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THE EFFECT OF TRADE OPENNESS ON THE INCOME DISTRIBUTION OF LATIN AMERICA.

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Abstract: This study investigates the impact of the structural reforms in trade policy on the income distribution of Latin America in the period 1990-2015. This is accomplished by analyzing the effects of trade openness on the wage gap between high-skilled and low-skilled workers. It is found that the radical change in trade openness, in general, did not affect the wage gap. In only one of the six models, trade openness has a significant positive effect on the wage gap. The results show that a rise in trade volume increases income inequality. This effect can mainly be attributed to the changes in exports. Furthermore, an interaction effect exists between education and the structural reforms. It is found that trade liberalization decreases inequality in low-skilled labor abundant countries, whereas it increases inequality in high-skilled labor abundant countries. This effect is in line with the Heckscher-Ohlin model and the Stolper-Samuelson theorem. In contrast to previous research, this study finds no direct relationship between trade openness and income inequality.

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6 July 2018

Acknowledgements

I would like to thank my family, friends, colleagues and everyone who supported me in writing this thesis. Especially, I would like to thank Dr. Albert de Vaal for his guidance, support and advice throughout the past six months. The discussions, feedback and conversation in his office really helped me in making progress and finalizing this study. I also would like to thank Rutger Schipzand, MSc LLm, in overcoming statistical problems. Furthermore, I would like to thank Myra Schleedoorn and Robert Klumpenaar for their comments on various issues that helped me to optimize this thesis. At last, I want to thank my parents, Ton and Anja. Not only the past six months, but throughout my entire career as student you have provided me with enormous support.

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1. Introduction

Recently, freedom of global trade has been threatened after the imposition of import tariffs by U.S. president Donald Trump, which led to a decrease in trade openness of the U.S. (De Rugy, 2018). In the literature, it is believed that a country will overall gain if it opens her borders for international trade, which has been demonstrated in the Ricardian Model (Krugman 1979). Furthermore, there is empirical evidence that trade openness promotes economic growth through technology transfer, economies of scale and comparative advantages (Yanikkaya, 2003). However, there is mixed evidence who gains when a country opens her borders for international trade (Attanasio, Goldberg and Pavcnik, 2004). The Heckscher-Ohlin model and the Stolper-Samuelson theorems state that income inequality within a country reduces when a developing country opens her border for international trade. In contrast, there are studies which demonstrate an opposing effect of trade liberalization on the income distribution of a country (Attanasio, Goldberg and Pavcnik, 2004). The skilled-biased technological change states that an increase in trade liberalization could lead to a shift in production technology which favors high-skilled over low-skilled labor (Durlauf & Blume, 2008). This shift in production technology can occur by adapting the technological advancements of trade partners or can be a result of domestic policy. The burst of new technology, favoring high-skilled labor, causes an increase in the demand for high-skilled labor. Favoring high-skilled labor can lead to a bigger wage gap between high-skilled and low-skilled workers.

This study aims to report on the effect of trade liberalization on the income distribution of Latin American countries. The findings could be used in the ongoing debate in the literature who benefits from international trade within Latin American countries. It is interesting to investigate these theoretical predictions for Latin American countries, particularly because of the radical structural reforms in trade policies the region has undergone since the mid-80s (Lora, 2012). These reforms resulted in trade liberalization and exchange rate unification, which opened the borders of Latin America for international trade. This led to a shift from protecting national markets and state intervention to improvements in efficiency, better market mechanisms, and a reduction of state interventions (Lora, 2012). These radical changes positively influenced the trade volumes of the region. 10 Latin American countries are listed in the ranking of Post-1980 globalizers, a list of developing countries that have seen a large increase in trade over the period 1980-2000 (Dollar & Kraay, 2001). Even though income inequality has declined significantly, Latin America remains the most unequal region in the world (Duryea & Robles, 2016).

This study examines the relationship between trade openness and the wage gap between low-skilled and high-skilled workers in Latin America, to find out who benefits from trade liberalization. To test this relationship, a panel is constructed for the period 1990-2015, where the wage gap is measured as the difference in compensation for high-skilled and low-skilled labor. For the empirical analysis, a Random Effects model is used. The wage gap is measured as the ratio of the share of national income held by high-skilled labor to the share held by low-skilled labor. Furthermore, the wage gap is measured as the share of national income allocated to capital to the share of labor. Trade openness, the main independent variable, is measured in three proxies: trade volume to GDP, an index for trade openness based on the Structural Reform Index and the KOF Index. Therefore, this study encompasses a deeper understanding of the effect of trade liberalization on income inequality by analyzing the impact of trade openness from three perspectives. In contrast to other studies, the database used in this study allows to place the structural reforms in a historical perspective, by addressing a longer and more recent period of time. Hereby, the long-term effects of trade openness on the wage gap between low-skilled and high-skilled workers in Latin America can be addressed. This provides an understanding of the impact of trade openness on the wage gap in the longer-run. A focus on this extent is needed as trade liberalization triggers the reallocation of resources in an economy, which needs time to be fully implemented and optimized (Székely & Sámano, 2012). Furthermore, in the period 2010-2015, there are contrasting patterns in the income distribution between countries in Latin America, which have not yet been investigated. Another contribution of this study is that it focuses on the wage gap between the high-skilled and low-skilled population groups of inhabitants in Latin American countries. Other studies examined the relationship between trade openness and income inequality by measuring income inequality with the GINI-Index. The results of this study can help policymakers in Latin America and other developing countries, by reporting on the effects of trade openness on the income distribution between high-skilled and low-skilled workers.

This paper is structured as follows: The next section entails the literature review, including international trade theories, an overview of the evolution of the income distribution of Latin American countries, and a brief history of the structural reform processes of the region. Chapter 3 provides an overview of the dataset of this study and describes the research method. Chapter 4 discusses the results that were obtained from the methodological steps that have been described in Chapter 3. Chapter 5 includes the discussion and conclusion.

2. Literature Review

2.1 International Trade Theories

After the structural reforms of most Latin America trade policies, the countries started to open their borders for international trade. This led to a shift from protecting the domestic market to promoting the economy to participate in international trade. In the literature, there is a consensus that opening the borders for international trade promotes economic trade through technology transfer, economies of scale and comparative advantages (Yanikkaya, 2003). However, there is no consensus about which population group will benefit within a country from the overall gains of international trade. In the literature, two waves describe contrasting effects of trade openness on the income distribution of country: The Heckscher-Ohlin & the Stolper-Samuelson theorem on the one hand and the skill premium & skill-biased technological change on the other hand.

According to the Heckscher-Ohlin model, trade liberalization will lead that a country starts to export goods, which require production factors that it has in abundance (Heckscher & Ohlin, 1933/1991). The Heckscher-Ohlin model rests on the concept of factor abundance. Prior to trade liberalization, the abundance of a production factor leads to a drop in the relative price due to the excess in supply (Jones, 1956). Liberalization of trade will lead to a reduction of trade barriers, resulting in an exposure of the domestic market to foreign competition. Opening the borders for international trade will increase the demand for goods, which embodies the abundant production factor since the domestic price is relatively lower than the world price. This increased demand causes an increase in the relative price of the abundant production factor. On the other hand, the country will start to import goods, which requires production factors that are domestically scarce. Due to the scarcity of these production factors, the final price of products is driven up. However, when the borders are opened for international trade, the price of products that embody scarce production factors are driven down due to an increase in supply.

Most of the countries in the Latin America region are still in development, characterized by an abundance of low-skilled labor. Prior to the liberalization of international trade in Latin America, it is assumed that the compensation of high-skilled workers is higher than low-skilled workers (Kremer & Maskin, 1996). According to the Heckscher-Ohlin theorem, by reducing import tariffs and opening up the borders for international trade, the region will start to export low-skilled intensive goods and to import high-skilled intensive goods (Feenstra, 2015). Prior to the trade liberalization, the abundance of low-skilled labor will drive the price down of products that are low-skilled intensive. However, when the borders are opened for international

trade, the price of low-skilled intensive goods will increase due to the increase in foreign demand and the relatively higher world price. On the other hand, the price of high-skilled intensive goods, which is relatively scarce in Latin America, will decrease, due to the increased supply from foreign countries.

Subsequently, the Stolper-Samuelson theorem, derived from the Heckscher-Ohlin model, describes the relationship between the relative price of the production factor and the relative reward of the production factor. The theorem states that the compensation for a production factor increases as the price of the final good increases (Feenstra, 2015). As a result, the Stolper-Samuelson theorem predicts that trade liberalization causes a decrease in the wage gap between low-skilled and high-skilled workers in Latin America (Juhn, Murphy and Pierce, 1993). The increased price of low-skilled intensive goods will increase the compensation for low-skilled labor, while the decreased price of high-skilled intensive goods leads to a decrease in the compensation of high-skilled labor. So, the Stolper-Samuelson theorem, derived from the Heckscher-Ohlin model, suggests that trade liberalization will reduce income inequality in Latin America by closing the wage gap between high-skilled low-skilled labor.

However, there is also a wave in the literature that argues that trade liberalization leads to an increase in the wage gap between low-skilled and high-skilled workers in developing countries. This increase in income equality within a country has several explanations. First of all, wage inequality could increase as production moves from the developed country to the developing country, which seems contradictory. As a part of the production process is allocated to Latin America, the developed countries conduct outward Foreign Direct Investments (FDI) through setting up production plants. When a developing country opens its borders for international trade and allows inward FDI, the economy becomes globally linked. The country is linked to the global production chain since some of the production is replaced to or away from the country. In most cases, the parts of the production process, which are offshored to developing countries, are considered as low-skilled intensive. The reason these parts are offshored is a result of the reasonably low compensation for low-skilled labor in developing countries. While the developed country sees the production of offshored products as low-skilled intensive, the developing country could consider these goods as high-skilled intensive (Feenstra & Hanson, 1997). This difference in skill level is a result of differences in education and technological advancements of the countries. So if a developed country conducts FDI in a developing country, the demand for high-skilled labor in the developing country will rise (Feenstra & Hanson, 1997). This increase in demand for high-skilled labor drives up the compensation, which results in a bigger wage gap between the low-skilled workers and high-

skilled workers.

Another explanation for an increased effect of trade liberalization on the wage gap between low-skilled and high-skilled workers is given by the theory of skill-biased technological change (Goldberg & Pavcnik, 2007). This theory states that a shift in production technology causes an increased demand for high-skilled labor since the burst in technological advancements leads to an increase in the relative productivity of high-skilled labor over low-skilled labor (Durlauf & Blume, 2008). This shift in production technology can occur through international trade. When a developing country opens its borders for international trade, it can take advantages of technological advancements in the world, which they may have had little incentive to adopt before trade liberalization (Wood 1995; Thoenig & Verdier, 2003). As trade liberalization of the developing country leads to adaptation of new technological advancements, like new equipment and software, there is an increase in demand for high-skilled workers since this burst of new technology increases the relative productivity of high-skilled labor. This increased demand for high-skilled workers leads to a rise in their compensation, causing a bigger wage gap between low-skilled and high-skilled workers. Next to international trade, a shift in production technology can also be determined endogenously within a country by policies, the size of markets and institutions (Durlauf & Blume, 2008).

2.2 Income Distribution and Structural Reform in Latin America

2.2.1 Import Substitution Industrialization

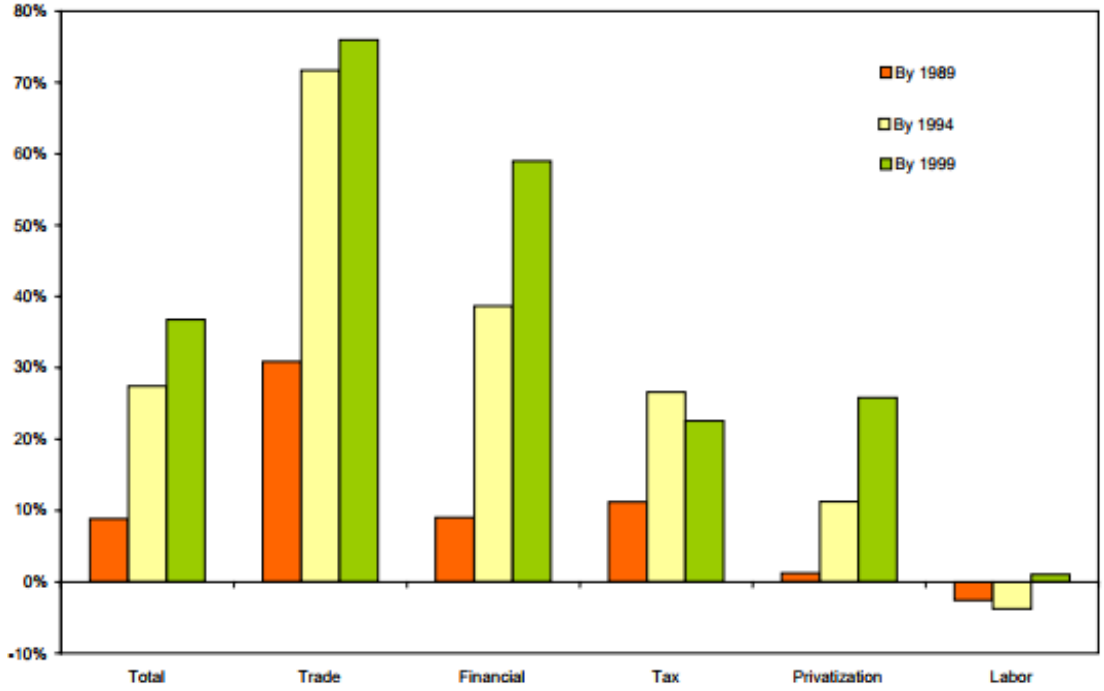
It is interesting to investigate the relation of trade liberalization on the income distribution of Latin American countries since this region had undergone radical reforms in trade policies (Lora, 2012). From the 1950s, the Latin American region started to adopt Import Substitution Industrialization (ISI). During that time, Latin America was specialized in labor-intensive goods, like the production of food and raw materials (Baer, 1972). Developed countries, like the US and Europe, were specialized in manufactured goods, which were imported by the Latin American region. Adoption of ISI implies that, instead of importing manufacturing goods from the developed world, the countries will start to produce those goods themselves so they will be more self-fulfilling. In order to protect domestic production, high import tariffs were implemented (Biglaiser & DeRouen, 2006). Since Latin American countries are characterized by an abundance of low-skilled workers, this implies that the region protects low-skilled labor-intensive goods. In Colombia and Mexico, ISI was translated in a high level of protection for manufacturing industries, with an average import tariff of 50% (Hanson & Harrison, 1999; Attanasio, Goldberg and Pavcnik, 2004). In the first two decades after implementation, ISI had a positive effect on Latin American growth rates, especially for countries with a large domestic

market. However, the positive effect stagnated after two decades and the growth rates started to exhibit negative numbers. One of the reasons for growth stagnation was that ISI forced households to buy overpriced goods from the inefficient domestic market, which was unexposed to foreign competition. After the debt crisis in the mid-80s, the Latin American region was faced with structural debt, which led to a fall in the support for ISI.

