is available for large cross sections of countries and has been used in previous studies (e.g., Dollar and Kraay, 2002, and Te Velde and Morrisey, 2004). As a robustness check of our empirical analysis we also use "imports as a percentage of GDP" from the World Development Indicator 2006 as an alternative openness measure (Openness 2).

Previous empirical studies used foreign direct investment (FDI), i.e., either FDI inflows or FDI stock as a percentage of GDP, as a proxy for openness to capital. FDI

[11] The data for this variable is obtained from the World Development Indicator 2006.

inflow is the sum of equity capital, reinvested earnings, and intra-company loans whereas FDI stock is the sum of FDI inflows over a period of time. The FDI stock may be considered a better measure to analyze the long-run impact of FDI than the commonly used FDI inflow. Therefore we use FDI stock as a percentage of GDP as a proxy for openness to capital.[12]

Globalization may impact skilled and unskilled wages differently depending on a country's level of development. There are huge differences in GDP per capita (an indicator of level of development) not only between but also within the two groups of countries (developed and developing). Since each openness measure (trade and FDI) most likely interacts with GDP per capita, the empirical analysis includes two interaction variables to capture this differential effect of level of development: openness to trade interacted with GDP per capita and FDI interacted with GDP per capita.[13] Table 1 presents the descriptive statistics of the variables used in the analysis.

>>> Table 1 here

4. Econometric Analysis

Several models are estimated to test the impact of openness on occupational wage inequality. Lagged relative wage is added as an explanatory variable since current wage most likely depends on past wage, and a dynamic model is estimated in addition to a non-dynamic model. First a simple specification of equation (1) is estimated using the key variables openness to trade and openness to capital (FDI) as explanatory variables. The

[12] Te Velde and Morrisey (2004) have used this proxy for openness to capital. The data is available at http://www.unctad.org/fdistatistics.

[13] GDP per capita is in constant 2000 international dollars, which is obtained from the Penn World Table 6.2. The data is available at http://www.nber.com.

results are presented in Table 2 and Table 3 for developed and developing countries respectively. Then the model is re-estimated by adding the interaction variables. The results are reported in Table 4 and Table 5 for developed and developing countries respectively. The robustness of our results is checked by using an alternative measure of openness to trade, the results of which are reported in Tables 6 and 7.

The first two columns (Columns 2 and 3) in Table 2 and Table 3 present the pooled OLS estimates as a baseline. The results show that the coefficients for openness to trade and FDI are small and insignificant, possibly due to omitted country fixed effects. The fixed effects (FE) models are useful to control for unobserved country fixed effects. In particular, the FE estimation takes care of unobservable time-invariant heterogeneity across countries by allowing for country fixed effects. Omitted variables therefore do not pose a problem even if they are correlated with the regressors. Therefore, the FE method provides more robust estimates in the case of an incomplete model specification.[14] The estimation results from the FE specification are presented in Column 4 of Table 2 and Table 3 for developed and developing countries respectively; the openness to trade coefficient is positive and significant for developed countries but insignificant for developing countries. The coefficient for FDI is significant for developed countries but insignificant for developing countries. This suggests that openness to trade increases occupational wage inequality in developed countries whereas FDI (openness to capital) reduces it. However,

[14] Under certain circumstances, random effects estimators may provide more efficient estimations. Using a Hausman test (Hausman, 1978), we find that the explanatory variables are correlated with the individual effects, meaning that the random effects model will provide inconsistent estimates in our case.

both globalization variables have an insignificant cant impact on wage inequality in developing countries.

>>>Table 2 here

>>>Table 3 here

The strict exogeneity assumption is violated in a dynamic model and the FE methods may produce biased estimates due to the correlation between the lagged dependent variable and the disturbance term. Nevertheless, since we have a fairly large T panel, the bias is probably small in our FE estimation (see Bond, 2002).[15] Hence, we estimate the model with dynamic FE and report the results alongside the non-dynamic FE results in Column 5 of Table 2 and Table 3 for developed and developing countries respectively.

