ERASMUS UNIVERSITY ROTTERDAM

Trade liberalization and income distribution

The Case of East Europe and Central Asia

Lukas Dubininas
Student Number: 413425

Thesis Supervisor: Dr.Julian Emami Namini
Second Reader:……..
JAN, 2016

Table of Contents

Abstract

This thesis theoretically and empirically investigates the relationship between trade liberalization and income distribution on a firm, sector and nation level. The empirical analysis uses the Enterprise Data on East European and Central Asian countries for the years 2002, 2004, 2007, 2009, 2013. The findings show that trade liberalization leads to a decrease in firms´ skill intensity in production and to an increase in the return to skilled labor in the short-run. The long-run analysis shows opposite results. Furthermore all firms were divided to following sectors: textile, retail and wholesale, services, raw materials, chemicals, construction, transport. I have found a significant difference between sectors.This thesis is a fresh view to trade liberalization and income distribution topic in Eastern European and Central Asian countries.

JEL Classification: C51, F02, F14, F16, F66, I26

Keywords: Skill intensity, Income distribution, Trade Liberalization, Firm Productivity, Equilibrium Model, Skilled Premium, Skilled Labor.

1. Introduction

The World Economic Forum Annual Meeting 2016 in Davos consider income inequality as one of the core issues in nowadays economics (World Economic Forum Annual Meeting 2016 report). According to anti-poverty charity Oxfam, the richest 1 percent holds more wealth than the rest 99 percent put together. To be more specific and consider wealth distribution in the world, 62 people (53 of them men) has more wealth than the poorest half of the entire world population. Unfortunately, the gap is even widening. Economists search for a reasons behind the surge of inequality.

This thesis is investigating the relationship between trade liberalization and income distribution. Next to trade, as possibly influential aspect to income distribution stand firms' performance, labor, and productivity related factors. The aim of thesis is to find a trend on influential factors to income distribution by looking up to topic of interest from the different perspectives. Empirical analysis part consists of separate investigations in firm, sector, nation levels. I will examine whether the data level has impact to findings. The method of looking to same topic by separate data levels is a unique aspect of this thesis. I suspect that data level might cause controversy findings by the economists. However there is a controversy between the findings in trade liberalization and income distribution topic. For instance Nobel laureate, Simon Kuznets, states that globalization in developing-countries may have slowed inequality (*The Economist). However, Michael Kremer explains that: "The empirical evidence is not really consistent with the idea that trade is reducing inequality (** Harvard Magazine). Therefore other Nobel laureate Erick Maskin, in his recent speech (***2014 Annual Bank Conference on Development Economics), explains why globalization has led to inequality increase in income. Next to majority of discussions I have noticed that majority of economists use either a theory based analysis, either only one county based analysis. On the other hand with help of most recent data I am able to make an explicitly investigate for Eastern Europe and Central Asia.

The motivation behind this research topic is driven by several reasons. Majority of previous researchers concentrate only on single county analysis (Amiti, Cameron, 2011, Galiania, Sanguinetti, 2003, Gieseckea, Heisig, Solga, 2014 and others). However a general conclusion

* http://www.economist.com/blogs/economist-explains/2014/09/economist-explains-0
** http://harvardmagazine.com/2015/03/how-globalization-begets-inequality
*** http://www.worldbank.org/en/news/feature/2014/06/23/theorist-eric-maskin-globalization-is-increasing-inequality

cannot be drawn from a single country. In addition, majority of papers are based on South America or Africa, where unstable political system and large volume of corruption make significant noise for analysis. Although I am able to obtain rich data sample of completely unique region, which is still named as developing, but have a western world integration signs. Even though, majority of the counties in my sample have been members of Soviet Union, currently those countries liberate their markets and increase collaboration with Western Europe and USA. Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Serbia, Slovakia, Slovenia are the members of the EU. Next to that some of them already entered the euro zone. Moreover free trade agreements between countries exist as well. For instance Deep and Comprehensive Free Trade Area (DCFTA) agreement was signed recently between Ukraine and EU.

Furthermore previous researchers initiated a question whether level of data influence the final conclusions. As due to perspective to topic some of researchers draw an opposite conclusions to those, who looked into same topic from different level of data. For instance Helpman et al. (2010) over the Davis and Harrigan (2011) contradiction, which will be explained in literature review section.