2.2.2 Structural Reform in Latin America

In order to overcome the debt crisis, the countries in the Latin American region started to implement structural reforms based on the 'Washington consensus', presented in 1989 (Williamson, 2009). Instead of protecting the national market, structural reforms were implemented to denationalize the market, reform the tax system, bring back fiscal discipline and diminish the protective role of the government (Lora, 2012). This led to a radical change in trade openness of Latin American countries. The structural reforms, based on the 'Washington consensus' led to trade liberalization, privatizations, financial liberalization and rebalancing of the entire tax system (Lora, 2012). These radical reforms are reflected in the big jump of the trade reform index, constructed by Lora (2012). The degree of structural reform of all Latin America countries, between 1985 and 2009, is quantified in the database Structural Reform Index (SRI). For each policy, the index ranges between 0 and 1, where a higher score indicates that the reforms are in favor of the proper working of markets. SRI of a country is the average of the five indexes, trade liberalization, privatizations, financial liberalization, rebalancing tax policies and reforming the labor market. The advances of reforms between 1989 and 1999, the margin of reform utilized, in Latin America are shown in Figure 1. As displayed in Figure 1, the total advance of reforms increased from less than 10% in 1989 to almost 40% in 1999. Especially in the first five years after the implementation of the 'Washington consensus', a great deal of progress has been made in the area of trade reform and financial policy (Lora, 2012). Furthermore, the area of privatization and tax reform has made progress between 1989 and 1999, however, not as large as the area of trade reform and financial policy. The only area which did not advance as much as the others was labor reform. Almost none of the countries in Latin America took the effort to implement policies to make the labor market more flexible, enabling the labor market to be more efficient in favor of proper market working. Figure 1.A in the appendix displays advances till 2009, which does not deviate much from Figure 1.

Figure 1 – Advance of Reforms in Latin America Source: Lora, 2012

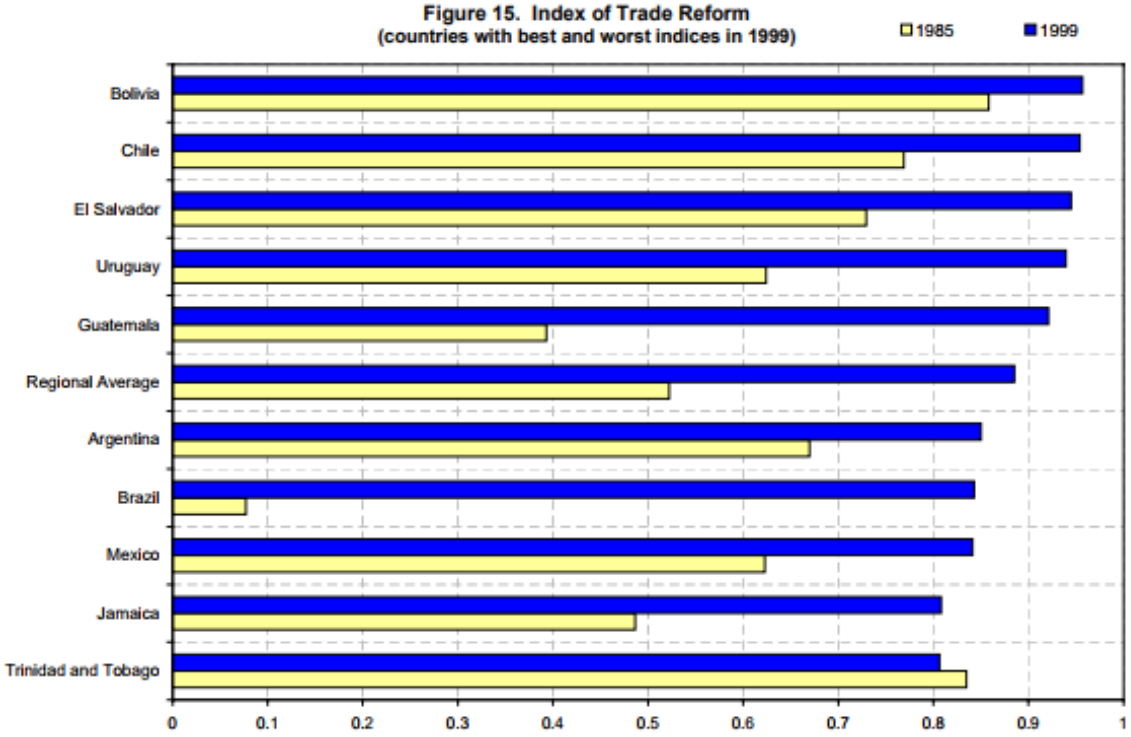


Perhaps the area of reform which has the most varied advances, is privatization, with indices varying between 0.1 and 0.9 in 1999. This area of reform reflects the share of the private sector in the production activities of a country. A larger share of the private sector in production activities of a country is in favor of the proper working of a market since it enables competition between companies (Lora, 2012). This competition drives firms to be as efficient as possible to survive. Bolivia, Peru and Brazil had made the most significant advances in privatizations, while almost no advances had been made in Uruguay, Paraguay and Costa Rica. Nevertheless, the area of privatization had the highest pace of reform between 1994 and 1999, compared with other areas.

In Figure 2 the index of trade reform for several Latin American countries is presented for 1985 and 1999. This index is based on average tariffs and tariff dispersion. As displayed in Figure 2, the reform process in the area of trade was in most countries radical and intense (Lora, 2012). Bolivia, Chile, El Salvador, Uruguay and Guatemala were the most advanced in trade reform in 1999 whereas Brazil has undergone the most radical changes in trade policy. The country's index trade reform index went from 0.08 to 0.83 in 14 years. Therefore, based on Figure 2, it can be concluded that average tariffs and tariffs dispersion are drastically reduced, which is in favor of proper market working. Being more exposed to foreign competition reduces the protection of domestic production. This provides households entrance to buy goods from international markets and not only from the inefficient local market, which was caused by ISI. Contrasting to other areas in the SRI, all countries in Latin America have an index of at least

0.8 for trade reform. This implies that the area of trade reform had been exploited to the fullest by the radical structural reforms.

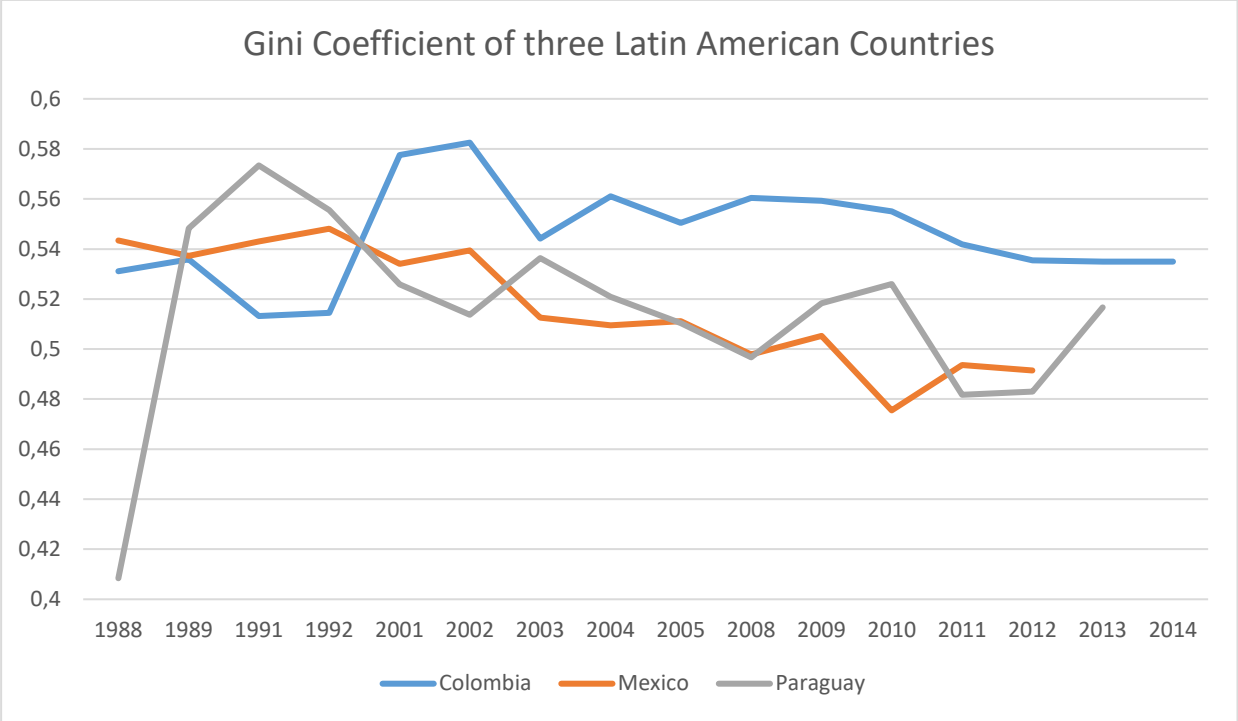
Figure 2- Index of Trade Reform. Source: Lora, 2012



2.2.3 Income Inequality in Latin America

In comparison with other regions in the world, income inequality declined the most in Latin America over the last decades (Duryea & Robles, 2016). Despite these advancements in reducing the wage gap between the richest and the poorest, the region remains the world's most unequal region (Duryea & Robles, 2016). Of the 20 countries in the world with the most unequal income distribution, measured with the GINI coefficient, there are 11 located in Latin America. Figure 3 shows the evolution of the Colombian, Mexican and Paraguayan GINI coefficient over the period 1988-2014. The data is retrieved from the 'World Income Inequality Database' constructed by UNU-Wider (2018). The y-axis represents the GINI coefficient of the country. The GINI Index measures the income inequality of a country. A score of zero implies perfect income equality whereas a score of 1 represents perfect income inequality. The x-axis represents the year of observation, which is from 1988 till 2014.

Figure 3: Evolution of the GINI Coefficient of three Latin American Countries. Source: UNU-Wider, 2018



In Colombia, income inequality slightly increased from 1988 to 2014, with a big boom around 1992 and 2001. However, from 2008 onwards there was a downward slope in the Colombian GINI coefficient. Overall the GINI coefficients vary between 0.51 and 0.58 in the period between 1988 and 2014. In contrast to the Colombian GINI coefficient, the Mexican GINI exhibited a downward slope in the period between 1989 and 2014. Still, there were periods in which the GINI coefficient rose. However, these upticks were not as big as in Colombia. The Paraguayan GINI coefficient exhibits more volatility compared with the Colombian and Mexican GINI coefficient. The GINI coefficient of Paraguay showed a significant increase in the period around 1990, implying that the income was distributed less equally. After that, the Paraguayan GINI coefficient exhibited a downward trend. However in Paraguay, in contrast to Colombia and Mexico, income inequality started to rise again from 2012. This upward trend needs close attention in order to get an understanding why the income inequality in Paraguay is rising, whereas Colombia and Mexico show a decreasing trend. The GINI coefficient is a well-known measure of income inequality. In the studies of Attanasio, Goldberg and Pavcnik (2004), Székely & Sámano (2012) and Spilimbergo, Londoño and Székely (1999) income inequality is measured with the GINI coefficient. The GINI coefficient, however, has several drawbacks. One of the shortcomings of the GINI coefficient is that two

countries with the same GINI coefficient can still have significant different income distribution, which can lead to a misleading interpretation of the income distribution of a country (Rosser, Rosser & Ahmed, 2000). This makes it hard to compare GINI coefficients between nations. To get a more accurate and nuanced picture of the income distribution of a country, this study measures the wage gap in a country as the share of national income held by the richest and poorest. Within a single country, it is expected that the GINI coefficient and the wage gap are highly correlated and both measures can be used to analyze the income distribution of a single country. However, to examine the effects of trade liberalization on the income distribution across different countries, the shares of national income are used in order to get a more accurate picture of the distributional impacts of trade liberalization.

In Figure 4 and 5, the share of national income held by the richest and the poorest for Paraguay and Brazil are graphed. This data is retrieved from the 'World Income Inequality Database' constructed by UNU-Wider (2018). These countries are interesting since Brazil has undergone the most radical changes in the area of trade reform, while the Paraguayan income distribution started to become more unequal. The poorest represents the share of the national income, which was held by the poorest 20 percent of the population. The richest represents the share of the national income, which was held by the wealthiest 20 percent of the population. The left y-axis of Figure 4 and 5 represents the percentage of income held by the richest and the right y-axis the percentage of income held by the poorest. The x-axis in Figure 4 and 5 represents the year of observation. Figure 4 and 5 show contradictory results in the Paraguayan and Brazilian evolution of the percentage of national income held by the richest and poorest. As displayed in Figure 4, the income gap between the richest and the poorest in Paraguay started to widen in 2013, which is in line with the rise of the GINI coefficient in Figure 5. This is reflected by the contrasting patterns of national income held by the richest and the poorest in Paraguay. During the entire period of time, the Paraguayan share of the poorest decreased from almost 6% to less than 4%. However, between 2000 and 2013, there was an upward trend in the share of income held by the poorest Paraguayan household. However, from 2013, this share started to decrease. The share of national income held by the richest population of Paraguay increased during the entire period. On the other hand, the Brazilian wage gap between the richest and the poorest is closing as seen in the upward trend of the share of national income held by the poorest. The portion of national income contributed by the richest of Brazil exhibited a downward trend during the period between 1982 and 2014. While the share of national income held by the richest was around 62% in 1982, this share was around 56% in 2014.

