LUND UNIVERSITY
School of Economics and Management

Income Inequality and Trade Protection

Does the Sector Matter?

Amanda Bjurling

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Supervisor: Joakim Gullstrand

Abstract

According to traditional trade theory, trade reduces inequality between the rich and the poor. However, since the beginning of the 1980s, a constantly rise in within-country inequality has been observed in many developed and developing countries. With the rapidly increasing globalization during the same period in mind, a natural question to ask is whether the two phenomenon are linked. In this paper I investigate the links between trade protection and inequality for a panel of 26 middle-income countries during the period 2000-2012. I additionally examine whether the level of protection in specific industries is of importance for the relationship. I do this by using both an OLS model and an FE model. I find no evidence for the effect of general protection on inequality, although general trade is found to reduce inequality. Further, I find the effect of sectorial protection on inequality to strongly depend on the industry and region that is being considered.

Keywords: inequality, globalization, trade protection, middle-income countries, sectorial protection.

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1 Introduction

During the past three decades, a pattern of constantly rising within-country inequality has been observed in many countries. Before this, the inequality had been constantly declining during the first half of the twentieth century. This rise in the global inequality seems to rather be explained by larger shares of rich quintiles than poor quintiles, whose income have not changed much. Alongside this development, many developing countries adopted a trade liberalization path and opened up their economies towards the world market in the 1980s (International Monetary Fund, 2007). Against this background, a natural question to ask is whether the observed rise in inequality has been related to the rapidly increasing globalization during the same time period.

Economic theory is divided regarding the impact of trade on inequality. The traditional theory, which takes its departure in the Heckscher-Ohlin model and the extended version of Stolper-Samuelson, predicts that trade leads countries into producing and exporting products that intensively uses the country´s abundant factors in its production. Hence, trade is expected to favour the abundant factors in the economy. For developing countries, this implies that the gains from trade should fall on the unskilled labour, for which developing countries generally are abundant. Hence, the wage gap, and thus inequality, between the rich and the poor is believed to decrease in developing countries after a trade liberalization. This theory is however challenged by more recent trade theory, which rather than focusing on trade in final goods focuses on trade in intermediate inputs. These intermediate inputs are traded between countries and combined to a final product, and is believed to generate a shift in the demand for skills within industries that lead developed countries into focusing on production of skill-intensive inputs and imports less skill-intensive inputs from developing countries. Thus, the demand for skilled labour is believed to increase in developed countries. However, the production that is considered low skill-intensive in developed countries that is transferred to developing countries, is actually is more skill intensive than previous production in the developing countries. Thus the demand for skilled labour is believed to increase in developing countries as well. Thus, this theory predicts that by increasing the demand for skilled labour in both

developed and developing countries, trade leads to a general rise in the relative wage of skilled labour and thereby increases income-inequality.

The cross-country studies of the links between trade and inequality generally suffers from the lack of comparable data across countries and over time, which has restricted the previous studies to cover rather small samples sizes. The results from these studies vary and it has been difficult to establish a general relationship between trade and inequality as well as determining its strength. There are, however, several country-specific studies that have proved inequality to rise after an introduction of a trade liberalization due to the technology upgrading and hence increased demand for skilled labour that it led to.

The objective of this paper is to fill the gap of lacking panel data analyses on the relationship between trade exposure and inequality. More, it investigates the links between trade protection and inequality for 26 middle-income countries during the period of 2000-2012. The main contribution of this paper to the literature is that it additionally examines whether the level of protection for specific industries is of importance for the relationship. That is, by disentangling the level of protection according to industry it is possible to investigate whether the allocation of trade protection is biased towards specific sectors and whether this affects the income distribution within developing countries. Hence, this way the inequality intensity of trade in different industries may be detected. Further, the measure of protection used in this study differs from those of similar studies, and is based on the maximum tariff level for specific industries according to the Harmonized System (HS). Knowing how trade exposure in specific industries affects inequality is of major importance for future trade policies concerning development strategies for developing countries.

The remainder of this paper is organized as follows: in section 2, the literature on trade and inequality will be described. Section 3 presents the empirical approach and explains the econometric specification. Section 4 presents the data used in the analysis. Section 5 presents the results and various sensitivity tests of the results. Section 6 discusses the results and finally concludes.

2 The Literature on Inequality and Trade

In this section I aim to explain the underlying economic theory as well as the empirical evidence of the relationship between trade exposure and inequality. The theoretical part will cover both traditional and modern economic theory, and in the empirical evidence several studies that focus on examining the same relationship although with varying methods and results will be presented.

2.1 Theoretical Framework

The traditional theory of the links between trade and inequality is much driven by the insights of Eli Heckscher and Bertil Ohlin and the extension of their model by Stolper-Samuelson. The Heckscher-Ohlin model was developed in the early 20:th century, and has been a workhorse model of international trade since for studies of the links between trade exposure and inequality. The model predicts that each country will produce and export goods that use its abundant factor intensively (Feenstra, 2003). This implies that developing countries, being abundant in unskilled-labour, are expected to produce and export products that are unskilled-labour-intensive such as textiles and handicraft. Similarly, developed countries are expected to produce and export skilled-labour-intensive products, such as machinery, for which they have abundance.

By studying this scenario from the simplest setting of the Hechscher-Ohlin model, that is, from a two-country, two-factor, two-good setting (the 2*2*2 model) also called the Hechksher-Ohlin-Samuelson (HOS) model, the following effects are likely to occur; in the developing country, trading with a developed country raises the price of the developing country´s unskilled workers, implying raised wages, while reducing the wages of the skilled workers. Similarly, the developed country can expect higher wages for their skilled workers, due to the increased demand for skills, as well as reduced wages for the unskilled workers, when trading with a developing country. Accordingly, the wage inequality is expected to decrease in the developing country, while it is expected to increase in the developed country. Hence, according to the

Heckscher-Ohlin theory, developing countries should benefit from globalization in terms of decreased wage inequality. For this theory to hold, the factor price equalization, stating that trade between two countries with universal technology but different factor endowments will lead to equalized factor prices due to the interaction of their goods markets, has to hold. The Hechscher-Ohlin model was further extended to a theorem developed by Stolper-Samuelson in 1941. The theorem states that, as the relative price of a good increase, the real return to the factor used intensively in its production will rise, whereas the return to the other factor will fall, and vice versa (Feenstra, 2003). Thus, as prices changes due to a trade chock, there will be income distributional effects where some factors are favoured and others are disfavoured. For instance, if a trade reform is introduced, which reduces the protection and hence the price of the imported good, the developing country will be able to concentrate its production on the good that uses its abundant factor intensively, and import the other good cheaper. Thus, trade is expected to lead to increased demand and thus a rise in the real return of unskilled labour. Hence, the unskilled workers in developing countries are expected to benefit from increased trade, and the inequality is consequently expected to decrease according to the Stolper-Samuelson theorem (Feenstra, 2003).

However, the model can be expanded to include several countries, several traded goods as well as production several factors, and is called the Heckscher-Ohlin-Vanek (HOV) model, based on the work of Vanek (1968). In this framework, the effects from trade are somewhat different from that of the 2x2x2 model. When only two countries trade, each country exports the product that uses its abundant factor intensively. In a multi-country situation, each country exports a set of goods that intensively uses its abundant factors. However, when there is no factor price equalization, factor prices are rather determined by the factor's relative abundances. Thus, abundant factors have lower prices, which create specialization patterns based on countries abundances. Countries then become very different from each other due to the differences in the distribution of endowments, and a hierarchic production patterns may arise (Feenstra, 2003).