As a robustness check of the dynamic FE estimates, we use the instrumental variable approach and estimate the model with the 2SLS method and the difference-GMM by Arellano and Bond (1991). However, it is difficult to find suitable instruments. The second lag of the dependent variable is used as an instrument for the differenced dependent variable. In most of the dynamic specifications, i.e., the dynamic FE, the 2SLS, and the differenced-GMM (Tables 2 and 3, Columns 5, 6, and 7), the lagged dependent variable term is found to be significant, which shows the importance of the dynamics in the system. However, the 2SLS and the differenced-GMM produce less precise estimates compared to FE in our case, as indicated by more than double standard error for most of the coefficients. This might be a result of using weak instruments. The dynamic FE estimation hence

[15] It should be noted here that the missing values make the average T smaller than 21. The size of the bias might therefore actually be greater than it would have been if T had been 21.

continues to be our preferred model, and the following discussion focuses on the results from this estimation (Tables 2 and 3, Column 6).

The coefficient for the openness to trade variable is positive and significant at the 1% level (Table 2, Column 5) for developed countries. The estimated short-run impact of openness to trade on wage inequality in these countries is 0.290, while the long-run impact is 0.559 (0.290/ (1-0.481)) compared to the non-dynamic (long-run) estimate of 0.442. Both of these estimates suggest an increase in occupational wage inequality; in the long run a 1% increase in openness to trade results in a 0.56% increase in wage inequality. In contrast, we do not find any statistically significant effect of openness on occupational wage inequality for developing countries (Table 3, Column 5).

In Table 4 and Table 5 we re-estimate the regressions of Table 2 and Table 3, but add two interaction variables. The coefficient for the interaction term between openness to trade and GDP per capita is found to be negative and significant for developed countries (Table 4, Column 5). This suggests that increased trade increases wage inequality mostly in developed countries with relatively low levels of GDP per capita. When evaluated at the sample mean of log GDP per capita, the partial effect of openness is 0.21 with a standard error of 0.003, which implies that a 1% increase in openness increases wage inequality by 0.21%. However, this increase in inequality weakens with increased GDP per capita (e.g., higher level of economic development). The coefficient for the interaction term between FDI and the level of development is insignificant for developed countries (Table 4, Column 5), implying that the impact of increased FDI on occupational wage inequality is similar at any level of development within this group of countries. As shown in Table 5, we do not find any statistically significant evidence that the impact of increased openness (either trade

or FDI) on occupational wage inequality varies with level of development in developing countries.

>>>Table 4 here

>>>Table 5 here

The robustness of the results discussed above is checked by using another measure of openness: imports as a percentage of GDP (Openness 2). The results from different specifications, i.e., FE, 2SLS, and GMM, are reported in Columns 2, 3, 4, and 5 in Table 6 and Table 7 for developed and developing countries respectively. Overall, the main results are qualitatively the same in terms of statistical significance. However, the coefficients for openness to trade are smaller for Openness 2 than for Openness 1 for developed countries.

>>> Table 6 here
>>> Table 7 here

5. Conclusions

By analyzing data for 34 occupations across 52 countries over the 1983-2003 period, this article provides fresh empirical evidence on the impact of globalization on inter-occupational wage inequality by using a relatively new database (OWW) and by focusing on openness to trade and openness to capital. Non-dynamic and dynamic models are estimated to investigate the impact of globalization on occupational wage inequality, which is measured by the ratio of skilled to unskilled wages. We perform separate analyses for developed (high-income OECD) and developing (low- and middle-income) countries.

Overall, the effect of openness is smaller in developing countries than in developed countries, where openness to trade contributes to an increase in occupational wage inequality by increasing the wage gap between skilled and unskilled workers. This result is in line with the theoretical prediction and in contrast to some previous findings (e.g., Majid, 2004, and Milanovic and Squire, 2005). Following the H-O-S intuition, these countries specialize in and export skilled labor-intensive products, resulting in a relative increase in the wages of skilled workers, in turn increasing wage inequality. The results also suggest that the increased inequality is more evident in developed countries which are at relatively low levels in their development process, and that the increase in wage inequality diminishes with increasing level of development. This can be interpreted using Tinbergen's (1974) argument that with an increased level of development in a developed country comes an increased supply of educated skilled workers who are able to fill the demand for technology-induced skilled workers. Consequently, an increased level of development may result in diminishing wage inequality. The increased openness to capital, measured by FDI, has insignificant impact on occupational wage inequality at any level of development. This is plausible because the OECD countries have already reached a certain level of development where increasing FDI, most likely due to the investment pattern in those countries, impacts skilled and unskilled wages similarly.