Figure 4; Evolution of income earned by the richest and the poorest in Paraguay. Source: UNU-Wider, 2018

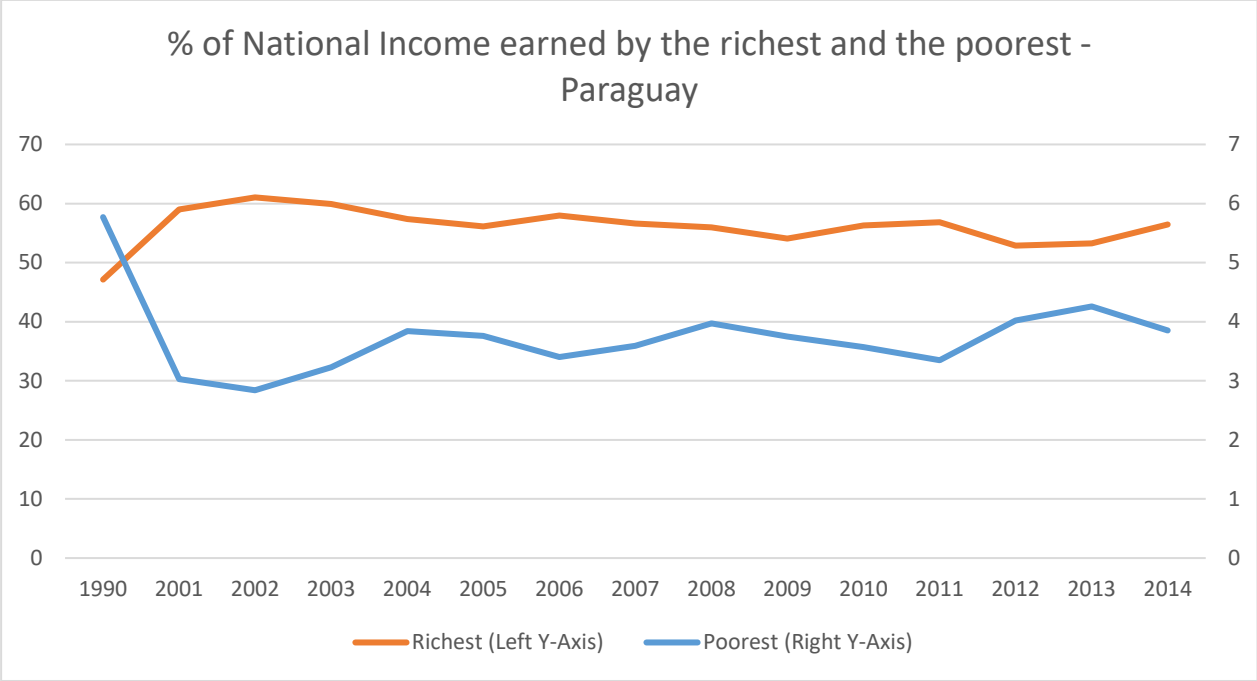
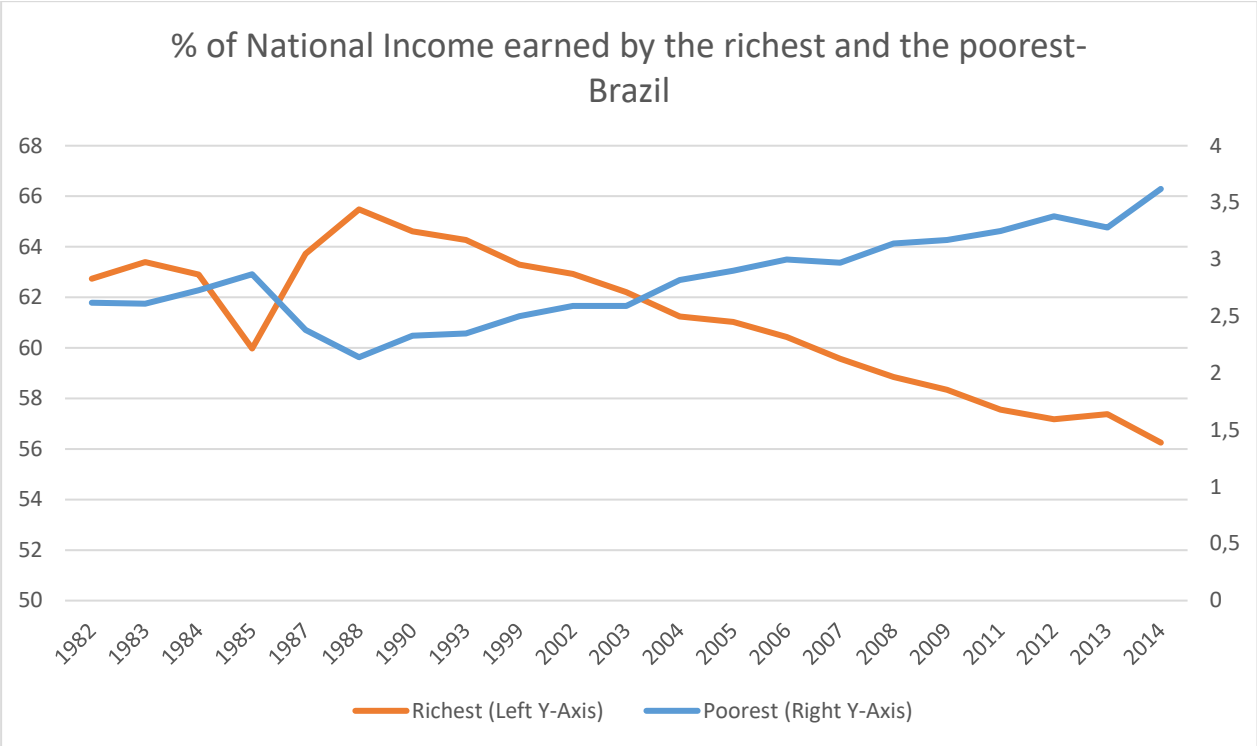


Figure 5; Evolution of income earned by the richest and the poorest in Brazil. Source: UNU-Wider, 2018



2.3 Empirical Evidence

To reduce poverty in a country, the national income of a country needs to be distributed more equally, which will lead to a reduction of the wage gap between the richest and the poorest. When national income increases and the income distribution remains stable, poverty will decline over time as income increases for the poorest households (Atkinson, 1983). When the income distribution becomes more equal, combined with an increase in national income, poverty will even decrease more, since more income is distributed to relatively poor households (Atkinson, 1983). Improving the income distribution of a country can be realized by many factors, like improving the returns to education, increase in compensation for labor, regional economic integration, trade liberalization and political stability (Duryea & Robles, 2016; Nguyen & Ezaki, 2005; Galor & Zeira, 1993). The study of Duryea & Robles (2016) demonstrates that a decrease in returns to education and increase in wage income results in a reduction of income inequality in a country. A decline in returns to education implies that the higher educated received fewer returns. As the Latin-American region started to develop, the level of education started to rise along. This led to an increase in higher-educated citizens, reducing the scarcity of higher-skilled labor. Therefore, the increased supply in higher-skilled labor led to a decrease in the relative returns in education. Implementing regional economic integration and liberalization of international trade also equals the income distribution of a country (Nguyen and Ezaki, 2005). This will lead to a big increase in welfare and leads to an overall gain of the country. Within the country, the poorest and rural household groups gain relatively more from trade liberalization and regional economic integration, than rich urban household groups (Nguyen and Ezaki, 2005). One of the reasons the poorest household gained more than the richest household lies in the fact that food prices increased faster than non-food prices. As a result, the wage of the poorest people, who mainly work in the agricultural sector, increased more than the wage of the richest people, who mainly work in non-food industries.

In the literature, many studies have been conducted to test the effects of trade liberalization on the income distribution of a country. First of all, Dollar & Kraay (2001) examine the effect of trade liberalization on the income distribution of the post-1980 globalizers. They state that these countries experience a rapid growth in international trade, which led to an acceleration of economic growth and reduction of poverty. Based on data from the post-1980 globalizers, Dollar and Kraay (2001) argue that inequality is not affected by changes in international trade. They state that income inequality is as likely to increase as to decrease when a country opens its borders for international trade since countries react differently to trade liberalization (Dollar & Kraay, 2001). The shifts in income distribution can

arguably be linked to other influences, far away from the effects of international trade, like domestic structural reforms of agricultural policies and internal migration of the population (Dollar & Kraay, 2001).

On the other hand, there is empirical evidence that trade openness does affect income inequality (Spilimbergo, Londoño and Székely, 1999). Their data, consisting of 108 countries, indicate that trade liberalization reduces income inequality in capital-abundant countries, while it increases inequality in skill-intensive countries. Furthermore, the study provides evidence that prior to trade liberalization, countries that have an abundance of land and capital have a less equal income distribution. The income distribution in countries with an abundance of high-skilled workers is more equal (Spilimbergo, Londoño and Székely, 1999). This can be explained by the natural bounds of ownership. This entails that certain production factors can be accumulated with almost no limit, like land and capital, while other production factors can be accumulated to a certain limit, like education (Spilimbergo, Londoño and Székely, 1999). The possibility of accumulation of ownership of certain production factors that a country has in abundance with almost no limit leads to unequal income distribution (Spilimbergo, Londoño and Székely, 1999). If the price of this production factor increases, a rise in income inequality is expected since just a few will gain from the rise in the price of the accumulated production factor. When a country has a production factor in abundance that can be accumulated to a certain limit, the income distribution will be more equal. This is because a majority of the population holds this production factor and receives compensation for it. Furthermore, a rise in this factor price will lead to a gain for a majority of the population, since a majority of the population can accumulate the underlying abundant production factor.

Within the literature, much research has been conducted to determine the relationship between trade openness and income inequality for Latin American countries. Mexico is one of the countries which has been studied extensively. Mexico is particularly interesting since it borders to the United States of America. After Mexico started to open its borders for trade, the country became interesting for the United States of America, since the average wage in Mexico is relatively low. This led to a shift in the production from the USA to Mexico as seen by the big jump in the FDI of the USA in Mexico (Feenstra & Hanson, 1997). This had a deteriorating effect on the income distribution of Mexico (Feenstra & Hanson, 1997). The study of Feenstra & Hanson (1997) provides empirical support that the FDI activities of the USA led to an increased demand for high-skilled workers in Mexico. Another effect of the trade liberalization of Mexico was the adaption of technological advancements by developed countries, like the USA. The adaptation of new machinery and other production techniques led to the replacement

of low-skilled workers by machinery (Hanson and Harrison, 1999: Acemoglu, 2003). This led to an increase in unemployment of low-skilled workers and widened the wage gap between low-skilled workers and high-skilled workers (Hanson & Harrison, 1999: Acemoglu, 2003).

Another related study is the research of Attanasio, Goldberg and Pavcnik (2004), where they investigate the effects of drastic tariff reductions in Colombia on wage distribution from 1984 to 1998. They found three main channels through which income distribution was affected: college education, wages of low-skilled and high-skilled workers and shifts of the labor force to the informal sector. All three are affected by trade policy. They found empirical evidence that the drastic tariff reduction led to bigger income inequality in Colombia. First of all, as a result of skill-biased technological change, the wage premium of skilled workers increased (Attanasio, Goldberg and Pavcnik, 2004). Secondly, wages of low-skilled workers dropped, since the trade reform harmed domestic production. By opening the borders for international trade, the domestic producers were exposed to international competition. For some firms this exposure was too high and led to bankruptcy, resulting in unemployment of domestic workers. Furthermore, their findings imply that returns to education and the shift of labor to the informal sector also have a significant effect on the increase in income inequality (Attanasio, Goldberg and Pavcnik, 2004). Return to college education implies that individuals who finished college education receive a substantially higher amount of salary than individuals who did not graduate from college. At last, there is empirical support that an increase in the informal labor market leads to bigger income inequality within a country. The informal sector is defined as follows: *'The informal sector may be broadly characterized as consisting of units engaged in the production of goods or services with the primary objective of generating employment and incomes to the persons concerned. The units typically operate at a low level of organization. Labour relations are based mostly on casual's employment, kinship or personal and social relations rather than contractual agreements with formal guarantees'* (ILO, 1993, p. 2). Furthermore, employees in the informal sector do not have any employment, work or social security (ILO, 1993). To cope with the increased exposure to global competition, Colombian firms replaced long-term contracts with temporary informal workers and outsourced some of their operations to the relatively cheap informal sector. This led to an increase in employment by the informal sector (Attanasio, Goldberg and Pavcnik, 2004). This increase resulted in a rise in income inequality since the informal sector does not provide social benefits and pays relatively lower wages as the formal sector (Attanasio, Goldberg and Pavcnik, 2004).

The work of Székely & Sámano (2012) is more recent. They investigate the medium-term effects of trade openness on the income distribution of Latin America in the period 1980-

2010. This period is interesting since it encompasses the period before and after the implementation of reforms based on the 'Washington consensus'. The study provides empirical support that the effects of implementing radical reforms in trade policies deteriorated the income distribution in the last two decades of the 20th century of Latin American countries. However, as the economy of Latin American countries had enough time to adjust to the changes that were caused by the trade liberalization, the deterioration of the income distribution was reversed (Székely and Sámano, 2012). This is represented by the fact that 75% of the increase in income inequality in the last two decades of the 20th century was compensated by the decrease in income inequality in the first decade of the 21st century.

3. Data and Methodology

3.1 Data

To examine the effect of structural reforms in the area of trade reform on the income distribution of Latin America countries, a panel is constructed covering 14 Latin American countries in the period 1990-2015. These countries are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, The Dominican Republic, Ecuador, Guatemala, Mexico, Paraguay, Peru, Uruguay and Venezuela. The length of the dataset covers the moment from the implementation of the structural reforms based on the 'Washington consensus' until the most recent data available. The data is extracted from multiple reputable databases, like the World Bank (2018), a combined dataset of the World Bank and the Center for Distributive, Labor and Social Studies (SEDLAC) (2017), the KOF Swiss Economic Institute (Gygli, Savina, Haelg and Sturm, 2018) and OECD (2018)

3.1.1 Dependent Variable – Wage Gap

The independent variable in this study is the wage gap of a country, which represents the outcome of the distribution of national income amongst the population. A popular measurement of the income distribution of a country is the GINI coefficient. However, as mentioned in chapter 2, the use of the GINI coefficient has several drawbacks. This study seeks to dig deeper into the effects of the radical structural reforms in trade policies on the income distribution of Latin American countries. Therefore the inequality in income is measured as the wage gap between high-skilled and low-skilled labor. This proxy of income inequality gives a more nuanced picture of the income distribution of a country, especially on the share of income held by the low-skilled and high-skilled workers. It is assumed that low-skilled workers represent a poorer group than the high-skilled workers (Juhn, Murphy and Pierce, 1993). The high-skilled workers are measured by the sum of the eighth and ninth deciles of the income distribution. The

reason the highest decile of the income distribution is not included in the total wage of high-skilled workers lies in the fact that the richest population group is mostly not compensated for their level of skill, but mainly for capital and inheritance (Juhn, Murphy and Pierce, 1993).

Another measurement to measure the gap in income distribution between the high-skilled and low-skilled workers is the evolvement of returns to labor and capital over time. Trade reform can have a significant impact on the returns to capital and labor since the economy of the underlying country is readjusted to the changes in supply and demand. It is assumed that low-skilled workers hold mainly one production factor, which is labor (Székely & Sámano, 2012). Due to the fact the compensation for low-skilled labor is significantly low, the low-skilled labor group does not have the financial resources to acquire capital. High-skilled workers have the ability to acquire capital, which can be accumulated with almost no limit (Spilimbergo, Londoño and Székely, 1999). This can lead to inequality since only a small population group receives compensation for a production factor. If the return on capital rises more than the return to labor, the income distribution is tilted towards high-skilled workers. This implies that the income gap between low-skilled and high-skilled workers is increasing. If the return of capital to labor decreases, the income distribution becomes less equal. Measuring income inequality with the returns on capital to labor gives a deeper understanding as to who benefits most from opening the borders for trade: the high-skilled or the low-skilled workers.