By moving on to newer trade theory, recent evidence of increasing wage gaps may be explained. Evidence show that since the early 1980s there has been a significant increase in skill-premiums, favouring skilled workers relative to unskilled workers. This development has been seen in both countries such as the US as well as in developing countries. The demand for skilled labour has increased which has lead to increase their relative employment and wages, implying a sustained increase in the wage gap between the skilled and unskilled workers.

Hence, although the Stolper-Samuelson theorem predicts decreasing wage gaps as a result of trade, late evidence show the opposite. So, why has there been an outward shift in the demand for skilled labour? According to Stolper-Samuelson, if the return to skill-intensive goods increases so does the relative price of the factor it uses intensively in its production. However, no such increase in the relative price of skill-intensive goods can be seen (Feenstra, 2003). This development can rather be explained by a newer theory accounting for trade in intermediate goods instead of merely trade with final goods. This is also called *outsourcing* or *offshoring* and implies that firms split their production processes into several stages and to several plants located in different countries. The components that are cheaper to produce abroad, generally unskilled labour-intensive inputs if the country in focus is a skill abundant developed country, are thus imported to a lower price than if they were produced at home. Hence, the focus in this theory is on activities with different skill-intensities *within* industries rather than between industries, which when we trade is believed to generate shifts in the relative demand for skilled labour. The reason for this is that if there is a trade shock with the effect of reducing the relative price of the imported inputs, then the home production of the other input will increase and the relative prices of the inputs will change. The demand thus increases for skilled labour at home, since the focus is on a developed country, while it falls for unskilled. As the demand for unskilled labour falls, so does its real return the result is an increasing wage gap between skilled and unskilled labour. This is also called a "within Stolper-Samuelson-effect", and it is likely to occur in developed countries. Since the price of the finished good is a weighted average of the two inputs, no substantial price change in the final good is seen as just as recent evidence shows (Feenstra, 2003).

However, there is a distinction in the literature between two possible causes for the increased skill-premiums; the trade explanation just described, and a technology explanation, which may be associated to the similar pattern of increased skill-premiums in developing countries. However, these two explanations are likely related. When developing countries open up to trade they come in contact with new and more advanced technology for which skilled labour is required. In order for firms that decide to engage in exports to keep up with the competition from abroad, newer technologies and strategies might have to be undertaken, which consequently increases the demand for skilled labour in countries that experienced a trade liberalization (Wood, 1995). There can also be a technology-induced change in skill-premiums in developing countries after trade liberalization due to that they start to import more high-technology equipment in order to upgrade from their labour-intensive production and devote to

a more capital-intensive production. Such capital-intensive production might be machinery or agribusiness. This shift in production may require skilled labour more intensively in its production, and thus increases the demand for skills as well (Goldberg & Pavcnik, 2004).

Exporting in general requires more from firms than operating on the domestic market due to the productivity and sunk-costs associated with exporting. Melitz (2003) argues that in order for a firm to survive and make profit on the exports market it needs to maintain a certain level of productivity, which is higher than that needed to serve on the domestic market. Higher productivity requires better technology, which in turn requires higher skills among the workers. So, exporters are believed to be more capital and skill-intensive than non-exporters. Thus, when opening up to trade a reallocation of resources will take place, moving the skilled labour to the more productive export firms which are believed to expand and thus increase the overall productivity in a country. Hence, there will be a general increase in the demand of skilled workers at the expense of the less skilled labour, as a result. According to, among others, Bernard et al. (2012), another characteristic of exporting firms is that they tend to pay higher wages to their employees, which together with their demand for skilled workers is believed to further increase the wage gap between skilled and unskilled workers.

2.2 Earlier Empirical Research

There is a large amount of studies that focus on the links between trade openness and inequality. However, just like the theoretical literature, the empirical evidence is contradictory. What mainly differ in these studies is the measurement of trade and inequality. Some of these studies are presented below. Meschi and Vivarelli (2007) distinguish between an import channel and an export channel when investigating the dynamic effects of trade. The import channel is believed to affect inequality through the flow of capital goods and innovations, which induces developing countries to upgrade their technologies in order to keep up with advanced economies. As discussed in the theoretical part, this technological upgrading consequently increases the demand for skilled labour. This is also argued for by Acemoglu (2003), who shows that skill-biased technical change induced by trade caused increased skill-premiums in both US and developing countries trading with US, without affecting the price of the skill-intensive goods, as the standard theory would predict.

The export channel, on the other hand, is believed to affect inequality due to the observed heterogeneity among exporting and non-exporting firms, as argued by Melitz (2003). When firms start to explore foreign markets they get exposed to learning-by-doing opportunities, which allow them to adopt newer technology. Technical assistance from the buyer in order to improve the quality of the product is also a way for the exporter to acquire knowledge (Meschi & Vivarelli, 2007). Thus, the demand for skilled labour is believed to increase due to the export channel as well. Bernard and Jensen (1995) find evidence for the export channel in the US while studying the determinants of the observed increase in the demand for skilled labour during the 1980s. The authors study changes in the wage ratio of unskilled (production) and skilled (non-production) workers as well as in employment, and compare the effects between exporters and non-exporting firms in the manufacturing sector. Their results indicate that exporters in fact are a substantial force behind the observed increase in skill-premiums. The change in skilled labour's wages that this contributes to is believed to arise from movements between plants within industries, transferring skilled labour to exporting firms. This reallocation of resources is motivated with technology upgrading by exporting firms, which inflates the demand for skilled labour.

Wood (1997), however, states several studies such as Krueger et al. (1981), Fischer and Spinanger (1986), Lee and Liang (1982), Nambiar and Tadas (1994), which study the relationship between trade and inequality in developing countries. When calculating the ratio of skilled to unskilled labour that is required in the production of the goods that the countries exports and imports respectively, all of them find that in the majority of the cases the exports is less skill-intensive compared to imports. This finding generally supports the traditional view of trade being beneficial for unskilled workers.

Attanasio, Goldberg and Pavcnik (2003) further investigate the relationship in Colombia during the period 1984-1998 by linking micro-level data from Colombian National Household Survey (NHS) to trade exposure for the same period. The country experienced a major trade liberalization period with reduced tariffs in mid-1980. Prior to this period the country had not taken part in the GATT rounds and had therefore still high tariff levels, which was advantageous for the study. The authors use two measures for inequality; the standard deviation of log wages and the difference between the ninetieth and tenth percentile of the log wage distribution. The paper focuses on skill premiums, industry premium occupations and informality discounts as the major channels through which trade might affect inequality. As the

theory suggests, the authors find evidence of skill-biased technological change caused by trade as one likely reason for the increased skill premium observed in Colombia. Further, they find decreasing wage premiums in sectors that got more exposed to trade. These sectors had the largest shares of unskilled labour. Hence, as the tariffs were reduced and the price of unskilled-intensive goods fell, so did the return to the unskilled labour, as in accordance with the Stolper-Samuelson theorem. They finally find that as the foreign competition increases, so does the informal sector. The informal sector is often characterized by lacking labour market regulations such as minimum wages, and is generally larger in developing countries (Goldberg & Pavcnik, 2004). This sector is believed to increase after a trade liberalization since firms face higher costs due to increased competition, which they often try to reduce by cutting employee benefits. Due to the lower quality of the informal job sector, the general inequality is hence believed to increase as this sector expands.