In the context of developing countries, our results suggest that openness to trade and FDI have insignificant impact on wage inequality and that the effect of openness does not vary with level of development. There may be factors not captured in our analysis at work as well, which may offset the effects of globalization. One such factor is resource abundance across countries in the low- and middle-income groups. For example, compared

to the abundance of natural resource in many Latin American countries, most Asian countries have a relative abundance of unskilled labor. Consequently, the impact of increased trade on wage inequality may differ between Latin American and Asian countries. Although most of the countries experienced trade reform more or less at the same time, the time period for capital market reform varies across countries. The amount and characteristics of FDI received vary as well. Again, labor market institutions play a major role in this context. The findings in this paper have important implications for a country's policy towards trade liberalization as well as for attraction of foreign direct investment. More detailed analysis for developing countries is required, which is left for future research.

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Table 1. Descriptive Statistics

	Developing countries(37)			Developed countries(15)		
Variables (in logarithms)	Mean	SD	N	Mean	SD	N
Relative wage (the ratio of skilled to unskilled wage)	1.04	0.550	320	0.59	0.213	207
Real GDP per capita	8.06	0.932	381	9.93	0.286	222
Trade as a percentage of GDP (Openness 1)	4.02	0.534	381	3.98	0.373	222
Imports as a percentage of GDP (Openness 2)	3.40	0.533	381	3.29	0.344	222
Foreign Direct Investment stock as a percentage of GDP (FDI)	2.30	1.094	371	2.24	0.761	222

Table 2. Occupational Wage Inequality – Developed Countries

Dependent variable	Relative wage					
Regression method	(2) OLS	(3) OLS(dynamic)	(4) FE	(5) FE(dynamic)	(6) 2SLS	(7) GMM
Lagged relative wage		0.90*** (0.036)		0.481*** (0.051)	0.516** (0.241)	0.460* (0.263)
Openness 1	-0.048 (0.089)	-0.016 (0.026)	0.422*** (0.080)	0.290*** (0.069)	0.257 (0.153)	0.179 (0.225)
FDI	-0.079 (0.053)	-0.003 (0.010)	-0.099*** (0.034)	-0.042 (0.028)	-0.067* (0.036)	-0.021 (0.036)
Number of Observations	207	187	207 [15]	187 [15]	170	170[15]
Hansen Test (p value)						0.905
m1 (p value)						0.059
m2 (p value)						0.214

Notes: All variables are in logarithms. Robust standard errors in parentheses. Linear time trend and constant are included in the regressions. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level respectively. m1 and m2 are tests for first-order and second-order autocorrelation in the first-differenced residuals. The null hypothesis of the Hansen test is that the overidentifying restrictions are valid.

Table 3. Occupational Wage Inequality – Developing Countries

Dependent variable	Relative wage					
Regression method	(2) OLS	(3) OLS(dynamic)	(4) FE	(5) FE(dynamic)	(6) 2SLS	(7) GMM
Lagged relative wage		0.888*** (0.034)		0.403*** (0.073)	0.466 (0.328)	0.151 (0.255)
Openness 1	0.017 (0.165)	0.012 (0.026)	0.057 (0.112)	0.109 (0.134)	0.090 (0.227)	0.316* (0.168)
FDI	-0.055 (0.066)	-0.004 (0.011)	-0.055 (0.048)	-0.065 (0.060)	0.110 (0.072)	0.021 (0.044)
No. of Observations	311	247	311	247	190	190
Hansen Test (p value)						0.446
m1 (p value)						0.235
m2 (p value)						0.493

Notes: All variables are in logarithms. Robust standard errors in parentheses. Linear time trend and constant are included in the regression. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level respectively. m1 and m2 are tests for first-order and second-order autocorrelation in the first-differenced residuals. The null hypothesis of the Hansen test is that the overidentifying restrictions are valid.