3.1.2 Independent Variable – Trade Openness

The main independent variable in this research is trade openness of a country. Trade openness of a country can be measured as the trade volume or as the implemented trade policies (Yanikkaya, 2003). The most common measure of trade openness in the literature is the sum of exports and imports as a percentage of GDP. In order to determine the effects of imports and exports on the income inequality, this measurement of trade volume can be broadened by focusing on the trends of exports to GDP and imports to GDP. The GDP is corrected for purchasing power. This is in line with the study of Avelino, Brown and Hunter (2001), where they constructed a new trade openness measure through substituting the exchange rate-based measure of GDP with one based on purchasing power parity (PPP). Correcting the GDP for purchasing power represents a more accurate measurement of trade openness to GDP for developing countries. If the trade volume is not corrected for the exchange rate, the relative size of international trade will be overestimated compared with the domestic sector (Avelino, Brown and Hunter, 2005). In the sector of international trade, prices are pushed to equality due to arbitrage opportunities. Goods in the non-trading sector of a developing country are comparatively inexpensive to goods traded internationally since the price of labor in a

developing country is relatively low. To avoid that the relative value of the non-trading sector is underestimated, the GDP should be corrected to the purchasing power of a country.

The second measurement of trade openness is based on implemented trade policies. These trade policies of Latin American countries are listed in the SRI, see chapter 2. The most interesting reform area for this study is the indicator for trade reform since it reflects the average tariffs and tariff dispersion of the underlying country in the data set (Lora, 2012). So an indicator near 0 implies a closed economy with relatively high tariffs, which is not in favor of proper market dynamics. On the other hand, an indicator close to 1 implies a very open economy with relatively low tariffs (Lora, 2012). To strengthen the validity of this study, a second measurement of trade restrictions is included. This measurement is the economic globalization based on the KOF Index of Globalization (Dreher, 2006).

It is important to note that structural reforms affect the economy of a country over a longer period. In the short run, opening the borders for trade will trigger the reallocation of the economy of a country. However, to measure the full impact of trade liberalization, a longer time period is needed since it needs time for the economy to adapt to the new situation. Therefore the database of this study entails the period 1990-2015. Expanding the time frame enables a deeper understanding of the income distribution of a country. It provides insight whether the impact on the short term was offset in the long run, which was found in the study of Székely & Sámano, 2012.

3.1.3 Other independent variables

By determining the effect of trade openness on the income distribution of a country, several other independent variables are included in the model. All of these variables are chosen based on the fact there is empirical evidence that it affects income distribution and it varies across countries. To support the variance of variables across the countries in the dataset, the summary statistics of the underlying variables per country are presented in section B of the appendix.

To begin with, female participation is taken into account. In most developing countries the woman has to take care of her family, which implies a low female participation rate in the working population. Higher female participation rate will lead to a reduction of income inequality. When the female participation rate rises, more women start to receive a monthly income. This will result in a higher income, which was previously almost zero, due to the fact the woman has to take care of her family. Therefore the wage gap closes if more women are being employed in developing countries.

Besides the female participation rate, social spending affects the income distribution of a country. Social spending is the amount of money a government spends to provide its citizens

with a safety net (Lindert, 2004). Having a high level of social security reduces the gap of income inequality by offering a safety net to the population, especially to the vulnerable (Avelino, Brown and Hunter, 2005; De Gregorio & Lee, 2002). Once there is a period of high employment, the unemployed population group is still guaranteed of a fixed income.

Furthermore, union density could affect the wage gap between low-skilled and high-skilled workers. Union density indicates the power of trade unions in the country. It could have a deteriorating effect on income equality if employers are not willing to hire employees, which are a member of a trade union. This could lead to an increase in unemployment, which results in a bigger wage gap. The study of Checchi & García-Peñalosa (2009) provides empirical support that union density leads to higher income inequality. Based on data from the OECD, Checchi & García-Peñalosa (2009) argue that union density plays an essential role in explaining differences in income inequality across countries. Union density leads to a bigger wage gap between low-skilled workers and high-skilled workers since it increases the unemployment rate (Checchi & García-Peñalosa, 2009). However, union density can also reduce the inequality gap. Having greater union density will result in higher bargaining power for the trade union. This gives the trade union more power in the negotiating process of wages of their members. This will result in higher wages of the labor people. The study of Gustafsson & Johansson (1999) provides empirical support that a higher union density results in a more equal distribution of income.

The next independent variable in the model is the unemployment rate. Having a higher unemployment rate will lead to a higher wage gap between the richest and the poorest. Being unemployed will have a negative effect on the income of an individual since it loses a monthly income (Attanasio, Goldberg and Pavcnik, 2003). This will increase the wage gap between the unemployed people, relatively the poorest, and the employed people, the richest. So, the unemployment rate of a country affects the income distribution of a country.

Furthermore, education is included as an independent variable in the model. It is expected that education has a strong relationship with the income distribution of a country (Muller, 2002). A higher level of education of a country will lead to an increase in individual income since a higher degree is a typical prerequisite for higher compensated work (Muller, 2002). This reduction of the inequality in the educational level of the population diminished the amount of low-skilled individuals (Muller, 2002).

Also, the size of the informal market is included. This variable measures the size of employment by the informal labor market, which counts for a large portion of employment in developing countries (Günther & Launov, 2012). It is expected that the informal market has a

positive effect on the income inequality. As the size of the informal labor market increases, which is characterized to hire low-skilled labor, more income of low-skilled people is unregistered (Attanasio, Goldberg and Pavcnik, 2004). Without including the informal sector, a portion of employment in a developing country is not taken into account.

Finally, real GDP per capita is added as a control variable. Real GDP per capita measures the economic performance of a country. To compare countries, the GDP per capita is corrected for PPP. An increase in real GDP per capita implies that the country performed economically well. This increase will lead to a reduction of income inequality if the income distribution of the country remains equal. The study of Choi (2006), where 119 countries were studied, provides empirical support that a higher GDP per capita reduces income inequality in a country.

3.2 Research Method

This study examines the relationship of the wage gap between the low-skilled and high-skilled workers and trade openness in Latin America in the period 1990-2015. To determine the relationship between the variables the following equation is used in this study, which is in line with the study of Amiti & Konings (2007) and Lim & McNelis (2014):

$$WG_{it} = \beta_0 + \beta_1 op_{it} + \beta_2 fempar_{it} + \beta_3 govspen_{it} + \beta_4 ud_{it} + \beta_5 unemp_{it} + \beta_6 educ_{it} + \beta_7 informal_{it} + \beta_8 GDPcap_{it} + \alpha_i + \varepsilon_{it}$$

All variables are indicated with an i for the country indices and a t for time indices. β_0 in the equation represents the constant. Country fixed factors (α_i) are included since there are systematic differences between the wage gaps of countries in the dataset (Amity & Konings, 2007). The α_i captures the difference between the given country and the average data in the entire dataset. The ε_{it} is the fixed error term.

The dependent variable is the wage gap (WG) between high-skilled and low-skilled workers. In this study, the wage gap is measured with two proxies to strengthen the validity of this study. First, the wage gap is operationalized as the difference between the income contributed by the low-skilled and the high-skilled labor groups. This is measured by the ratio of the sum of the shares of national income held by the 8th and 9th decile of the wage distribution to the sum of the shares held by the poorest 20 percent of the population. Data regarding the shares of national income held by the poorest and the richest are extracted from the SEDLAC (2017). SEDLAC provides the distribution of income for the Latin American Region for the period 1980-2015. In the database, the share of national incomes held by each decile is documented. The second measurement of the wage gap is the evolvement of the return to capital

to the return to labor. This measurement of the wage gap is calculated as the share of national income allocated to capital divided by the share of national income allocated to labor. Data regarding the labor and capital income quote are retrieved from the Penn World Table 9.0 (Feenstra, Inklaar and Timmer, 2015).

The main independent variable of this study is trade openness of a country (op), which is measured with three proxies. Two proxies are based on trade restrictions and one on trade volume. Trade restrictions are based on SRI and the KOF index. The SRI is measured with numbers from the trade reform index of Lora (2012). The KOF index is retrieved from the KOF Swiss Economic Institute (Gygli, Savina, Haelg and Sturm, 2018). As discussed in chapter 2, the observations of trade restrictions will be lagged for five years (Székely & Sámano, 2012). This is because the economy needs some time to adapt to the new economic circumstances. Furthermore, trade openness is measured as the sum of exports and imports to real GDP. To get a broader view of the impact of trade volume on the wage gap, the effects of trade volume can be separated in the effects of imports and exports. This data is extracted from the database 'World Development Indicators' (World Bank, 2018). As a result, six models are constructed (two proxies for the wage gap variable and three proxies for trade openness). The data is checked for heterogeneity and autocorrelation, which will be elaborated in section 3.3.

As mentioned, several control variables are included in the model since they can have a mediating effect on the relationship between trade openness and the wage gap. In all six models, the following control variables are included: female participation rate, social spending, union density, unemployment rate, education and real GDP per capita. The female participation rate ($fempar$) represents the percentage of women of the total labor population. Data regarding the female participation rate of a country is retrieved from the World Development Indicators Database, created by the World Bank (2018). Social spending ($govspen$) is measured as the amount of social spending of a government as a percentage of the GDP. This data is also retrieved from the World Development Indicators Database, created by the World Bank (2018). Union density (ud) represents the bargaining power of the trade unions. This variable is measured as the percentage of trade union members to the total labor population. Data about union density is retrieved from the OECD Social and Welfare Statistics database (OECD, 2018). The unemployment rate ($unemp$) represents the percentage of unemployed workers to the labor population. Data, regarding the unemployment rate, is retrieved from the World Bank (2018a). Education ($educ$) is measured as the average of attained years of education. The average total years of attained education of the 14 countries in the sample for each period are retrieved from the database of SEDLAC (2013). The size of the informal labor market

($informal$) represents the size of the informal employment to the total size of the formal labor market. Data regarding informal employment is retrieved from SEDLAC (2017). GDP per capita ($GDPcap$) measures the amount of real GDP per capita in dollars for each country. Real GDP per capita is lagged for one year. This data is retrieved from the World Development Indicators Database, created by the World Bank (2018).

3.3 Data description and data management

In Figure 6 the evolution of the mean share of national income of all 14 countries held by the high-skilled and low-skilled workers is graphed. The high-skilled workers represent the percentage of national income held by the eighth and ninth decile, which share is scaled with the left y-axis. The low-skilled workers represent the percentage of national income held by the first and second decile, which share is scaled with the right y-axis. The x-axis in Figure 6 represents the year of observation. Based on Figure 6, it can be concluded that both the sum of national income held by high-skilled workers as the sum of national income held by the low-skilled workers increased over the period 1990-2015. Still, the high-skilled workers earn significantly more, in 1990 the share of national income held by the high-skilled workers was 7.46 times bigger than the share of the low-skilled workers. Over the period 1990-2015 the share of national income held by the high-skilled workers remained stable around 27.5%.

Figure 6: Evolution of the mean share of National Income held by the high-skilled and low-skilled workers Latin America. Source: SEDLAC, 2017

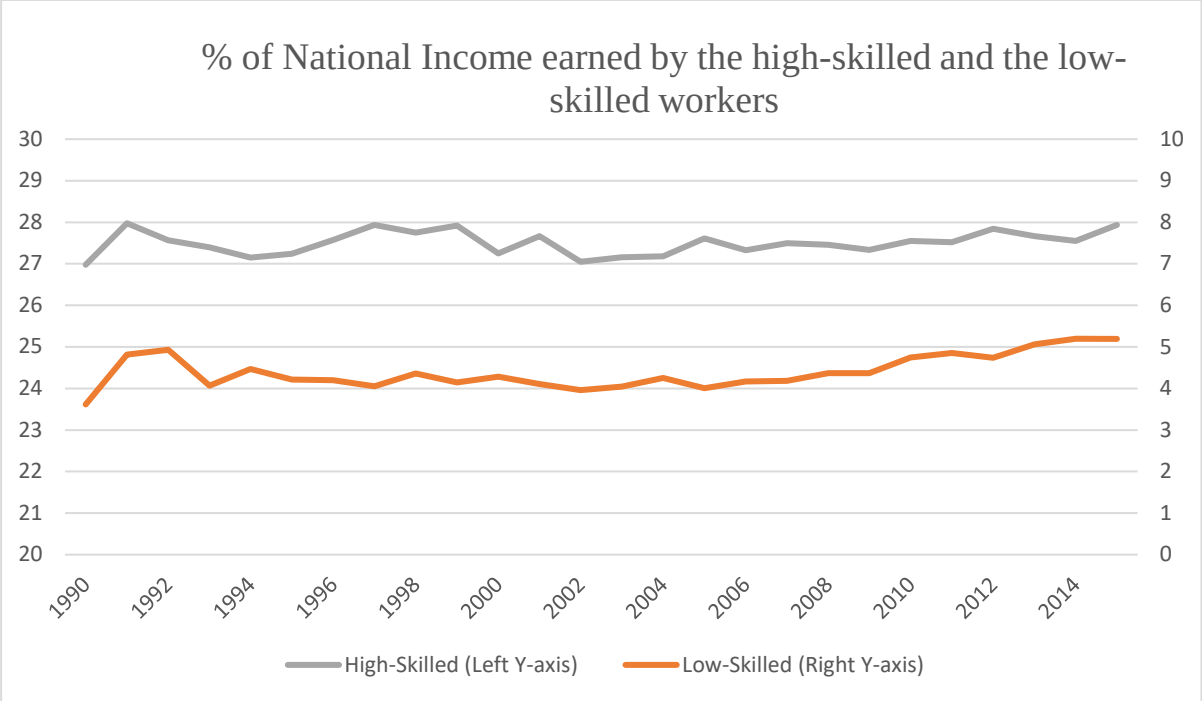
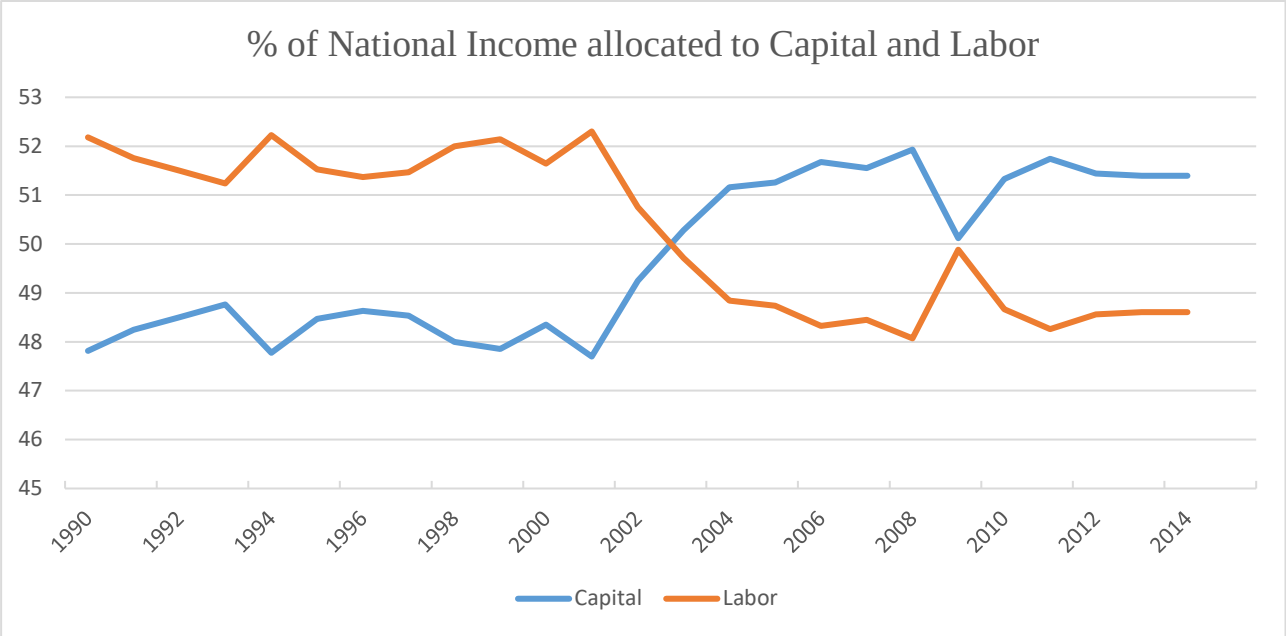