Hanson and Harrison (1999) find similar results for Mexico in a paper investigating the impact of trade reform. Mexico implemented a trade reform in 1985, prior to which the wage gap had been declining. After the reform, however, the difference between the wages of the skilled and the unskilled workers began to rise. Just as in the Colombian case, the authors suggest a skewed pattern of tariff reduction where sectors with higher share of unskilled workers experienced the largest reduction. However, they also discuss other likely causes of the increased wage inequality such as technological change, direct foreign investment as well as export orientation.

Topalova (2007), Savvides (1998) and Vivarelli (2007) use methodological frameworks closer to that of this study when examining the links between trade and inequality. Topalova (2007) investigates the relationship between trade and poverty and inequality in urban and rural India by looking at the effects of a trade liberalization period that the country experienced in the 1990s. She constructs a district-level trade exposure variable through weighing average tariff levels in specific sectors by the workers employed in the sector as a share of all registered workers. For the dependent inequality variable she uses both the standard deviation of log consumption and the mean logarithmic deviation of consumption as measures. By comparing industries subject to larger tariff reduction with those that remained protected, a difference-in-difference approach, she enables short- to medium-run regional outcomes of trade liberalization to be encountered. Although she finds that reduced tariffs decrease the poverty in the rural parts of India, no such statistically significant result can be obtained for inequality.

Savvides (1998) further analyses the relationship by studying the effect of trade protection on inequality and distinguishing the effects between developed and developing countries during the 1980s and 1990s. In order to measure trade protection Savvides uses a variable for non-tariff trade barriers (NTBs) constructed by Lee and Swagel (1997). Due to the declining tariff levels after several GATT rounds and the increasing importance of NTBs, NTBs are the main focus in this study when measuring the trade restrictions. In line with the methodology of this paper, Savvides regresses several indicators of trade protection on the Gini-coefficient. He finds a negative relationship between protection and inequality in developing countries. That is, the more protected the economies the lower the inequality. The opposite effect was found for developed countries.

Finally, Mesche and Vivarelli (2007) investigate how trade affects inequality in 70 developing countries during the period 1980-1999. Additionally, they disaggregate the total trade flows by their areas of origin and destination in order to investigate whether trading with advanced economies alternatively with other less advanced economies matters in terms of inequality. They regress total aggregate trade flows on within-country measured as EHII household income inequality, but only find a small and barely significant positive effect. However, they are able to proof that the income-characteristics of the trading partner largely matters for inequality in developing countries. Trading with high-income countries is negative for the income distribution, whereas trading with less developed countries does not affect inequality or has a small opposite effect. This result further strengthens the hypothesis of technological differences being of major importance for the effect of trade openness on income distribution. However, when distinguishing between low-income countries and middle-income countries, instead of pooling them together, the authors find that this result is strongly associated to middle-income countries, rather than to the low-income countries. This result can be interpreted by recognizing the higher absorptive capacity in middle-income countries, facilitating technological upgrading to technology developed in advanced economies and thus stronger affect the skill demand.

By reviewing previous empirical research it becomes clear that earlier studies tend to find that trade reduces inequality, whereas more recent studies rather find that trade increases inequality. The reasons for this may be the differences in the structure of trade, where modern trade is more dominated by intermediate goods than by final goods as earlier. It may also be that the methodological approach in earlier studies differs from those of recent ones, which are able to

account for unobserved heterogeneity. Hence, recent studies may be able to capture the importance of other policies than trade policies when explaining the relationship between trade and inequality, which may generate other results.

3 Empirical Approach

The empirical framework of this paper will differ from those of previous studies in two manners: first, as stated in section 2, the majority of previous studies are based on cross-sectional, alternatively time-series analyses. However, in this paper the impact of trade on inequality of a panel of 26 countries over the period 2000-2012 will be analyzed. Secondly, instead of merely looking at general trade protection as in accordance with previous literature, additionally, protection in six different industries will be compared in order to detect to which extent they affect the Gini-variable in each country.

3.1 Specification

The econometrical strategy of this paper will follow that of Savvides (1998), and regress several openness and protectionism measures on the level of inequality. Hence, equation 2 is the baseline specification:

$$gini_{i,t} = \beta_0 + \beta_1 gdpc_{i,t} + \beta_2 prot_{i,t} + \beta_3 inflation_{i,t} + \beta_4 (gdpc*prot)_{i,t} + \beta_5 trade_{i,t} + \beta_6 uppermid_{i,t} + \beta_7 lowermid_{i,t} + \gamma_t + \delta_i + \varepsilon_{i,t} \quad (2)$$

where gini is the country-level Gini-coefficient, gdpc is the per-capita GDP growth for each year and country, prot is the variable for general protectionism based on the average of the collected maximum tariff levels in the six industries, inflation is the inflation rate, (gdpc*prot) is an interaction term aiming to detect whether the relation between protection and inequality varies with income, trade is a variable for the ratio of imports plus exports over GDP, and finally uppermid and lowermid are dummies indicating income level groups. This model is estimated with Ordinary Least Squares (OLS) as well as with Fixed Effects where it further includes a year dummy variable controlling for time effects, γ_t, and a country dummy variable controlling for country-specific effects, δ_i. By estimating the model with the Fixed Effects (FE)

method, the country-specific effects may capture the long-run NTBs that do not vary over time. All variables are expressed in natural logarithms.

The model will further be extended to distinguish between the inequality intensity of trade protectionism in different industries. Hence, it will include variables for the maximum tariff level in each sector respectively for each country and year in order to see how these correlate with the Gini-coefficient. The extended model has the following equation:

$$\text{gini}_{i,t} = \beta_0 + \beta_1 \text{gdpc}_{i,t} + \beta_2 \text{inflation}_{i,t} + \beta_3 (\text{gdpc*prot})_{i,t} + \beta_4 \text{trade}_{i,t} + \beta_5 \text{foodprot}_{i,t} + \beta_6 \text{oilprot}_{i,t} + \beta_7 \text{electronicsprot}_{i,t} + \beta_8 \text{vehiclesprot}_{i,t} + \beta_9 \text{armsprot}_{i,t} + \beta_{10} \text{textileprot}_{i,t} + \gamma_t + \delta_i + \varepsilon_{i,t} \quad (3)$$

where gini and the first four variables are the same as in equation (2), followed by the variables for the level of protection in the sectors of food, oil and minerals, electronics and machinery, vehicles, arms and ammunition, and finally in the textile sector. This regression will also be estimated with OLS as well as with Fixed Effects where it additionally includes dummy variables to control for time- and country-specific effects.

4 Data

The dataset used in this paper consists of a panel of 26 middle-income countries over the period 2000-2012. The countries are approximately equally divided between upper-middle-, and lower-middle-income countries according to the World Bank's country classification by income (see Appendix A for country list).

The main aim of this paper is to look at the variation in the degree of inequality within the countries followed by different levels of trade protection. The degree of inequality is measured by the Gini-coefficient. The Gini index measures the extent to which a population deviates from perfectly distributed income or expenditure. A Gini-coefficient of 0 indicates perfectly equally shared income, whereas a coefficient of 1 implies one person having all of the country's income (International Monetary Fund, 2007). Although inequality is difficult to measure and there exists several other indicators such as the Theil's entropy measure, the Atkinson index as well as decile and quintile ratios, the Gini-coefficient is a commonly used summary index within research. However, the indicator is not perfect and involves some issues when compared across countries and over time. One main reason is that the rates of self-employment in agriculture in developing countries generally are high, which may imply fluctuating incomes during year. Thus, indexes based on household consumption tend to show lower inequality than those based on income. Differences in the definition of inequality, in indicators of inequality on household and individual level, as well as in the methods used in the household surveys further complicate comparisons (International Monetary Fund, 2007). The data on inequality is taken from the World Bank Human Development Indicators database. The inequality data is available for a large set of countries, although only complete for a small set. The incompleteness of the inequality data has restricted the choice of countries to 26 middle-income countries of which the majority is Latin American.