Table 4. Occupational Wage Inequality – Developed Countries with Interaction Variables

Dependent variable	Relative wage					
Regression method	(2) OLS	(3) OLS(dynamic)	(4) FE	(5) FE(dynamic)	(6) 2SLS	(7) GMM
Lagged relative wage		0.827*** (0.069)		0.404*** (0.053)	0.342** (0.146)	0.438 (0.295)
Openness 1	8.38*** (1.88)	2.689** (0.956)	3.619** (1.629)	2.238* (1.308)	6.683* (3.406)	13.903* (7.314)
FDI	0.045 (0.966)	0.045 (0.206)	-0.997** (0.485)	-0.433 (0.396)	-0.603 (1.250)	-0.848 (1.90)
GDP per capita	3.09*** (0.812)	1.03** (0.359)	1.020 (0.702)	0.539 (0.555)	2.280 (1.395)	5.751* (3.20)
Openness 1× GDP per capita	-0.842*** (0.184)	-0.269** (0.095)	-0.337** (0.166)	-0.204* (0.133)	-0.654* (0.350)	-1.39* (0.746)
FDI × GDP per capita	-0.010 (0.99)	-0.004 (0.022)	0.091* (0.050)	0.039 (0.041)	0.054 (0.127)	0.081 (0.192)
No. of Observations	207	187	207	187	170	170
Hansen Test (p value)						0.999
m1 (p value)						0.076
m2 (p value)						0.213

Notes: All variables are in logarithms. Robust standard errors in parentheses. Linear time trend and constant are included in the regression. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level respectively. m1 and m2 are tests for first-order and second-order autocorrelation in the first-differenced residuals. The null hypothesis of the Hansen test is that the overidentifying restrictions are valid.

Table 5. Occupational Wage inequality – Developing Countries with Interaction Variables

Dependent variable	Relative wage					
Regression method	(2) OLS	(3) OLS(dynamic)	(4) FE	(5) FE(dynamic)	(6) 2SLS	(7) GMM
Lagged relative wage		0.847*** (0.044)		0.399*** (0.073)	0.529 (0.376)	0.111 (0.230)
Openness 1	-3.817*** (1.289)	-0.778** (0.295)	-0.122 (0.937)	0.697 (1.153)	0.889 (1.189)	0.788 (0.824)
FDI	0.766* (0.439)	0.159* (0.085)	-0.025 (0.353)	-0.172 (0.436)	-1.230* (0.630)	-0.735 (0.462)
GDP per capita	-1.892*** (0.517)	-0.377*** (0.131)	-0.070 (0.453)	0.408 (0.575)	-0.367 (0.547)	0.127 (0.462)
Openness 1× GDP per capita	0.461*** (0.144)	0.095*** (0.033)	0.022 (0.114)	-0.073 (0.140)	-0.099 (0.153)	-0.063 (0.105)
FDI × GDP per capita	-0.090* (0.051)	-0.018* (0.009)	-0.003 (0.043)	0.123 (0.054)	0.184* (0.087)	0.109 (0.067)
No. of Observations	311	247	311	247	190	190
Hansen Test (p value)						0.514
m1 (p value)						0.228
m2 (p value)						0.572

Notes: All variables are in logarithms. Robust standard errors in parentheses. Linear time trend and constant are included in the regression. ***, **, and * denote statistical significance at the 1%, 5% and 10% level respectively. m1 and m2 are tests for first-order and second-order autocorrelation in the first-differenced residuals. The null hypothesis of the Hansen test is that the overidentifying restrictions are valid.

Table 6. Occupational Wage Inequality in Developed Countries: Robustness Check

Dependent variable	Relative wage			
Regression Method	(2) FE	(3) FE(Dynamic)	(4) 2SLS	(5) GMM
Lagged relative wage		0.515*** (0.054)	0.556* (0.251)	0.669**
Openness 2	0.211*** (0.053)	0.084** (0.045)	-0.023 (0.088)	0.003 (0.093)
FDI	-0.029 (0.034)	0.011 (0.026)	-0.031 (0.041)	0.004 (0.034)
No. of Observations	207	187	170	170
Hansen Test (p value)				0.983
m1 (p value)				0.028
m2 (p value)				0.169

Notes: All variables are in logarithms. Robust standard errors in parentheses. Linear time trend and constant are included in the regression. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level respectively. m1 and m2 are tests for first-order and second-order autocorrelation in the first-differenced residuals. The null hypothesis of the Hansen test is that the overidentifying restrictions are valid.