Figure 7 displays the other proxy for the difference in income distribution between high-skilled and low-skilled labor, the mean allocation of national income to labor and capital. The y-axis represents the share of national income that is allocated to labor and capital. The x-axis represents the given year in the data sample. Again, this figure represents the mean of all 14 countries in this study for the given time period. As displayed in Figure 7, till 2003, a majority of the national income was allocated to labor. After 2003, the share of national income allocated to capital overtook the labor share. However, there was not a major change, as one can interpret from the figure since both allocations vary around between the 47% and 53%.

Figure 7: Evolution of the mean allocation of National Income to labor and capital. Source: Feenstra, Inklaar and Timmer (2015)



The complete dataset contains 14 countries. Jamaica, Honduras and El Salvador were intended to be included in the dataset, but these countries have too much missing data. In total there is a maximum of 364 unique observations. Table 1 provides the summary statistics of the variables in this study.

Table 1: Summary statistics[1]

Variables	N	Mean	Std. Dev	Min	Max	Median
Wage Gap	228	6.641	1.746	3.414	15.99	6.436
Capital to Labor	350	1.066	0.406	0.356	2.262	1.109
SRI	280	0.864	0.0641	0.580	0.980	0.870
KOF Index	364	44.08	11.24	16.60	69.34	44.01
Trade Volume (%)	334	27.27	12.16	7.157	55.97	25.97
Female Part. Rate (%)	350	2.807	1.016	1.100	6.500	2.500
Gov. Spending (%)	362	12.13	3.562	2.976	22.73	11.96
Union Density (%)	90	14.70	9.252	0.200	42	14.45
Unemployment Rate (%)	340	8.046	3.909	1.300	20.50	7.40
Education (years)	199	8.644	1.385	3.900	11.90	8.70
GDP per Capita ($)	363	9,205	4,454	2,396	23,014	8,397
Informal Employment (%)	191	47.656	9.387	26.7	69.9	46.5

As displayed in Table 1, the variable union density has just 90 observations of the possible 364 unique observations. Therefore union density is linear interpolated based on the country (Chow & Lin, 1971). So, based on the available 90 observations, 274 new observations are created, using linear interpolation. For each country in the dataset, the new observations regarding union density are the average of the available observations. Within a country, the union density does not change significantly over time, which is in line with the available data. However, between countries the union density differs significantly. This data recreation should be discussed during the results since the coefficients can be more significant than they are. The data is also checked for skewness by analyzing the histograms of each variable. Of all variables, Female Participation Rate and real GDP per capita are skewed to the right. To solve this problem and achieve normality, the two variables are log transformed. Furthermore, in line with the study of Székely and Sámano (2012), Trade Reform and the KOF Index is lagged for five years. Summary statistics of these transformed variables can be found in section C of the appendix. To summarize, all the variables in this research are listed in Table 2 by their name and operationalization.

[1] For a full specification of the variables, see Table 2

Table 2: Variables and Description

Dependent variable: Wage Gap	
Wage Gap	Sum of share of national income held by the 8th and 9th decile divided by the sum of share of national income held by the 1st and 2nd decile.
Capital to Labor	Share of national income allocated to capital divided by share of income allocated to labor
Main Independent variables: Trade openness	
SRI	Index for Trade Reform based on the Structural Reform Index, lagged for five years
KOF Index	Index which captures the economic globalization, lagged for five years
Trade Volume	Percentage of the sum of exports and imports to the real GDP
Other Independent Variables	
Female Participation Rate	The logarithm of the percentage of women in the Total Labor population
Government Spending	Amount of social spending of a government to GDP
Union Density	Percentage of trade union members to the total labor population
Unemployment Rate	Percentage of unemployed labor to the total labor population
Education	Average years of attained education
GDP per Capita	The logarithm of real GDP per capita, measured in dollars, lagged for 1 year
Informal Market	Percentage of informal workers to the total labor population

Before the panel data is estimated, the variables are tested to detect the presence of collinearity between the variables. This can be detected by analyzing the correlation matrix. If there is any correlation between independent variables, the variables should be corrected, to realize valid results. Section D of the appendix provides the correlation matrix of all variables of the dataset. The correlation matrix does not reflect any cases of correlation between the variables since the highest value in the matrix is -0.559, which is not considered as problematic. After no cases of correlation between the variables of the study are observed, it should be determined which model is the most relevant for the constructed panel dataset, the Fixed Effect or Random Effects model. The Hausman test states which model is more suited for the panel dataset of this dataset. If the null hypothesis of the Hausman test is rejected, a Fixed Effect model is more suited for the data set than the Random Effects model. The Hausman test

provides a probability of 0.4436, implying that the null hypothesis, a Random Effects model is preferred, is not rejected. Therefore, a Random Effects model is used in this study. The Random Effects model assumes that the error term is uncorrelated with one of the explanatory variables in the model. This implies that differences across countries are random. To caught this randomness, a second error term, the α_i is added to the equation. Using the Random Effects models enables to include time-invariant variables, like the interpolated variable Union Density. However, it is unrealistic to state that the error term is completely uncorrelated with the explanatory variables. Therefore the parameter estimates of the Random Effects model can be biased. However, the Random Effects model is most suited to analyze the impact of trade liberalization on the wage gap in this study.

Furthermore, the panel dataset is checked for autocorrelation. Drukker (2003) wrote a program based on the Woolridge tests, to check for autocorrelation in panel data models. All six models in this study do not contain autocorrelation since the null hypothesis is not rejected, with a probability of at least 0.07. Also, a modified Wald test is used to check the data for the presence of heteroscedasticity. The modified Wald test for all six models indicates the presence of heteroscedasticity since the null hypothesis, the presence of homoscedasticity, is rejected with a probability of <0.000. This implies the presence of heteroscedasticity in the dataset, which indicates that there is cross-sectional dependence (Hoechle, 2007). Cross-sectional dependence suggests that within the countries there are intricate patterns of unobservable factors, which influence the relationship between the wage gap and trade openness of a country. This heteroscedasticity is reflected in the fact that covariate values far from the mean result in higher variance residuals. To assure that the standard errors of the random effects model are valid and to overcome the problem of heteroscedasticity, robust standard errors are used, which is a common practice in the literature. These robust standard errors are robust against cross-sectional dependence and overcome the problem of heteroscedasticity (Hoechle, 2007). It should be noted that robust standard errors can result in lower standard errors, to assure that the estimated standard errors are valid.

4. Results

4.1 Regression Results for the Full Model

Table 3 presents the results for the relationship between trade openness and the wage gap, namely the difference between the compensation for high-skilled and low-skilled labor. Column 1, 2 and 3 of Table 3 represent the estimation results where the dependent variable wage gap is measured as the ratio of shares of national income held by high-skilled labor to shares of national income held by low-skilled labor. Looking at the estimated effect of trade openness, operationalized in all three proxies, there is no significant effect on the wage gap. The variables that do have a significant positive impact on the wage gap are union density, unemployment and the size of the informal market. The significant positive effect of union density implies that an increase in the bargaining power of the trade unions increases the wage gap between high-skilled and low-skilled labor. A one percentage point increase in union density results in the widening of the wage gap between 0.067 and 0.08. Furthermore, the estimated model exhibits a significant positive effect of the unemployment rate on the wage gap. An increase of one percentage point in the unemployment rate results in a wage gap increase between 0.116 and 0.117. Also, the size of the informal market has a significant positive effect on the wage gap. Holding other variables constant, a one percentage point increase in informal employment causes the wage gap to widen between 0.042 and 0.06.

Table 3: Random Effects model estimates of Trade Openness on the Wage Gap

	(1) Wage Gap	(2) Wage Gap	(3) Wage Gap	(4) Cap to Lab	(5) Cap to Lab	(6) Cap to Lab
SRI	0.387			0.051		
	(0.20)			(0.25)		
KOF Index		-0.002			0.000	
		(-0.22)			(0.15)	
Trade Volume			0.001			0.004*
			(0.04)			(2.01)
Female Part.	-0.006	-0.012	-0.014	0.043	0.043	0.016
	(-0.02)	(-0.03)	(-0.03)	(0.49)	(0.50)	(0.23)
Gov. Spend.	0.038	0.014	-0.002	-0.056***	-0.056***	-0.053***
	(0.37)	(0.15)	(-0.02)	(-4.63)	(-4.88)	(-5.03)
Union Dens.	0.067*	0.074*	0.080*	-0.001	-0.001	0.000
	(2.12)	(2.10)	(2.13)	(-0.18)	(-0.18)	(0.05)
Unemploym.	0.117**	0.116**	0.116**	-0.001	-0.001	0.003
	(2.84)	(2.90)	(2.86)	(-0.23)	(-0.11)	(0.89)
Education	-0.195	-0.167	-0.176	0.045	0.047	0.040
	(-0.72)	(-0.51)	(-0.54)	(1.02)	(0.93)	(0.73)
GDP Cap.	-0.558	-0.450	-0.391	0.216	0.215	0.185
	(-0.72)	(-0.58)	(-0.54)	(1.83)	(1.75)	(1.76)
Inform. Emp.	0.042*	0.054*	0.060*	0.009	0.010*	0.012***
	(2.08)	(2.33)	(2.38)	(1.81)	(2.37)	(3.95)
Constant	8.604	7.432	6.678	-1.053	-1.065	-1.012
	(1.52)	(1.29)	(1.19)	(-1.61)	(-1.61)	(-1.46)
Observations	153	153	153	175	175	174
R^2-within	0.288	0.294	0.297	0.333	0.332	0.368
R^2-between	0.217	0.184	0.153	0.190	0.191	0.120
R^2-overall	0.247	0.197	0.175	0.234	0.238	0.166

t statistics in parentheses: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Column 4, 5 and 6 in Table 3 represent the estimation results where the wage gap is measured as the ratio in the allocation of national income of capital to labor. Again, trade restrictions do not have a significant effect on the wage gap. However, trade volume does have a significant positive effect ($p<0.05$) on the wage gap (Column 6, Table 3). As trade volume increases with one percentage point, the wage gap increases 0.004. This implies that an increase

in international trade causes the wage gap to widen. The wage gap is widened since more income is distributed to high-skilled labor. This entails that high-skilled labor benefits more from an increase in trade volume than low-skilled labor. Besides trade volume, government spending and the size of the informal market have a significant effect on the wage gap. Government spending has a negative effect on the wage gap. A one percentage point results in a wage gap decrease between 0.053 and 0.056. This implies that income inequality is reduced when more income is distributed to labor, causing the wage gap to close. Also, the size of the informal market has a significant effect on the wage gap when trade openness is measured as the KOF index and trade volume. It can be concluded that an increase in the size of the informal labor market results in a larger wage gap (Column 5 and 6, Table 3). A one percentage point increase of the informal labor market results in a wage gap increase of 0.01 and 0.012.

4.2 Trade Openness and the Wage Gap

In section E of the appendix, the regression output of the Random Effects models is displayed in Table 10, 11 and 12, where the wage gap is measured as the shares of national income held by high-skilled and low-skilled labor. In these tables, the independent variables are added sequentially in the order of the equation. Table 10.E, in which trade openness is measured with the SRI, does not provide any new major insights. The only new finding is that education has a significant effect on the wage gap, until GDP per capita is added. The results displayed in Table 11.E and 12.E, where trade openness is measured with the KOF index and trade volume, do provide some new insights. In both models, trade openness loses significance. The KOF index loses significance after the unemployment rate is added to the model, while trade volume loses significance after education is added. Since both coefficients are negative, it implies that an increase in the KOF index or trade volume, respectively, causes the wage gap to reduce. This means that income inequality is reduced since more income is distributed to low-skilled labor. An increase in trade volume leads to an even larger decrease in the wage gap.

The same procedure is applied when the wage gap is measured as the ratio of the share of national income allocated to capital versus labor. The results of this procedure can be found in section F of the appendix, where the three models are displayed in Table 13, 14 and 15. The effect of trade openness on the wage gap is to some extent in line with the results in Table 3. The SRI has only a significant effect on the wage gap when controlled for the female participation rate, government spending, union density and unemployment rate, with a $p < 0.01$ (Column 5 in Table 13.F). SRI has a significant positive effect on the wage gap. This indicates that an increase in SRI causes the wage gap to widen since more income is distributed to high-

skilled labor. When trade openness is measured as the KOF index it has a significant effect on the share of national income allocated, until education is included in the model, with a $p < 0.05$ (Table 14.F). Again, trade openness has a significant positive effect on the wage gap. An increase in the KOF index results in the widening of the wage gap since more income is distributed to high-skilled labor. However, when trade openness is measured as the trade volume, it has a significant positive effect on the wage gap in all six columns. (Table 15.F). This implies that an increase in trade volume increases the wage gap between high-skilled and low-skilled labor.