Measuring trade exposure is a difficult and complex task and there is not one correct way to do it. One common strategy is to use trade barriers as an indicator of a country's outward orientation. However, the use of only one single indicator, such as tariffs, might give a misleading and unrealistic image of the situation. For instance, the use of only tariffs as an indicator of openness might indicate great openness due to low tariffs even though the non-

tariff trade barriers continue high. For that reason, many previous studies include both tariffs and non-tariff trade barriers (NTBs) into their models. Lee and Swagel (1997), for instance, propose different measures of NTBs. Among these is the black-market premium as well as import- and export as shares of GDP. Due to the GATT restrictions of decreasing tariff levels, NTBs have increasingly become a tool for trade protection, which further motivates its importance when estimating trade exposure (Lee & Swagel, 1994). For this panel data set, however, a ratio of import plus export over GDP will be included as an explanatory variable.

The empirical strategy of this paper will follow that of Savvides (1998) and estimate the effect of different levels of trade protection on country-level inequality. However, the protection variable in this paper will differ from that of Savvides. Savvides uses Lee and Swagel's (1997) composed measure of trade protection, focusing on non-tariff barriers (NTB's) due to its increasing importance. This measure is based on several NTB determinants such as the black-market premium, tariff rates and other sector-specific indicators. However, due to the difficulties in accessing such specific data when working with a panel data, the measure of protection in this study will differ. Here, the general protection variable is constructed as the average of the sum of maximum tariff rates for the six different manufacturing sectors stated under, for each country and year. That is, the country level protection is computed according to equation 1:

$$Prot_{i,t,s} = \frac{\Sigma Maximum\ Tariff_{i,t,s}}{Nr\ of\ Industries} \qquad (1)$$

where i is the country, t is the year and s is the industry. Hence, the maximum tariff for every industry are summed for each country and year, and thereafter divided by the number of industries. The reason for using the maximum tariffs is that they demonstrate most variety and also depicts the countries with the absolutely highest tariff levels. Hence, it makes it possible to identify whether the country has generally high tariff levels among the industries.

Further, as this paper aims to detect whether the allocation of sectorial trade protection matters for the impact on inequality, variables for trade protection in every specific industry will additionally be included into the model. By looking at the distribution of tariffs across different sectors, potential biasness in tariff rates across industries may be found, and their effect on inequality may be determined. The tariff data used in this paper is two-digit level data of the Harmonized System (HS). The HS is a system for classification of traded goods on a common basis developed by the World Customs Organization (World Trade Organization, n.d.). Since

the focus is on general openness towards other countries for which a country does not have a specific agreement, the ad valorem most favored nation (MFN) applied duty rates are used. Six different manufacturing industries are included and compared. The first industry is the food sector, corresponding to chapters 01-05 of the HS. The second and third industries are those of oil and mineral as well as machinery and electronics, which corresponds to HS chapter 25-27 and chapter 84-85 respectively. The fourth included industry is the vehicles (non-aircraft) sector, or HS chapter 87. Finally the fifth and sixth industries are the arms and ammunition as well as the textile sector, corresponding to HS chapters 93 and 50-63, respectively. This data was taken from the World Trade Organization's tariff database. Using the maximum tariffs for specific industries further enables to detect whether the tariff distribution within a country is biased towards specific industries and whether this matters for inequality.

More, per-capita GDP growth and the inflation rate are included as control variables in the regression since they are likely to affect inequality. Data for both variables is taken from the World Bank Database. Economic growth is introduced into the model in order to investigate its relationship to inequality in developing countries. Often, trade and trade agreements with developing countries are motivated with increased growth. Kuznets, in a paper from 1955, suggests an inverted U-shaped relationship between inequality and per-capita GDP growth. He argued that in the initial stage of industrialization technological development increases the demand for skilled labor and capital, favoring the higher-income groups and thereby widening inequality. This pattern eventually stabilizes and finally narrows at later stages as the economy and society catch up on the development (Kuznetz, 1955).

The inflation rate is an indicator of the macroeconomic environment and is also relevant for the model. Inflation might have the effect off disproportionally eroding real incomes, affecting the low-income population hardest, and hence leading to increasing inequality. This becomes of even greater relevance in developing countries where the macroeconomic environment often is less stable. Lundberg and Squire (2003) for instance find a relationship between higher inflation and higher inequality.

Lastly, two dummy variables for income status are included in order to distinguish income-specific effects for the total sample. Table 1 presents the entire variable list together with the abbreviations, types and expected signs. For further descriptive variable statistics, see table 6 in Appendix B.

Table 1: Descriptive Variable List

Variable	Abbreviation	Type	Expected sign
Gini-variable	gini	continous	
GDP per capita. growth	gdpc	continous	-
General protectionism	prot	continous	-
GDP p.c. growth*general protectionism	gdpc*prot	interaction	-
Level of trade*general protectionism	trade*prot	interaction	-/+
Inflation rate	inflation	continuous	+
(Import+Export)/GDP	trade	continuous	+
Protection of food industry	foodprot	continuous	+
Protection of oil industry	oilprot	continous	-
Protection of electronics industry	electronicsprot	continuous	-
Protection of vehicle industry	vehiclesprot	continous	+
Protection of arms industry	armsprot	continous	-
Protection of textile industry	textileprot	continous	+
Upper-middle income country	uppermid	dummy	+
Lower-middle income country	lowermid	dummy	+

5 Results

In this section the results obtained from the regressions will be presented. This will be followed by different tests of the sensitivity of the results.

5.1 Results

The results obtained from the regressions are shown in table 2. Heteroskedasticity as well as serial correlation in the error terms is accounted for by computing robust standard errors in the models. The first and second columns represent the baseline regression estimated with OLS and Fixed Effects respectively. The baseline LS model in column (1) shows that general trade reduces inequality and the coefficient is significant at the 1 per cent level. Further, the dummy variables indicating income groups are both positive and statistically significant at the 1 per cent level, which suggests a somewhat higher inequality level among the middle-income countries. Due to the ambiguity of previous studies, these results are partly in line with the existing literature. The FE model further obtains a positive value for the GDP per capita variable, which is significant at the 5 per cent level.

The third and fourth columns display the extended model, which includes variables for protection of specific sectors also estimated by OLS and FE respectively. The FE model still obtains a positive sign for GDP per capita at the 5 percent significance level, which indicates that GDP growth increases inequality. More, the LS model obtains three statistically significant results that disappear in the FE model; general trade reduces inequality, protection of the vehicles industry also reduces inequality whereas protection of the arms and ammunition sector leads to increasing inequality. Each of the coefficients are significant at the 1 per cent level. Finally, protection of the textile sector is significant in both models although they obtain different signs. The LS model suggests that protection of the textile sector further increases the inequality, whereas the FE model predicts the opposite. In neither of the models a statistically significant result for inflation was obtained, although positive signs were expected. In section 5.2 several sensitivity tests will be performed in order to test for the robustness of these results.