Table 7. Occupational Wage Inequality in Developing Countries: Robustness Check

Dependent variable	Relative wage			
Regression Method	(2) FE	(3) FE(Dynamic)	(4) 2SLS	(5) GMM
Lagged relative wage		0.405***	0.475	0.176
		(0.073)	(0.329)	(0.249)
Openness 2	-0.063	0.079	0.027	0.172
	(0.105)	(0.129)	(0.173)	(0.124)
FDI	-0.042	-0.062	0.115	0.034
	(0.048)	(0.059)	(0.071)	(0.041)
No of Observations	311	247	190	190
Hansen Test p value				0.472
m1 (p value)				0.215
m2 (p value)				0.502

Notes: All variables are in logarithms. Robust standard errors in parentheses. Linear time trend and constant are included in the regression. ***, **, and * denote statistical significance at the 1%, 5% and 10% level respectively. m1 and m2 are tests for first-order and second-order autocorrelation in the first-differenced residuals. The null hypothesis of the Hansen test is that the overidentifying restrictions are valid.

Appendix 1: Occupations and Country Lists

Table 1: Skilled occupations

# from ILO OI	Occupation	ISCO-88 code
11	Coalmining engineer	2147
14	Petroleum and natural gas engineer	2147
44	Journalist	2451
52	Chemical engineer	2146
61	Occupational health nurse	2230
76	Power distribution and transmission engineer	2143
129	Accountant	2411
133	Computer programmer in insurance	2132
138	Computer programmer in public administration	2132
145	Mathematics teacher (third level)	2310
146	Teacher in languages and literature (third level)	2310
147	Teacher in languages and literature (second level)	2320
148	Mathematics teacher (second level)	2320
149	Technical education teacher (second level)	2320
150	First-level education teacher	2331
151	Kindergarten teacher	2331
152	General physician	2221
153	Dentist (general)	2222
154	Professional nurse	2230

Table 2: Unskilled Occupations

# from ILO OI	Occupation	ISCO-88 code
13	Underground helper, loader in coal mining	9311
21	Hand packer	9322
28	Laborer in textiles	9322
51	Laborer in printing, publishing, and allied industries	9322
56	Laborer in manufacturing of industrial chemicals	9322
58	Hand packer in manufacture of other chemical products	9322
59	Laborer in manufacture of other chemical products	9322
70	Laborer in manufacturing in machinery	9322
80	Laborer in electric light and power	9322
90	Laborer in construction	9312/9313
100	Room attendant or chambermaid	9132
104	Railway vehicle loader	9333
117	Dockworker	9333
123	Aircraft loader	9333
144	Refuse collector	9161

Table 3 List of Developing Countries (37)

Algeria	Mali
Argentina	Mauritius
Bangladesh	Mexico
Barbados	Mozambique
Belize	Nicaragua
Bolivia	Niger
Burkina Faso	Peru
Burundi	Philippines
Cambodia	Rwanda
Cameroon	Sri Lanka
Central African Republic	St. Lucia
Chad	St. Vincent and the Grenadines
Chile	Thailand
China	Trinidad and Tobago
Colombia	Tunisia
Honduras	Uruguay
India	Venezuela, RB
Madagascar	Zambia
Malawi	

Table 4. List of Developed Countries (15)

Australia	Norway
Austria	Portugal
Canada	Sweden
Denmark	United Kingdom
Finland	United States
Germany	
Italy	
Korea, Rep.	
Netherlands	
New Zealand	

Table 5. Developing Countries Not Reported in OWW (51 countries)

Afghanistan	Kiribati	Samoa
Bhutan	Korea, Dem. Rep.	Sao Tome and Principe
Comoros	Lao PDR	Solomon Islands
Congo, Dem. Rep.	Lesotho	Somalia
Djibouti	Liberia	South Africa
Dominica	Malaysia	Tanzania
Ecuador	Maldives	Timor-Leste
Egypt, Arab Rep.	Marshall Islands	Tonga
El Salvador	Mauritania	Vanuatu
Eritrea	Mayotte	Vietnam
Ethiopia	Micronesia, Fed. Sts.	Zimbabwe
Gambia, The	Mongolia	
Grenada	Morocco	
Guatemala	Namibia	
Guinea	Nepal	
Guinea-Bissau	Northern Mariana Islands	
Haiti	Pakistan	
Indonesia	Palau	
Jamaica	Panama	
Kenya	Paraguay	