There are some differences in the effect of other independent variables on the wage gap between the tables in section E and F. Table 13.F shows that female participation rate and education have a significant positive effect on the allocation of national income to capital versus labor, when trade openness is measured as the SRI, both with $p<0.05$. However, the significant effect of the female participation rate disappears after the point where education is added to the model, while the significant effect of education disappears after GDP per capita is added (Colum 5 and 6 in Table 13.F). Table 14.F also exhibits a significant positive effect of female participation rate and education on the allocation of national income to capital versus labor when trade openness is measured as the KOF index. However, female participation rate only has significant effect in column 5 of Table 14.F ($p<0.05$). Education has a positive effect on the wage gap ($p<0.01$) until GDP per capita is added. The effect of other independent variables on the wage gap do not differ when Table 12.E and 15.F are compared.

When education is put first in the sequence of other independent variables in the equation, the other variables hold roughly the same significance levels as displayed in section E and F in the appendix. This implies that education has a substantial effect on the explanatory power of other variables in the model.

4.3 Regression Results Trade Openness on the wage gap with an interaction term

A closer look at SRI illustrates that it does not have much variation across countries. To expand the understanding of the relationship between the SRI and the wage gap, an interaction term between SRI and education is created. This interaction effect tests whether the relationship between trade openness and the wage gap changes by the level of education of a country. In the literature, there is an emerging view that the relationship between trade openness and income inequality differs between countries with low- and high levels of education. As the level of education in a country is relatively high, it can be assumed that high-skilled labor is abundant, while a country with a relatively low level of education has an abundance of low-skilled labor.

As discussed in chapter 2, the Heckscher-Ohlin model and the Stolper-Samuelson theorem state that the abundant production factor will benefit from trade liberalization. So these theories state that trade liberalization in countries with a high level of education causes the wage gap to widen since more income is distributed to high-skilled labor (Goldberg & Pavcnik, 2007). However, trade liberalization causes the wage gap to reduce in countries with a low level of education since more income is distributed to low-skilled labor (Amiti & Cameron, 2012). To improve the interpretation of the main effects of the interaction term, the interaction term is created after both main independent variables, education and SRI were mean-centered. Through this procedure, all observations of SRI and education are subtracted by the mean average. Without centering, the coefficients of the main effects of SRI and education can only be interpreted when the other variable has a value of zero, which is unrealistic (Jaccard, Wan and Turrisi, 1990). The model with the interaction term SRI-Education is presented in Table 4.

In contrast to the findings in previous models, the dependent variable SRI has a much larger main effect on both measurements of the wage gap. However, this effect remains insignificant. More interesting is the fact that the interaction term has a significant positive effect on both measurements of the wage gap ($p<0.01$). So the results imply the following: If a country with a mean-level of education liberates its trade policy with 0.1, the wage gap increases with 0.272. The significant effect of the interaction term implies that the effect of SRI on the wage gap changes by the level of education of a country. Since both variables are centered, the positive interaction term can be interpreted as followed: First of all, as the level of education of a country is below average, the SRI has a negative effect on the wage gap. This implies that an increase in trade openness leads to a reduction in income inequality. On the other hand, in countries with a level of education at or above average, the SRI has a positive effect on the wage gap of a country. This implies that an increase in trade openness leads to an increase in the wage gap. Compared with the results in Table 3, the effects of other variables in the model do not differ slightly. The only difference is that the informal sector becomes significant on the wage gap, with a $p<0.05$ (Table 4, Column 2).

Table 4: Random Effects Model: Effect of SRI with interaction term Education on the Income Distribution

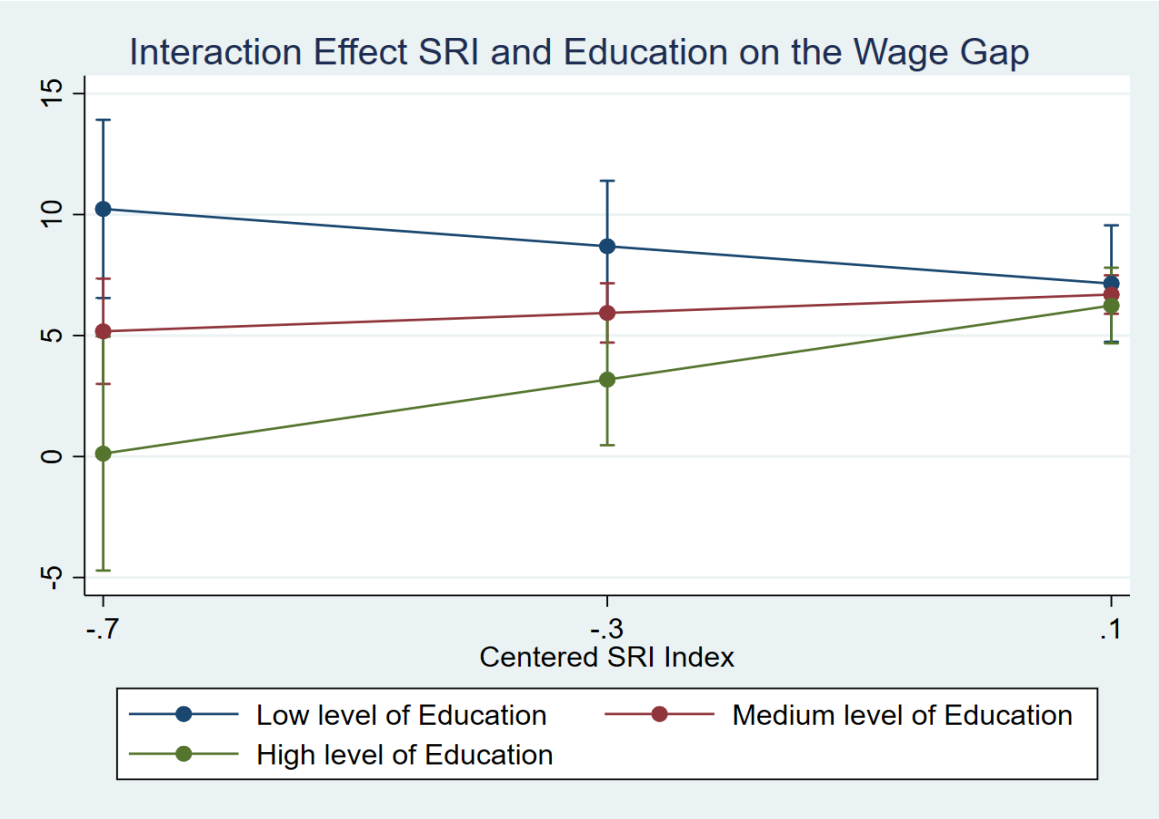
	(1) Wage Gap	(2) Capital to Labor Share
SRI	2.720^{+}	0.367^{+}
	(1.76)	(1.73)
Education	-0.294	0.039
	(-1.07)	(0.89)
Education * SRI	1.644**	0.284**
	(2.71)	(3.24)
Female Part.	0.133	0.069
	(0.39)	(0.82)
Gov. Spend.	0.025	-0.055***
	(0.23)	(-4.41)
Union Dens.	0.069*	-0.002
	(2.12)	(-0.29)
Unemploym.	0.119**	-0.000
	(2.68)	(-0.05)
GDP Cap.	-0.630	0.175
	(-0.76)	(1.42)
Inform. Emp.	0.042*	0.009*
	(2.14)	(2.47)
Constant	7.695	-0.272
	(0.99)	(-0.26)
Observations	153	175
R^2-within	0.321	0.380
R^2-between	0.238	0.197
R^2-overall	0.254	0.248

t statistics in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In Figure 8, the interaction effect of SRI and education on the wage gap is graphed, which correspondents with the results of column 1 of Table 4. It charts the effect of SRI for countries with a level of education above average (green line), at an average level (red line) and below average (blue line). As graphed in Figure 8, the effect of SRI on the wage gap differs between countries with different levels of education. Countries with a relatively low level of

education have a higher wage gap when the SRI is relatively small. The higher wage gap can be related to the fact that there is a lack of high-skilled labor and an abundance of low-skilled labor. Therefore, the compensation for high-skilled labor shifts upwards, while the compensation for low-skilled labor drops due to excess in supply. This difference in supply results in a higher wage gap between high-skilled and low-skilled labor. However, the wage gap changes when the SRI rises. For countries with a low level of education the SRI has a negative effect on the wage gap, as seen by the blue line in Figure 8. So, the wage gap reduces in countries with a low level of education, as trade openness rises. This reduction implies that income inequality is reduced since more income is distributed to low-skilled labor. A possible explanation is that relatively low price of low-skilled labor increases the demand for low-skilled labor from other countries, causing the compensation for low-skilled labor to rise. This reasoning is in line with the Heckscher-Ohlin model and the Stolper-Samuelson theorem, described in Chapter 2. Countries with a relatively high level of education have a lower wage gap when the SRI is relatively small, which can be related to the wage compression effect (Gregorio & Lee, 2002). This effect states that the wage premium for high-skilled labor decreases as the relative supply of high-skilled labor increases, which lowers the income inequality. In contrast to countries with a relatively low level of education, the SRI has a positive effect on the wage gap for countries that have a medium to high level of education, as seen by the red and green line in Figure 8. A possible explanation is that a relatively low price of high-skilled labor increases the demand for high-skilled labor from other countries, causing the compensation for high-skilled labor to rise. This reasoning is also in line with the Heckscher-Ohlin model and the Stolper-Samuelson theorem. The increase in wage premium for high-skilled labor causes the wage gap to widen since more income is distributed to high-skilled labor.

Figure 8: Interaction effect of SRI and Education on the Wage Gap between high-skilled and low-skilled workers.



4.4 Regression Results Effects of Exports vs. Imports on the Capital/Labor Ratio

The effects of trade volume are analyzed in depth since trade volume exhibits a significant effect on the allocation of national income. Therefore, two more models are created, where trade volume is separated in imports to real GDP and exports to real GDP. The results of the two models are presented in Table 16 and 17 of section G of the appendix. As shown in the two Tables, the same procedure has been applied by adding other independent variables one by one. Column 8 of both models represent the outcome of the full model. As Table 16.G displays, exports have a significant positive effect on the wage gap ($p<0.05$). An increase of one percentage point of exports to real GDP increases the wage gap by 0.01. This indicates that an increase in exports results in the widening of the wage gap since more income is allocated to capital. In contrast to the significant effect of exports, imports do not have a significant effect on the wage gap (Table 17.G). So the results suggest that the radical change in trade policy affected the income distribution through the channels of exports. The effect of other independent variables does not differ significantly from previous findings (Table 17.G & 18.G). Government spending and the size of the informal market still have a significant effect on the wage gap.

5. Conclusion and recommendations

5.1 Conclusion

In this study, the impact of trade liberalization on the wage gap in Latin America is analyzed. The results of this analysis contribute to the ongoing debate in the literature: does trade liberalization affect the income distribution, and if so, who benefits within the country? The Heckscher-Ohlin model and the Stolper-Samuelson theorem state that an increase in trade openness causes a decrease of the wage gap between low-skilled and high-skilled workers in developing countries. Opening the borders for international trade causes a rise in the relative demand for low-skilled labor, which increases the compensation for low-skilled labor. There is also an opposing view in the literature, which argues that trade liberalization results in a widening of the wage gap. The wage gap widens as the relative demand for high-skilled labor rises, which increase the income distributed to high-skilled labor. To analyze the impact of trade liberalization on the wage gap, a panel is constructed covering 14 Latin American countries over the period 1990-2015. A Random Effects model with robust standard errors is used to estimate the effect of trade openness on the wage gap, controlling for other variables. The wage gap is operationalized by the difference in national income held and the allocation of national income to capital versus labor. Trade openness is measured in three proxies: the trade reform index from SRI, the KOF Index and trade volume.

This study provides empirical support that trade openness, in general, does not affect the wage gap between high-skilled and low-skilled labor. In only one of the six models, trade openness has a significant positive effect on the wage gap. The results show that a rise in trade volume increases income inequality. However, this effect is not as big as the effect of government spending or the size of the informal labor market. The significant effect of trade volume is mainly contributed by exports. Exports have a significant positive effect on the wage gap, while imports do not have a significant effect. Furthermore, an interaction effect is found between the SRI and education on the income distribution. The relationship between SRI and the wage gap differs between countries with a low level and countries with an average to high level of education. In countries with a low level of education, the SRI has a negative effect on the wage gap. An increase in SRI results in a decrease in the wage gap since more income is distributed to low-skilled labor. In contrast, the SRI has a positive effect on the wage gap in countries with an average to high level of education. An increase in the SRI leads to an increase in the wage gap since more income is distributed to high-skilled labor. This interaction effect is in line with the Heckscher-Ohlin model and the Stolper-Samuelson theorem.

5.2 Discussion

The findings of this study suggest that trade openness generally does not have a significant effect on the wage gap between high-skilled and low-skilled labor. In one of the six models a positive significant effect of trade liberalization on the wage gap was found. This implies that high-skilled labor benefitted more from the radical changes in policy. These findings are in line with the results of the studies of Feenstra & Hanson (1997) and Attanasio, Goldberg and Pavcnik (2004). However, it is unclear whether this increase in the wage gap is caused by the adaptation of new technologies or by the increase of foreign FDI. In five of the six models no relationship has been found between trade liberalization and the wage gap. This suggests that the radical transformation in trade policies of Latin American countries does not have a significant impact on the returns to skill. On the other hand, the results show that other factors do have an impact on the wage gap, like government spending, union density, the unemployment rate and the size of the informal labor market. This interpretation is in line with the findings of Dollar & Kraay (2001), who argue that shifts in the income distribution can arguably be linked to other influences, far away from the influences of international trade. The findings of this study are unaligned with previous studies that investigate the impact of trade liberalization on the wage gap. A relationship between trade openness and the wage gap between the low- and high-skilled labor could exist, given the fact a majority of study's found a link between trade liberalization and income inequality. A possible explanation of the absence of the relationship between trade openness and the skill premium could be the result of the way the wage gap was defined in this study. Although the use of deciles and the allocation of income provide reasonably good proxies for the wage gap, it could be that these operationalizations fail to adequately incorporate all factors that are relevant for this phenomena. Hence, the wage gap is not captured in its entirety.

The absence of an impact of trade openness on the wage gap is in contrast against the standard Heckscher-Ohlin reasoning. This study does not provide empirical support that trade liberalization results in a decrease in the wage gap of low-skilled abundant countries. This implies that the relative productivity of high-skilled labor held, despite their relatively high cost. A possible explanation could be that the higher educated population group better coped with the technological advancements of the developed world, which increased their productivity.

5.3 Limitations and further research

One of the limitations of this study is related to the fact that the wages of low-skilled and high-skilled labor are derived from the shares of national income held by the first and second decile and eighth and ninth decile of the population group. To strengthen the validity of this study, a

second measurement of the wage gap is derived from the difference in allocation of national income to capital and labor. Due to time, financial and geographical constraints, it is beyond the bounds of this research to obtain the real wages of low-skilled and high-skilled labor of the underlying countries of this study. Therefore the impact of trade openness on the wage gap can be analyzed more precisely by constructing a comprehensive dataset of reliable returns to skill.