Table 2: Effect of Trade Protection on Inequality in 26 Middle-Income Countries During the Period 2000-2012 (dependent variable, Gini-coefficient).

Variables	(1) LS baseline	(2) FE baseline	(3) LS industry	(4) FE industry
gdpc	-0.0694	0.0766**	-0.120	0.0639**
	(0.208)	(0.0331)	(0.188)	(0.0305)
prot	0.0555	-0.0324		
	(0.0339)	(0.0320)		
inflation	-0.0100	-0.00122	-0.0374	-0.00437
	(0.0608)	(0.0201)	(0.0655)	(0.0188)
gdpc*prot	-0.0139	-0.175	0.409	-0.0778
	(0.532)	(0.121)	(0.493)	(0.108)
trade	-0.0314***	-0.00851	-0.0471***	-0.00558
	(0.00855)	(0.0194)	(0.00831)	(0.0170)
uppermid	0.0497***			
	(0.0129)			
lowermid	0.0394***			
	(0.0139)			
foodmax			0.0108	-0.0129
			(0.0102)	(0.00912)
oilmax			0.0435	-0.0235
			(0.0346)	(0.0190)
electromax			0.0262	0.0181
			(0.0465)	(0.0325)
vehiclesmax			-0.221***	-0.0140
			(0.0255)	(0.0278)
armsmax			0.275***	0.0119
			(0.0320)	(0.0280)
textilemax			0.0814*	-0.0753**
			(0.0470)	(0.0322)
Constant	0.318***	0.399***	0.340***	0.416***
	(0.0196)	(0.0128)	(0.0171)	(0.0136)
Observations	297	297	297	297
R-squared	0.156	0.358	0.306	0.409
Number of countries		26		26

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1. Source: STATA

5.2 Robustness

In this section, a couple of robustness checks of the results obtained in section 5.1 are conducted. As stated above, the models are tested both with OLS and with FE in order to test the importance of unobserved heterogeneity for the relationship between trade protection and inequality. The results suggest that the sample is too small and the variation is too little to be able to obtain significant results while controlling for country- and year specific effects although they point out the need for it. This problem will further be discussed in section 6.

5.2.1 Regional Differences

By recognizing the heterogeneity among the included countries it is interesting to investigate whether regional differences are present in the sample. By identifying the majority of the countries in the sample as Latin American, we may suspect that the results from Table 1 are biased. This problem may however be overcome by accounting for regional effects. Hence, in order to test regional differences the extended model will be regressed for every region and the results are presented in table 3. Due to data limitations, only one country from Africa is included in the sample and hence this region will be excluded.

Table 3: Effect of Trade Protection on Inequality in Different Regions During the Period 2000-2012 (dependent variable, Gini-coefficient).

Variables	(1) Lat. America LS	(2) Lat. America FE	(3) Asia LS	(4) Asia FE	(5) Caucasus LS	(6) Caucasus FE
gdpc	-0.108	0.108*	0.369	-0.173	0.166**	0.0740
	(0.138)	(0.0535)	(0.612)	(0.344)	(0.0775)	(0.0378)
inflation	0.0133	0.0125	-0.124*	0.119	0.0406	0.00835
	(0.0167)	(0.0150)	(0.0705)	(0.107)	(0.0487)	(0.0311)
gdpc*prot	0.293	-0.213*	-0.633	0.257	-0.394	0.120
	(0.306)	(0.113)	(1.338)	(0.947)	(0.331)	(0.196)
trade	0.00389	-0.0161	0.00834	-0.0371	-0.0516***	0.0408
	(0.00580)	(0.0159)	(0.0149)	(0.0286)	(0.0103)	(0.0313)
foodprot	-0.0169***	-0.0113	0.000548	0.331*	0.0326**	0.00627
	(0.00643)	(0.0101)	(0.0522)	(0.0998)	(0.0122)	(0.0100)
oilprot	0.0222	-0.00752	-0.125**	-0.0365	-0.00773	-0.0275
	(0.0187)	(0.0144)	(0.0490)	(0.0381)	(0.0305)	(0.0253)
electroprot	0.102**	0.0602**	-0.0975***	0.670	-0.281**	0.142**
	(0.0429)	(0.0247)	(0.0336)	(0.530)	(0.139)	(0.0423)
vehiclesprot	0.133***	0.0547**	0.0823	-0.756	-0.193*	0.0192
	(0.0343)	(0.0203)	(0.0692)	(0.527)	(0.106)	(0.0318)
armsprot	-0.121***	-0.0538**	0.0402*	-0.187	0.308***	0.0135
	(0.0345)	(0.0211)	(0.0214)	(0.106)	(0.106)	(0.0287)
textileprot	-0.196***	-0.117***	-0.0526	-0.127	-0.00427	-0.176*
	(0.0363)	(0.0353)	(0.0422)	(0.343)	(0.109)	(0.0711)
		(0.00617)		(0.185)		(0.0214)
Constant	0.434***	0.441***	0.362***	0.158	0.312***	0.321***
	(0.0111)	(0.0136)	(0.0771)	(0.141)	(0.0142)	(0.0311)
Observations	183	183	32	32	64	64
R-squared	0.220	0.682	0.866	0.882	0.579	0.590
Number of countries		15		3		6

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1. Source: STATA

For Latin America, the FE regression obtains significant results for both the GDP per capita variable as well as for the interaction variable (gdpc*prot), which disappears in the LS regression. The FE model suggests that increased economic growth increases inequality. The interaction variable tells us that general protection reduces inequality as the country income increases. The LS model obtains a negative result for protection of the food industry, which is significant at the 1 per cent level, and implies that increased protection of this sector is positive for inequality. Furthermore, significant results for protection of the electronics- and machinery sector are now obtained in both the LS and FE regressions. Increased protection of this sector

increases the inequality, and the coefficients are significant at the 5 per cent level in both models. Protection of the vehicle sector also obtains positive significant results at the 5 per cent level, indicating that protection of this sector leads to increased inequality. Protecting the arms- and ammunition industry, on the other hand, reduces inequality in Latin America in contrast to the effect of the other regions, and the variable is significant at the 5 per cent level in both regressions. Finally, a negative and statistically significant sign at the 1 per cent level is also obtained for the textile sector, telling us that protection of this sector is beneficial for the income distribution in Latin America.

As regards Asia, a negative sign if obtained for inflation and the coefficient is significant at the 10 per cent level. Further, the LS regression obtains significant results for protection of the oil-, machinery and electronics-, and the arms and ammunition sectors, which disappear when using the FE method. These results indicate that protection of the oil sector has the effect of reducing inequality, which is also true for protection of the electronics and machinery sector. Protecting the arms and ammunition sector, on the other hand, increases inequality in Asia.

By moving on to Caucasus, the LS regression in column (5) obtains significant results for the variables for GDP per capita growth and trade. The coefficient for GDP per capita growth indicates that economic growth is increases inequality, and is significant at the 5 per cent level. Trade, on the other hand, is positive for inequality and significant at the 1 per cent level. These results disappear in the FE regression. More, protection of the food industry increases inequality and significant at the 5 per cent level. Protection of the arms industry also increases inequality and the coefficient is significant at the 1 per cent level. Contrarily, protection of the electronics- and the vehicle industries reduces inequality, and the variables are significant at the 5 and 10 per cent level, respectively. When controlling for unobserved heterogeneity, as in column (6), the model is able to find two statistically significant results. Protection of the textile sector reduces inequality and the coefficient is significant at the 1 per cent level, and protection of the electronics industry is now negative for inequality and the coefficient is significant at the 5 per cent level. Hence, the results vary to some extent across the regions and they will be further discussed in section 6.