Another limitation of this study is the problem of data availability is the omission of the observations of Jamaica, Honduras and El Salvador and linear interpolating of the variable union density. The available data of union density exhibits a low degree of variance within countries and relatively big differences between countries. Therefore, the variable union density is linear interpolated, which is a common tool in the literature to deal with missing data (Chow & Lin, 1971). Furthermore, the variables education, wage gap and informal market lacked some data. To strengthen future research by enhancing the predictive power of the model, the lack of available data should be overcome. Also, when measured as trade restrictions, trade openness is lagged five years. Although it is assumed that the economy needs some time to adapt to the changes in trade policy's, it could be that in some cases this assumption is too strict and that some changes in trade policy have effect in more or less than five years. At last, although the control variables used in this study have been proven to affect the wage gap, other factors could also affect the income distribution. This could for example be tax policy, regional differences within a country, political stability and the size of the financial sector (Galbraith, 2010; Azzoni, 2001).

Despite these concerns, the results of this study provide new insights regarding the ongoing debate which population group benefits from an increase in trade openness. In the literature, no interaction effect has been found between SRI and education on the wage gap for developing countries. However, these findings are in line with the Heckscher-Ohlin model and the Stolper-Samuelson theorem. Although this study does provide empirical support that exports cause the wage gap to widen, it remains unclear why imports do not have a similar impact. Additional research is needed to provide a deeper understanding of the impact of imports on the income distribution. Moreover, since trade openness has a positive effect on the wage gap in one of the six models, future research should analyze whether this is caused by the Feenstra-Taylor theory or by the skilled-biased technological change. Therefore the technological state of the countries and inward FDI should be included. To further assess the impact of trade liberalization on the income distribution between high-skilled and low-skilled labor, more research is warranted.

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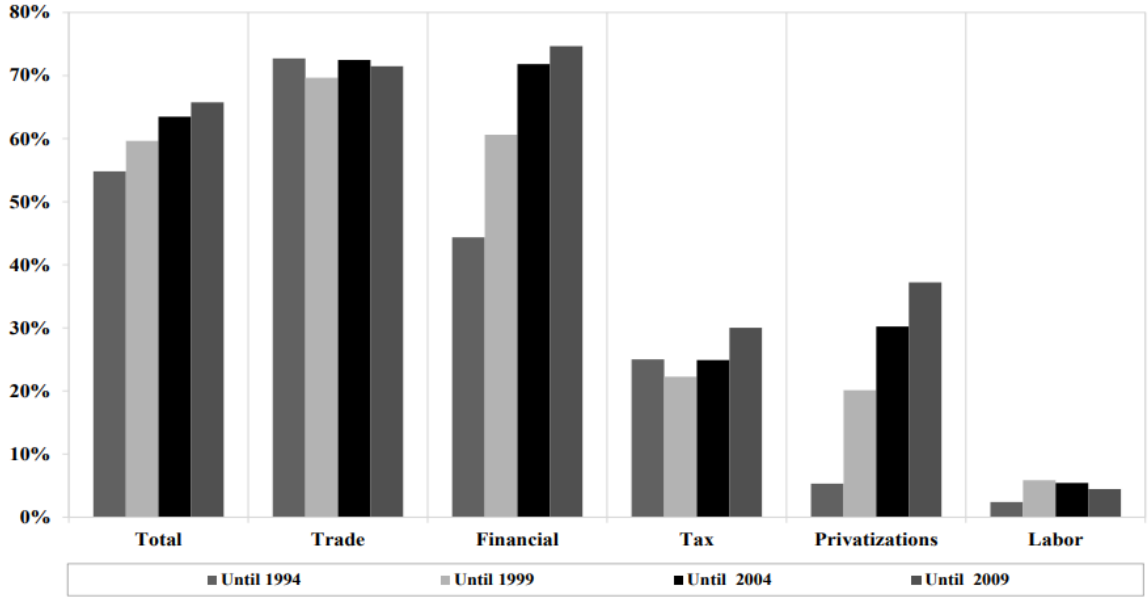
7. Appendix

Section A: Figure SRI 1994-2009

Figure 1 – Margin of Structural Reform of Latin America 1994 until 2009. Source: Lora, 2012



Note: The reform margin is calculated as follows: $(X_t - X_{85}) / (1 - X_{85})$, where X_t is the average of the reform index in year t and X_{85} is the average of the reform index in 1985.
Sources: see Appendix.

Section B: Summary Statistics other independent variables by country

Table 1 - Summary Statistics Female participation rate (% of labor population) by country

	Mean	Std	Min	Max	N
Argentina	2.48	0.30	1.9	3.2	25
Bolivia	2.48	0.23	2.2	2.9	25
Brazil	2.45	0.41	1.6	3.1	25
Chile	1.93	0.41	1.5	2.9	25
Colombia	2.60	0.30	1.9	3.0	25
Costa Rica	3.64	0.96	1.8	5.0	25
Dominican Republic	2.20	0.62	1.1	3.1	25
Ecuador	3.60	1.36	1.9	6.5	25
Guatemala	2.08	0.40	1.6	2.7	25
Mexico	2.01	0.33	1.4	2.5	25
Paraguay	3.20	0.90	1.6	5.3	25
Peru	2.94	0.34	2.4	3.7	25
Uruguay	2.73	0.85	1.9	6.2	25
Venezuela	4.96	0.38	4.0	5.5	25
Total	2.81	1.02	1.1	6.5	350

Table 2 - Summary Statistics Government spending (% of GDP) by country

	Mean	Std	Min	Max	N
Argentina	12.69	3.98	3.0	18.5	26
Bolivia	14.31	1.36	11.8	17.5	26
Brazil	18.86	0.93	15.8	20.1	26
Chile	11.02	1.41	8.7	13.2	26
Colombia	16.01	3.35	9.2	22.7	26
Costa Rica	14.41	1.79	12.0	17.6	26
Dominican Republic	7.37	2.35	3.2	10.9	26
Ecuador	11.59	1.48	9.4	14.4	26
Guatemala	8.10	2.06	5.0	10.8	26
Mexico	11.40	1.11	8.4	13.2	26
Paraguay	9.94	1.50	6.6	12.8	25
Peru	10.51	1.51	7.3	13.2	26
Uruguay	12.20	0.84	10.9	13.8	26
Venezuela	11.27	2.45	5.0	14.6	25
Total	12.13	3.56	3.0	22.7	362

Table 3 - Summary Statistics Union density (% of labor population) by country

	Mean	Std	Min	Max	N
Argentina	32.40	4.39	27.7	42.0	9
Bolivia	32.85	8.84	26.6	39.1	2
Brazil	18.04	1.04	16.2	19.5	11
Chile	15.79	1.03	14.5	17.9	16
Colombia	9.69	0.16	9.4	9.9	8
Costa Rica	14.90	3.27	12.4	18.6	3
Dominican Republic	9.86	0.86	8.8	11.1	8
Guatemala	2.89	0.46	2.3	3.6	7
Mexico	13.91	0.79	12.9	15.3	7
Paraguay	6.16	0.94	4.9	7.2	5
Peru	4.57	0.55	4.0	5.2	7
Uruguay	26.56	5.61	16.6	30.1	5
Venezuela	0.20	0.00	0.2	0.2	2
Total	14.70	9.25	0.2	42.0	90

Table 4 - Summary Statistics Unemployment rate (% of labor population) by country

	Mean	Std	Min	Max	N
Argentina	11.31	4.28	5.6	19.6	25
Bolivia	4.14	1.55	2.0	7.3	23
Brazil	7.95	2.15	3.7	15.3	24
Chile	7.83	2.15	4.4	11.3	26
Colombia	11.86	3.34	7.8	20.5	26
Costa Rica	6.39	1.91	3.9	10.2	26
Dominican	11.85	5.69	4.8	20.3	25

Republic					
Ecuador	7.44	2.93	3.1	14.4	26
Guatemala	2.83	0.85	1.3	4.1	16
Mexico	4.00	1.10	2.5	6.9	25
Paraguay	6.72	1.79	3.4	10.8	21
Peru	7.80	1.16	5.7	9.9	26
Uruguay	9.89	3.04	6.3	16.9	25
Venezuela	10.10	3.01	6.6	16.8	26
Total	8.05	3.91	1.3	20.5	340

Table 5 - Summary Statistics Education by country

	Mean	**Std**	**Min**	**Max**	**N**
Argentina	10.85	0.98	8.9	11.9	16
Bolivia	8.07	1.06	7.0	10.4	12
Brazil	7.16	1.05	5.5	8.7	18
Chile	10.31	0.78	9.2	11.5	11
Colombia	8.02	0.74	6.6	9.1	15
Costa Rica	8.32	0.62	7.1	9.2	19
Dominican	8.57	0.37	7.9	9.1	12
Republic					
Ecuador	8.93	0.53	7.6	9.6	15
Guatemala	4.55	0.47	3.9	4.9	4
Mexico	8.14	0.91	6.5	9.4	12
Paraguay	7.89	0.89	6.5	9.3	17
Peru	9.38	0.81	7.6	10.2	12
Uruguay	9.40	0.68	8.1	10.3	18
Venezuela	8.92	0.81	7.7	10.1	18
Total	8.64	1.38	3.9	11.9	199

Table 6 - Summary Statistics Informal market (% of labor population) by country

	Mean	**Std**	**Min**	**Max**	**N**
Argentina	40.79	2.28	37.0	43.9	17
Bolivia	62.09	3.65	57.6	69.9	11
Brazil	42.31	3.08	37.3	46.7	17
Chile	32.59	3.51	26.7	38.8	11
Colombia	58.70	1.32	56.3	59.9	7
Costa Rica	37.76	1.95	33.5	41.2	19
Dominican	49.29	1.60	46.1	52.2	12
Republic					
Ecuador	55.84	1.32	53.5	57.5	17
Guatemala	55.23	1.35	53.7	57.0	4
Mexico	43.98	1.66	41.9	46.8	12
Paraguay	56.50	4.37	50.1	63.6	17
Peru	59.59	2.22	56.9	63.0	12
Uruguay	38.25	2.41	34.7	41.5	17
Venezuela	50.24	6.02	36.2	58.1	18
Total	47.66	9.39	26.7	69.9	191

Table 7 - Summary Statistics GDP per capita by country

	Mean	Std	Min	Max	N
Argentina	13681.89	4181.64	6990.6	20340.3	26
Bolivia	4147.53	1333.36	2396.1	6955.2	26
Brazil	10739.09	3171.84	6686.1	16160.4	26
Chile	12665.13	6023.66	4507.1	23014.0	26
Colombia	8270.01	2745.18	4869.2	13827.7	26
Costa Rica	9539.18	3351.68	5033.1	15881.6	26
Dominican Republic	7650.18	3246.13	3404.3	14238.9	26
Ecuador	7407.93	2140.43	4829.4	11461.3	26
Guatemala	5342.05	1354.52	3296.8	7765.8	26
Mexico	11549.25	3494.95	6037.0	17270.1	26
Paraguay	5749.71	1524.47	3901.6	9199.7	26
Peru	6882.46	2930.63	3433.8	12530.8	26
Uruguay	12189.17	4540.58	6360.4	21117.8	26
Venezuela	13212.51	2958.10	9340.0	18281.2	25
Total	9205.14	4454.36	2396.1	23014.0	363

Section C: Summary Statistics transformed variables

Table 8 - Summary Statistics of Lagged variables SRI, KOF and LOG GDP per capita, Interpolated variable Union Density and Log transformed variables Female Participation Rate and GDP per capita

Variables	N	Mean	Std.Dev	Min	Max	Median
SRILAG5	345	0.812	0.155	0.04	0.98	0.87
KOFLAG5	364	42.642	11.399	16.503	69.344	41.807
IP UD	364	13.871	10.120	0.20	32.85	11.888
LOGFEMPAR	350	0.974	0.333	0.0953	1.872	0.916
LOGGDPCAP	363	9.012	0.488	7.782	10.044	9.036
LAGGDPCAP	350	8.993	0.482	7.782	10.044	9.019

Section D: Correlation Matrix Full Model

Table 9 - Correlation Matrix of Full Model

Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)Wage Gap	1.000											
(2) Cap to Lab	-0.384	1.000										
(3) SRI	-0.159	0.098	1.000									
(4) KOF Index	-0.048	-0.131	-0.066	1.000								
(5)Trade Vol	-0.408	-0.203	0.225	0.064	1.000							
(6)Fem Par	-0.160	0.010	0.013	0.070	0.107	1.000						
(7) Gov Spen	0.467	-0.249	-0.119	0.407	-0.324	0.003	1.000					
(8) Union Dens	0.222	-0.134	-0.003	-0.062	-0.189	-0.297	0.329	1.000				
(9) Unemp	0.136	0.044	0.008	-0.005	-0.369	0.190	0.051	0.053	1.000			
(10)Education	-0.379	0.382	0.369	-0.010	0.221	-0.009	-0.178	0.295	0.187	1.000		
(11) GDP p Cap	-0.250	0.118	0.016	0.358	0.173	0.096	0.240	0.097	0.207	0.549	1.000	
(12) Informal	0.058	0.192	0.079	-0.094	-0.341	0.129	-0.153	-0.389	-0.087	-0.291	-0.559	1.000

Section E: Random Effects Model: Effects of Trade Openness on the Wage Gap

Table 10: Random Effects Model: Effect of Trade Liberalization (SRI) on the Wage Gap

	(1) Wage Gap	(2) Wage Gap	(3) Wage Gap	(4) Wage Gap	(5) Wage Gap	(6) Wage Gap	(7) Wage Gap	(8) Wage Gap
SRI	0.387	1.710	1.475	1.565	1.134	0.902	0.692	0.387
	(0.20)	(0.89)	(0.59)	(0.62)	(0.46)	(0.42)	(0.33)	(0.20)
Female Part.		-0.417	-0.417	-0.377	-0.263	0.028	0.048	-0.006
		(-1.14)	(-1.04)	(-0.96)	(-0.87)	(0.08)	(0.13)	(-0.02)
Gov. Spend.			0.021	0.011	0.012	-0.023	0.027	0.038
			(0.22)	(0.12)	(0.15)	(-0.22)	(0.27)	(0.37)
Union Dens.				0.053	0.054	0.071*	0.057	0.067*
				(1.55)	(1.40)	(2.07)	(1.68)	(2.12)
Unemploym.					0.115***	0.115**	0.111*	0.117**
					(5.02)	(2.59)	(2.50)	(2.84)
Education						-0.385*	-0.219	-0.195
						(-2.57)	(-0.90)	(-0.72)
GDP Cap.							-0.617	-0.558
							(-0.96)	(-0.72)
Inform. Emp.								0.042*
								(2.08)
Constant	6.221***	5.479**	5.430***	4.689**	3.995*	7.399***	11.348*	8.604
	(3.46)	(2.89)	(3.36)	(2.62)	(2.19)	(3.32)	(2.45)	(1.52)
Observations	218	215	215	215	210	160	160	153
R^2-within	0.002	0.024	0.020	0.022	0.114	0.242	0.237	0.288
R^2-between	0.181	0.060	0.000	0.125	0.136	0.125	0.255	0.217
R^2-overall	0.014	0.001	0.035	0.064	0.058	0.203	0.250	0.247

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 11: Random Effects Model: Effect of Trade Liberalization (KOF) on the Wage Gap

	(1) Wage Gap	(2) Wage Gap	(3) Wage Gap	(4) Wage Gap	(5) Wage Gap	(6) Wage Gap	(7) Wage Gap	(8) Wage Gap
KOF Index	-0.033**	-0.033*	-0.036**	-0.034**	-0.020	-0.006	-0.005	-0.002
	(-2.67)	(-2.53)	(-2.86)	(-2.70)	(-1.45)	(-0.54)	(-0.50)	(-0.22)
Female Part.		-0.302	-0.329	-0.280	-0.229	0.029	0.044	-0.012
		(-1.08)	(-1.02)	(-0.90)	(-0.77)	(0.08)	(0.12)	(-0.03)
Gov. Spend.			0.062	0.048	0.041	-0.002	0.034	0.014
			(0.97)	(0.79)	(0.88)	(-0.02)	(0.42)	(0.15)
Union Dens.				0.040	0.046	0.064	0.054	0.074*
				(1.43)	(1.29)	(1.91)	(1.49)	(2.10)
Unemploym.					0.112***	0.117**	0.112**	0.116**
					(4.80)	(3.00)	(2.74)	(2.90)
Education						-0.344	-0.171	-0.167
						(-1.77)	(-0.59)	(-0.51)
GDP Cap.							-0.642	-0.450
							(-0.97)	(-0.58)
Inform. Emp.								0.054*
								(2.33)
Constant	7.955***	8.221***	7.651***	7.115***	5.570***	7.898***	11.939**	7.432
	(10.77)	(10.20)	(10.07)	(7.60)	(4.79)	(4.71)	(2.60)	(1.29)
Observations	228	225	225	225	219	160	160	153
R^2-within	0.038	0.042	0.035	0.037	0.121	0.233	0.232	0.294
R^2-between	0.071	0.065	0.341	0.286	0.239	0.193	0.312	0.184
R^2-overall	0.013	0.022	0.138	0.120	0.099	0.226	0.250	0.197

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 12: Random Effects Model: Effect of Trade Volume on the Wage Gap

	(1) Wage Gap	(2) Wage Gap	(3) Wage Gap	(4) Wage Gap	(5) Wage Gap	(6) Wage Gap	(7) Wage Gap	(8) Wage Gap
Trade Vol.	-0.043***	-0.043***	-0.043***	-0.043***	-0.032**	-0.010	-0.006	0.001
	(-3.66)	(-3.60)	(-3.45)	(-3.45)	(-2.86)	(-0.70)	(-0.45)	(0.04)
Female Part.		-0.112	-0.112	-0.083	-0.104	0.049	0.053	-0.014
		(-0.38)	(-0.37)	(-0.29)	(-0.43)	(0.14)	(0.14)	(-0.03)
Gov. Spend.			0.013	0.004	0.014	-0.019	0.010	-0.002
			(0.17)	(0.05)	(0.26)	(-0.20)	(0.11)	(-0.02)
Union Dens.				0.050	0.051	0.065	0.058	0.080*
				(1.45)	(1.31)	(1.76)	(1.56)	(2.13)
Unemploym.					0.096**	0.112**	0.111**	0.116**
					(3.23)	(2.76)	(2.63)	(2.86)
Education						-0.297	-0.190	-0.176
						(-1.33)	(-0.64)	(-0.54)
GDP Cap.							-0.485	-0.391
							(-0.77)	(-0.54)
Inform. Emp.								0.060*
								(2.38)
Constant	7.711***	7.800***	7.668***	7.020***	5.870***	7.750***	10.836*	6.678
	(13.86)	(12.15)	(7.82)	(6.33)	(5.13)	(4.40)	(2.45)	(1.19)
Observations	223	223	223	223	217	160	160	153
R^2-within	0.075	0.075	0.074	0.075	0.142	0.236	0.235	0.297
R^2-between	0.095	0.093	0.117	0.235	0.203	0.183	0.260	0.153
R^2-overall	0.083	0.086	0.099	0.124	0.109	0.212	0.230	0.175

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Section F: Random Effects Model: Effects of Trade Openness on the Capital/Labor Ratio

Table 13: Random Effects Model: Effect of Trade Liberalization (SRI) on the Capital/Labor Ratio

	(1) Cap to Lab	(2) Cap to Lab	(3) Cap to Lab	(4) Cap to Lab	(5) Cap to Lab	(6) Cap to Lab	(7) Cap to Lab	(8) Cap to Lab
SRI	0.319	0.322	0.386	0.385	0.459**	0.120	0.137	0.051
	(1.81)	(1.87)	(1.92)	(1.91)	(2.64)	(0.60)	(0.68)	(0.25)
Female Part.		0.153*	0.160*	0.160*	0.160*	0.069	0.069	0.043
		(2.01)	(2.01)	(2.00)	(2.06)	(0.83)	(0.83)	(0.49)
Gov. Spend.			-0.009	-0.009	-0.011	-0.034**	-0.040**	-0.056***
			(-1.24)	(-1.22)	(-1.74)	(-2.74)	(-2.92)	(-4.63)
Union Dens.				-0.005	-0.006	-0.009	-0.006	-0.001
				(-0.66)	(-0.69)	(-0.97)	(-0.72)	(-0.18)
Unemploym.					-0.002	-0.001	0.001	-0.001
					(-0.36)	(-0.11)	(0.14)	(-0.23)
Education						0.088*	0.048	0.045
						(2.32)	(0.92)	(1.02)
GDP Cap.							0.135	0.216
							(1.17)	(1.83)
Inform. Emp.								0.009
								(1.81)
Constant	0.806***	0.654***	0.702***	0.775***	0.761***	0.731*	-0.148	-1.053
	(6.86)	(4.61)	(4.99)	(3.79)	(3.55)	(2.39)	(-0.23)	(-1.61)
Observations	345	332	332	332	311	186	186	175
R^2-within	0.088	0.127	0.135	0.135	0.157	0.303	0.316	0.333
R^2-between	0.028	0.001	0.036	0.050	0.062	0.190	0.177	0.190
R^2-overall	0.002	0.014	0.049	0.066	0.078	0.248	0.230	0.234

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 14: Random Effects Model: Effect of Trade Liberalization (KOF) on the Capital/Labor Ratio

	(1) Cap to Lab	(2) Cap to Lab	(3) Cap to Lab	(4) Cap to Lab	(5) Cap to Lab	(6) Cap to Lab	(7) Cap to Lab	(8) Cap to Lab
KOF Index	0.007*	0.006*	0.007**	0.007**	0.008*	0.000	0.000	0.000
	(2.48)	(2.42)	(2.59)	(2.60)	(2.44)	(0.13)	(0.23)	(0.15)
Female Part.		0.124	0.129	0.129	0.143*	0.066	0.066	0.043
		(1.90)	(1.96)	(1.95)	(2.23)	(0.84)	(0.84)	(0.50)
Gov. Spend.			-0.005	-0.005	-0.006	-0.033**	-0.038**	-0.056***
			(-0.90)	(-0.88)	(-1.23)	(-2.89)	(-2.89)	(-4.88)
Union Dens.				-0.004	-0.004	-0.009	-0.007	-0.001
				(-0.55)	(-0.52)	(-1.10)	(-0.82)	(-0.18)
Unemploym.					0.008	0.000	0.002	-0.001
					(1.25)	(0.05)	(0.32)	(-0.11)
Education						0.092**	0.055	0.047
						(2.68)	(0.98)	(0.93)
GDP Cap.							0.128	0.215
							(1.01)	(1.75)
Inform. Emp.								0.010*
								(2.37)
Constant	0.775***	0.683***	0.722***	0.781***	0.653***	0.765**	-0.067	-1.065
	(7.96)	(6.81)	(7.79)	(5.50)	(3.46)	(2.79)	(-0.09)	(-1.61)
Observations	350	336	336	336	315	186	186	175
R^2-within	0.105	0.136	0.140	0.140	0.154	0.299	0.311	0.332
R^2-between	0.041	0.011	0.001	0.004	0.000	0.186	0.173	0.191
R^2-overall	0.005	0.000	0.004	0.015	0.003	0.250	0.229	0.238

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 15: Random Effects Model: Effect of Trade Volume on the Capital/Labor Ratio

	(1) Cap to Lab	(2) Cap to Lab	(3) Cap to Lab	(4) Cap to Lab	(5) Cap to Lab	(6) Cap to Lab	(7) Cap to Lab	(8) Cap to Lab
Trade Vol.	0.009***	0.008***	0.009***	0.009***	0.010***	0.005*	0.004*	0.004*
	(3.48)	(3.41)	(3.89)	(3.89)	(3.72)	(2.30)	(2.54)	(2.01)
Female Part.		0.073	0.079	0.079	0.086	0.041	0.041	0.016
		(1.42)	(1.61)	(1.60)	(1.68)	(0.63)	(0.62)	(0.23)
Gov. Spend.			-0.010*	-0.010*	-0.011	-0.036***	-0.040***	-0.053***
			(-2.21)	(-2.20)	(-1.85)	(-3.79)	(-3.80)	(-5.03)
Union Dens.				-0.004	-0.004	-0.007	-0.005	0.000
				(-0.44)	(-0.43)	(-0.72)	(-0.54)	(0.05)
Unemploym.					0.008	0.004	0.005	0.003
					(1.51)	(0.89)	(1.12)	(0.89)
Education						0.066	0.041	0.040
						(1.57)	(0.67)	(0.73)
GDP Cap.							0.104	0.185
							(0.86)	(1.76)
Inform. Emp.								0.012***
								(3.95)
Constant	0.837***	0.780***	0.882***	0.937***	0.843***	0.857**	0.179	-1.012
	(8.03)	(7.16)	(8.36)	(5.11)	(4.44)	(3.15)	(0.24)	(-1.46)
Observations	321	321	321	321	301	184	184	174
R^2-within	0.192	0.202	0.216	0.216	0.235	0.340	0.347	0.368
R^2-between	0.058	0.043	0.009	0.000	0.005	0.098	0.101	0.120
R^2-overall	0.009	0.003	0.000	0.004	0.001	0.145	0.147	0.166

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Section G: Random Effects Model: Effects of Exports vs Imports on the Capital/Labor Ratio

Table 16: Random Effects Model: Effect of Exports on the Capital/Labor Ratio

	(1) Cap to Lab	(2) Cap to Lab	(3) Cap to Lab	(4) Cap to Lab	(5) Cap to Lab	(6) Cap to Lab	(7) Cap to Lab	(8) Cap to Lab
Exports	0.019***	0.018***	0.019***	0.019***	0.021***	0.011*	0.010**	0.010*
	(3.48)	(3.35)	(3.97)	(3.97)	(3.75)	(2.27)	(2.67)	(2.22)
Female Part.		0.073	0.080	0.079	0.085	0.046	0.045	0.020
		(1.40)	(1.59)	(1.59)	(1.64)	(0.69)	(0.67)	(0.28)
Gov. Spend.			-0.012**	-0.012**	-0.013*	-0.038***	-0.042***	-0.055***
			(-2.63)	(-2.63)	(-2.53)	(-3.79)	(-3.82)	(-5.23)
Union Dens.				-0.004	-0.004	-0.006	-0.005	0.001
				(-0.41)	(-0.42)	(-0.66)	(-0.49)	(0.10)
Unemploym.					0.005	0.002	0.003	0.001
					(1.02)	(0.46)	(0.70)	(0.32)
Education						0.063	0.038	0.037
						(1.50)	(0.63)	(0.70)
GDP Cap.							0.101	0.181
							(0.87)	(1.76)
Inform. Emp.								0.012***
								(3.97)
Constant	0.847***	0.788***	0.908***	0.959***	0.911***	0.913**	0.250	-0.933
	(8.75)	(7.75)	(8.56)	(5.19)	(4.61)	(3.20)	(0.35)	(-1.42)
Observations	321	321	321	321	301	184	184	174
R^2-within	0.198	0.208	0.227	0.227	0.238	0.346	0.352	0.375
R^2-between	0.030	0.019	0.001	0.001	0.000	0.107	0.107	0.126
R^2-overall	0.002	0.000	0.004	0.011	0.009	0.156	0.155	0.170

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 17: Random Effects Model: Effect of Imports on the Capital/Labor Ratio

	(1) Cap to Lab	(2) Cap to Lab	(3) Cap to Lab	(4) Cap to Lab	(5) Cap to Lab	(6) Cap to Lab	(7) Cap to Lab	(8) Cap to Lab
Imports	0.013**	0.012**	0.012***	0.012***	0.014**	0.004	0.003	0.002
	(3.13)	(3.08)	(3.32)	(3.32)	(3.14)	(1.49)	(1.06)	(0.78)
Female Part.		0.096	0.102*	0.101*	0.107*	0.058	0.058	0.039
		(1.89)	(2.01)	(2.01)	(1.99)	(0.75)	(0.75)	(0.47)
Gov. Spend.			-0.008	-0.007	-0.008	-0.036***	-0.041***	-0.054***
			(-1.57)	(-1.54)	(-1.38)	(-3.63)	(-3.51)	(-4.63)
Union Dens.				-0.004	-0.005	-0.008	-0.006	-0.001
				(-0.49)	(-0.50)	(-0.88)	(-0.66)	(-0.15)
Unemploym.					0.007	0.002	0.003	0.000
					(1.66)	(0.46)	(0.65)	(0.09)
Education						0.081*	0.051	0.048
						(2.04)	(0.86)	(0.90)
GDP Cap.							0.119	0.197
							(0.98)	(1.75)
Inform. Emp.								0.010**
								(2.65)
Constant	0.883***	0.804***	0.884***	0.944***	0.858***	0.823**	0.056	-0.956
	(8.30)	(7.12)	(8.90)	(5.44)	(4.71)	(3.14)	(0.08)	(-1.56)
Observations	322	322	322	322	302	185	185	175
R^2-within	0.142	0.161	0.168	0.168	0.180	0.319	0.328	0.336
R^2-between	0.085	0.054	0.014	0.000	0.004	0.144	0.146	0.170
R^2-overall	0.018	0.005	0.000	0.004	0.000	0.196	0.196	0.215

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$