5.2.2 Income-based Differences

With the result of Meschi and Vivarelli (2007) in mind, which proved differences in the effect of trade on income distribution between low- and middle-income countries, it also becomes interesting with a similar test in this study. Since the countries included in this sample are approximately equally divided between upper-middle-, and lower-middle-income countries, the extended model will be tested for both country groups and the results are presented in columns (1)-(4) of Table 4. The main result is that trade reduces income inequality in both LS regressions, implying that being an upper- or lower-income country is not determining for inequality. Further, protection of the oil industry is positive for the poorer group and negative for the other group according to the LS models. The variable is significant at the 10 per cent level for the lower-income group, and at the 1 per cent level for the upper-income group. More, protection of the textile sector reduces inequality in the lower-middle income group according to the LS model, and the coefficient is significant at the 10 per cent level. This effect disappears in the FE model. The upper-middle income group obtains a similar result for the textile sector, although the effect that is present and significant at the 1 per cent level in the FE model disappears in the LS model. Finally, for the lower-middle income group, protection of the food industry reduces inequality according to the FE model, and arms protection increases inequality and both variables are significant at the 1 per cent level.

Table 4: Effect of Trade Protection on Inequality By Income-level Groups, 2000-2012 (dependent variable, Gini-coefficient).

Variables	(1) Lower-mid LS	(2) Lower-mid FE	(3) Upper-mid LS	(4) Upper-mid FE
gdpc	-0.0158	0.00888	-0.00761	-0.0217
	(0.212)	(0.0410)	(0.142)	(0.0552)
gdpc*prot	0.171	0.202	0.0597	0.121
	(0.773)	(0.214)	(0.402)	(0.130)
inflation	0.0231	-0.0170	-0.134	0.00828
	(0.0532)	(0.0178)	(0.0831)	(0.0225)
trade	-0.0347*	0.00443	-0.0332***	0.00226
	(0.0177)	(0.0244)	(0.0107)	(0.0212)
foodprot	-0.0312	-0.0192***	-0.00626	0.0172
	(0.0218)	(0.00333)	(0.0101)	(0.0121)
oilprot	-0.109*	-0.0133	0.135***	0.00145
	(0.0649)	(0.0173)	(0.0328)	(0.0123)
electronicsprot	-0.0298	0.0283	0.00182	0.0614**
	(0.146)	(0.0493)	(0.0399)	(0.0213)
vehiclesprot	-0.0468	0.0278	0.0181	0.0150
	(0.0622)	(0.0477)	(0.0398)	(0.0180)
armsprot	0.588***	-0.100	0.00281	-0.0100
	(0.0872)	(0.0566)	(0.0415)	(0.0203)
textileprot	-0.171*	-0.0908	0.0385	-0.0855***
	(0.0948)	(0.0513)	(0.0675)	(0.0226)
		(0.00908)		(0.00524)
Constant	0.346***	0.429***	0.352***	0.405***
	(0.0202)	(0.0133)	(0.0158)	(0.0170)
Observations	140	140	128	128
R-squared	0.344	0.681	0.275	0.551
Number of countries		12		11

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1. Source: STATA

5.2.3 Protection and the Level of Trade

As a last robustness check, the variable for trade will be excluded from the baseline model in order to test whether this improves the fit of the model. The results are presented in columns (1)-(4) of table 5. Column (1) and (2) represent the baseline regression and are included in order to facilitate comparisons. In column (3) and (4) the trade variable has been excluded. More, an interaction term, (trade*prot), will further be included into the baseline model in order

to see how the effect of protection on inequality varies with the level of trade. The results are presented in column (5) and (6).

Table 5: The effect of Trade Protection on Inequality when Accounting for Heterogeneity Based on Trade Levels (dependent variable, Gini-coefficient).

Variables	(1) LS Baseline	(2) FE Baseline	(3) LS -trade	(4) FE -trade	(5) LS +interaction	(6) FE +interaction
gdpc	-0.0754	0.0766**	-0.0513	0.0672*	-0.0857	0.0570*
	(0.212)	(0.0331)	(0.225)	(0.0395)	(0.219)	(0.0303)
prot	0.0668*	-0.0324	0.0505	-0.0115	0.0491	-0.0404
	(0.0363)	(0.0320)	(0.0363)	(0.0398)	(0.0404)	(0.0262)
gdpc*prot	-0.152	-0.175	-0.512	-0.213	-0.221	-0.142
	(0.552)	(0.121)	(0.557)	(0.154)	(0.582)	(0.0875)
-inflation	-0.0327	-0.00122	-0.0497	0.0246	-0.0509	-0.0160
	(0.0620)	(0.0201)	(0.0673)	(0.0233)	(0.0679)	(0.0241)
trade	-0.0386***	-0.00851				
	(0.00758)	(0.0194)				
		(0.00657)				(0.00827)
trade*prot					-0.0769***	0.0697*
					(0.0248)	(0.0378)
Constant	0.356***	0.399***	0.380***	0.378***	0.372***	0.414***
	(0.0152)	(0.0128)	(0.0144)	(0.0164)	(0.0151)	(0.0133)
Observations	297	297	297	297	297	297
R-squared	0.102	0.358	0.027	0.021	0.055	0.372
Number of countries		26		26		26

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1. Source: STATA

It is clear from table 5 that the fit of the model is deteriorated when excluding the variable for trade. When including an interaction term the model however gets improved when estimated by FE. The interaction term is significant at the 10 per cent level and tells us that as the level of trade increases, increasing protection increases inequality. The GDP per capita growth variable continues significant and increases inequality as it grows

5.2.4 Endogeneity

The problem of endogeneity often arises as a result of three circumstances; measurement errors, omitted variables and simultaneity. This problem might bias the estimates and hence give unreliable results. When studying the relationship between trade and inequality, there is likely a problem of distinguishing the direction of causality. The argument of the traditional model and the Stolper-Samuelson effect described above is that trade between developing (low-skilled) and developed (high-skilled) countries will decrease the wage gap in the developing country and increase it in the developed country. However, it can also be the reverse case, that a change in the income distribution within a country may change the country's trade flows. For instance, if the cost of producing a good using the abundant factor intensively increases due to the change in incomes, then the relative comparative advantage of the country deteriorates and we can expect changes in the trade pattern, leading to biased estimates of the effect of trade on inequality.

Endogeneity can partly be corrected for when working with panel data by applying the FE model as it effectively evens out unobserved heterogeneity. Another technique of addressing the endogeneity problem is to apply instrumental variables for the trade flows. However, since a convenient instrument for trade flows generally is of policy character (inward- and outward orientation), the method is not suitable when working with cross-country samples due to limitations in accessing such data. Hence, in this study the FE approach addresses the expected problem of endogeneity.

6 Discussion and Conclusion

In this section the results will be discussed and a final conclusion will be drawn. Due to the rather contradictive results, the main focus of the discussion will be to explain the likely reasons for this from a theoretical as well as practical perspective.

6.1 Discussion of the Results

So far, this paper has established that general trade is positive for middle-income countries in terms of inequality, although trade in specific industries have varying impacts on inequality depending on which industry and which region that is considered. For the total sample, the results suggest that protection of the vehicle industry reduces inequality, whereas protecting the arms and ammunition industry increases inequality. The opposite effects were expected since production and import of arms and ammunition is technically more advanced and requires more skilled labour than production of vehicles, which is normally associated to factory workers with less education. Trade with arms and ammunition would thus theoretically increase the demand for skilled labour and hence increase the wage gap and inequality. Protection of the textile sector also reduces inequality when country- and year-specific effects are accounted for. This is also the opposite of the expected result, since this kind of production is not characterized by the use of high skills and hence trade in this sector was expected to increase the demand for unskilled labour and thus raise their wages.

Both models are regressed with both the LS and the FE method in order to test the robustness of the results. Since many of the effects disappear in the FE models, we may expect other unobserved factors and policies not covered by this analysis to be more important when explaining the development of inequality. We thus have something in the error term correlating with trade and trade protection. This may for instance be educational policy, which possibly have high impacts on the relationship between trade and inequality. If liberalizing trade implies an increased demand for skills, then the educational system determines whether the country will be able to fulfil this demand. If the access to the educational system is restricted to a small

share of the population, then this may work as an obstacle for development and thus increase the demand for a small group of people. Hence, the educational system may be a determining factor when evaluating the impact of a trade policy on. Savvides (1998) for instance finds increased human capital investments to reduce inequality, which further strengthens this discussion. More, the infrastructure within a country may also be of major importance for the inequality development. If some sectors expand due to increased demand from abroad, lacking infrastructure may hinder the reallocation of resources needed in order for the industries to reply to the increased demand. International investors normally invest in urban areas where the infrastructure is better, and hence many people from poorer rural areas are hindered from enjoying this development. Thus, poor infrastructure may have the effect of excluding the poorest from enjoying increased demand of labour arising from trade. Unemployment may also be determining for the development of inequality since it implies that resources are not used in the best possible way. In developing countries, unskilled labour is often affected hardest by unemployment when countries devote to more skill-intensive production. Hence, the utilization of resources by a country is also determining for the inequality.

As commented above, the obtained positive sign of the GDP per capita growth variable indicates that economic growth affects inequality negatively when country-specific effects are introduced. The theory of Kuznetz (1955) predicted this result for economies in early stages of development. Nevertheless, due to the heterogeneity among the countries included in this panel data and that the majority of the countries actually are upper- or lower-middle-income countries, we may expect that Kuznetz's theory of initial stages also holds for later stages of development, and that the relationship is not U-shaped as predicted. The model suggests that economic growth mainly benefits higher income groups. There may be political reasons for this result, which are out of the scope of this paper to discuss, and it calls for a further investigation of who actually gains from growth.

Although a positive sign for inflation was expected, a significant result was not obtained for the total sample. However, when accounting for regional effects, a negative sign is obtained in the LS regression for Asia. Hence, increased inflation has the effect of lowering the income inequality in Asia. This result is quite contradictive and not in line with previous literature. However, it suggests that increased inflation does not erode real incomes in a manner that affects the poor hardest but rather the opposite.

By continuing with regional differences, it is important to stress that due to the small amount of countries included in some regions, the results may be somewhat misleading as little variation can be seen. The interaction variable now gets significant for Latin America and tells us that general protection reduces inequality as the country income increases This result is in line with that of Mesche and Vivarelly (2007), which proved that increased inequality from trade is stronger for middle-income countries that are more absorptive and may adopt new technology. The increased demand for skilled labour is hence stronger for middle-income countries than for low-income countries according to these authors, and the increase in inequality is stronger. Thus, we expect protection to have a stronger, reducing, effect on inequality as the income increases. More, we see that trade is only positive in terms of inequality for Caucasus whereas it cannot be supported for Latin America and Asia. Further, protection of specific industries has different effects on inequality for different regions. The likely explanations for this are differences in abundances across the regions, which reply differently to trade in terms of inequality, as well as the unobserved non-trade policies discussed above that together with trade policies jointly affect inequality. These arguments are important to have in mind for the remainder of the regional regressions. For instance, protection of the food industry in Latin America reduces inequality while it increases inequality in the other regions. This result is quite contradictive, since Latin America is unskilled labour abundant and has many local small-scale producers. Hence, trade in this sector was expected to increase the demand for unskilled labour and thereby lower the inequality, but rather protection was found to increase inequality.

Protection of the machinery and electronics industry however increases inequality in Latin America and Caucasus and decreases it for Asia. The result of Asia is thus the only one that supports the theory of increased inequality due to increased demand for skilled labour when trading with advanced technology, and is thus in line with the expected result.

Protecting the vehicles industry further increases inequality in Latin America while decreasing it in Caucasus. Hence, only Latin America obtains the expected sign, since the vehicles industry is, as commented above, a fairly unskilled-intensive industry and trade in this sector was thus expected to increase the demand for unskilled labour and thereby decrease inequality.

The results for the arms- and ammunition sector are somewhat contradictive to the previous results discussed as they indicate that for Latin America, protection of the arms and ammunition industry is positive for inequality whereas protecting it in Asia and Caucasus generates higher inequality. It is contradictive since protection of the machinery sector, which

also is advanced and skill-intensive and thus requires more skilled labour, gave the opposite effect. However, it is in line with late theory since arms and ammunition generally is very advanced and naturally requires educated labour to handle or producing it. Hence, having a large arms and ammunition industry naturally comes with a larger demand for skilled labour, which is why trade in this sector may be negative for inequality. However, the opposite effect is seen in Asia and Caucasus.

More, protection of the textile industry reduces inequality in both Latin America and Caucasus. Again, this is a contradictive result since the textile industry is more unskilled labour-intensive in its production than the other sector. Thus protection of this sector was expected to inhibit the increased demand for unskilled labour stemming from trade, and thus increase inequality.

Finally, the only region obtaining a significant sign for protection of the oil industry is Asia and the result suggests that protecting it reduces inequality. Since this industry generally is characterized by very advanced technology this sign was expected according to the discussions of increased demand for skilled labour when trading with advanced technology above. As the result disappears in the FE model we may assume for example political and reasons having larger impacts on inequality than trade policies included into this model.

When comparing the impacts of trade in different sectors it becomes of great importance to also mention something about the production pattern within countries. The production within a country may be skewed towards sectors that are more intensive in skilled alternatively unskilled labour. This may off course greatly influence the results when valuating the impact of a trade policy on inequality. It may also be that the tariff reduction is skewed towards sectors with more skilled or more unskilled labour. If an industry that is intensive in unskilled labour experiences a large reduction in tariffs, then the price of the produced good will be reduced and consequently the return to the factor it uses intensively, which is unskilled labour, will also fall, according to the Stolper-Samuelson theorem. Hence, inequality may be affected by other circumstances than the specific trade policy. What may further influence the effect of a trade policy on income inequality is the labour rigidity often prevalent in developing countries. Labour rigidity may work as an obstacle to resource reallocations as a response to economic reform, which may have the effect of increasing the return to specific occupations. This naturally hinders efficiency gains from trade policies and may lead to the richer and educated part of the population getting even more demanded on the labour market and thus increased inequality.

The next step was to compare the effects between lower- and upper-middle-income countries in order to detect whether the absorptive ability of higher-income countries was different of that in the lower-income countries as suggested and proofed by Meschi and Vivarelli (2007). What differs this analyse from that of Meschi and Vivarelly is that they focus on the differences in the effect of international trade for low-income countries (LICs) and middle-income countries (MICs), whereas this study compares the effect between upper-middle- and lower-middle-income countries. Hence, weaker differences were expected since the differences in income among the countries in this sample are smaller than among the countries in their study. The estimates reveal that trade still is positive in terms of inequality for both groups, implying that being an upper- or lower-income country is not determining for inequality. The results further indicate unobserved heterogeneity as explained above. More, protection of the oil industry reduces inequality for the lower income group whereas it increases inequality in the upper income group. In order to be in line with the results of Mechi and Vivarelli, the opposite result was expected. Due to the advanced technology required in the production and trade with oil, trade was expected to increase the demand for skilled labour and hence increase the wage gap, and thus protection of this sector was expected to decrease inequality. Thus, these results cannot support those of Meschi and Vivarelli of higher income countries being more absorptive in upgrading their technology towards those of more advanced economies and thus having higher inequality effects. The next comparable result is that of protection of the textile sector, which shows similar positive results for both income groups. Hence, as expected, no large differences were found in the relationship between upper-middle- and lower-middle income countries.

Finally, including an interaction term of the level of trade and the level of protection into the model suggests that as the level of trade increases, higher protection leads to increased inequality.

With respect to the heterogeneity among the countries in this dataset, a single answer to whether trade protection is positive or negative for the within-country inequality is thus not possible. Moreover, there are several non-country or non-sector specific technical factors that likely influence the results obtained in papers studying the relationship between trade policies and inequality in developing countries. In the first place, there is an enormous lack of data on inequality and other development indicators for developing countries. This, first of all, leads to very little variation in the data and thus complicates analytical processes in order to identify

certain patterns. Further, this tends to bias the general evidence of trade and inequality towards regions that keep data. The countries for which there is recent evidence, as commented above, tend to be Latin American and Asian since these are the only regions with somewhat complete data of inequality for the past decades. Hence, the evidence on this topic cannot be representative for developing countries or middle-income countries in general if regional effects are not accounted for. However, in order to do this for the region of Africa, more data is required. Furthermore, most of the, to different extents, developing countries keeping this kind of data are generally middle-income countries, and thus the data does not cover low-income countries. Hence, more data and research is required in order to investigate the impact of trade on inequality.

The evidence is also affected by the period that the study covers. Many papers focus on the period before and after the 1980s when trade liberalization programs were implemented in many developing countries and inequality begun to rise. Studying more recent data, however, as in this paper, may capture the long-run effects of those programs. Hence, recent studies may suggest other effects of trade on inequality than the older ones.

Lastly, differing results between earlier and more recent studies on this topic may be due to the change in the structure of trade as commented above, which has become more focused on intermediate inputs rather than on finished goods. Many earlier studies also fail to account for unobserved heterogeneity due to the methods used to investigate the relationship between trade and inequality, which makes more recent results, such as those of this paper, more reliable.

6.2 Conclusion

This paper investigates the links between trade protection and inequality for 26 middle-income countries during the period 2000-2012. It further examines whether sectorial trade exposure is of importance for the relationship. To motivate this topic, the discrepancy between the prediction of reduced inequality from trade of the traditional theory, and the evidence of increasing within-country inequality since the beginning of the 1980s is presented.

This is investigated by applying both an LS and an FE approach. I find no evidence for the effect of general trade protection on inequality. However, general trade, measured as the ratio of exports and imports over GDP, is found to reduce inequality. When accounting for regional differences, the effect of trade protection on inequality is found to strongly depend on which industry and which region that is considered. I expect to find inequality-decreasing effects from protection in high skill-intensive industries such as machinery and arms, since trade in these industries is believed to increase the demand for skilled labour and hence increase inequality. Oppositely, I expect to find inequality-increasing effects from protection in unskilled labour-intensive industries, since trade in these sectors is believed to increase the demand for unskilled labour and thus reduce inequality. However, the results are overall contradictive. Protection of certain sectors reduces inequality in some regions, while increasing it in others. I discuss several likely reasons for the contradiction of my results. The FE models suggest unobserved factors in the error terms that correlate with trade and trade protection. One likely such factor is the differences in abundances that the countries possess, which are not accounted for by the models. Differing abundances can greatly affect the impact of a trade policy on inequality due to the change in demand that may arise when opening up for trade. More, non-trade policies of for example educational or infrastructural character may jointly or multiply determine inequality together with trade policies. For instance, if trade is liberalized and as a result the demand for skilled labour increases, then the educational system determines whether the country will be able to respond to this demand. If the access to education is restricted to a small share of the population, then increased trade may lead to increased inequality by increasing the demand for a small share of people. Thus, the effect of a trade policy on inequality strongly depends on other unobserved policies, which are not covered by this study. With respect to these conclusions, control variables for education and infrastructure would be interesting and very relevant to include into models of future similar research.

Further, I was not able to distinguish different effects of trade protection on inequality when accounting for income differences in the sample, as suggested by Mesche and Vivarelli (2007). However, as I distinguished among upper-middle- and lower-middle income countries, the differences in income may have been too small in order to detect different impacts of trade on inequality. Hence, I further stress practical obstacles when examining this topic such as the lack of existing data for low-income countries, which thus becomes underrepresented in these studies.

Lastly, I motivate the ambiguity of the empirical evidence on the links between trade and inequality with the period of the analysis. Both due to the structure of trade that has changed and lately become more focused on trade in intermediate inputs rather than in final goods, which may affect inequality. And as well because the methods of many earlier studies fail to account for unobserved heterogeneity, which I have discussed to be essential when evaluating the effects of a trade policy on inequality.

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Appendix A: Estimation Sample and Country Groups

Countries used in sample: Argentina, Armenia, Bolivia, Brazil, China, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Georgia, Guatemala, Honduras, Indonesia, Mexico, Moldova, Panama, Paraguay, Peru, Russian Federation, Thailand, Turkey, Ukraine, Uruguay, Venezuela, Vietnam, Zambia.

- **Latin American countries:** Argentina, Bolivia, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay, Venezuela
- **Asian countries:** China, Indonesia, Thailand, Vietnam
- **Caucasian countries:** Armenia, Georgia, Moldova*, Russian Federation, Ukraine*, Turkey
- **African countries:** Zambia

Income country groups: World Bank classification of countries by income: lower-middle income economies; $1,046-$4,125, upper-middle income economies; $4,125-$12,735.

- **Upper-middle income countries:** Argentina, Brazil, Colombia, Costa Rica, Dominican Republic, Mexico, Panama, Peru, Russian Federation, Turkey, Uruguay, Venezuela
- **Lower-middle income countries:** Armenia, Bolivia, China, Ecuador, El Salvador, Georgia, Guatemala, Honduras, Indonesia, Moldova, Paraguay, Thailand, Ukraine

*: not officially Caucasian countries.

Appendix B: Descriptive Statistics

Table 6: Descriptive Statistics of Variables

Variables	Obs.	Mean	Std. Dev.	Min	Max
Gini	267	0.466	0.082	0.248	0.63
Gdpc	351	0.047	0.042	-0.148	0.183
Prot	351	0.309	0.228	0.04	2.348
Inflation	329	0.081	0.090	-0.017	0.961
Trade	351	0.749	0.341	0.217	1.630
Foodprot	302	0.658	0.800	0.1	3
Oilprot	318	0.191	0.159	0.05	1.04
Electronicsprot	300	0.216	0.150	0	1.55
Vehiclesprot	302	0.339	0.453	0	5
Armsprot	303	0.212	0.400	0	5
Textileprot	293	0.248	0.200	0	1.51