2. Literature review

2.1. Overview

Trade liberalization and income distribution is a topic of interests in international economics. The modern economists have been analyzing how open trade influence an income distribution for the last decades. Traditional international trade theories by Heckscher-Ohlin (1933), Stolper Samuelson (1941), Ronald Shephard (1953) and others gave the researchers theoretical reasoning for an empirical investigations. The economists have looked into topic from both, macro and micro perspectives. Moreover, researchers (Matsuyama, 2007, Gropello, Sakellariou, 2010, Parro, 2011) use long-term and short-term separation due to the opposite expectations according to the theory. Therefore, economists use different perspectives of skilled labor due to the availability of data. In some cases skilled workforce is represented by university degree workers, in other cases non-production workers stand for a skilled labor. The recent data has a more accurate perspective by establishing a skilled labor

variable as a separate measurement. Due to the availability of most recent data I will run an extensive empirical analysis from different perspectives and look for consistency with previous researchers. However the structure of analysis is crucial. In the following sections I will describe the differences between diversity of perspectives into the trade liberalization and income distribution topic.

2.2. The study of country and firm level data

There are different perspectives to trade liberalization and income distribution analysis. One of the ways is to separate the empirical analysis by data level. In most cases analysis consist either from country either from firm level data, from which sector level analysis is constructed. For instance Findlay and Kierzkowski (1983) investigated the formation of human capital by the two-factor, two-good (Heckscher-Ohlin) set up of international trade within a country level data. The authors have showed that trade liberalization leads to one time increase in skill intensity, as skilled wages decrease. However there are contrary findings by economists. According to firm level analysis by Helpman et al. (2010) trade liberalization contributes to a higher income inequality, as wages of the skilled workforce enhance. On the other hand firm level analysis by Davis and Harrigan (2011) showed that trade liberalization impacts the relative slump in skilled labor wages, hence income inequality shrinks. Additionally Gropello, Sakellariou (2010) nation level analysis findings indicate generally increasing demand for skills in the East Asia region. Matsuyama (2007) finds out that export contributes in skill intensity upswing. Parro (2011) agrees to Gropello, Sakellariou and Matsuyama and digs for a reason. Parro constructed a multi-country model of international trade with a capital-skill complementarity over the period 1990-2007. Research was done under the assumption of skill intensity increase with a higher trade volume. The author found that the impact of skill-biased trade is much larger than that of Stolper-Samuelson effects, especially in developing countries.

I have noticed that effect of trade liberalization on wage inequality in developing countries has mixed evidence. However majority of researchers found that trade liberalization contributes in relative decline in skilled labor wages. This conclusion was consistent in both, nation and firm level analysis. So I should expect consistency in my firm and nation level investigations. Unfortunately due to the missing data of income distribution my analysis will

be based on skill intensity rather than income distribution. However theory shows a direct link between two of them (proposition 1-4 in theoretical framework).

2.3. The study of long-term and short-term periods

According to theoretical framework (chapter 3) trade liberalization leads to a distinct impact on income distribution, depending on the period of analysis. Mishra and Kumar (2005) have studied the trade liberalization in India, within a one year periods. Firm level data with a sector division was used for an empirical model. The findings show a skill intensity slump. The short-term analysis results in a negative trade impact on the relative skilled over unskilled labor demand. The controversy is confirmed by Emami Namini and Lopez (2012) as well. Emami Namini and Lopez have constructed a long-run model's set up, which is based on a Ramsey growth setting; hence the skill labor stocks are flexible and determined endogenously. Households increase investments to the skilled labor stock, since competition and return from a skill workforce increases in a long-run. Finally, firms produce more skill intensely. Next to that Emamu Namini and Lopez agrees to Mishra and Mumar findings in a short-term. Beyer, Rojas, and Vergara (1999) assume that the reason behind opposite results in short and long-term is a sticky wages (New Keynesian). On the other hand Arbache (2001) has a different reasoning. According to Arbache the smaller the substitutability of skilled for unskilled labor and the more inelastic the supply of skilled labor, the larger the dispersion of wages and skill intensity will be. The results show that the new wage equilibrium should show a relative increase in skilled workers' wages, since the supply of unskilled labor is more elastic. Moreover author concludes that Asian countries experienced a reduction in wage inequality, which is in agreement with the standard theory of international trade. On a contrary Latin American and other countries experienced a rise in wage inequality following openness.

According to Mishra and Kumar (2005) and Emami Namini, Lopez (2012) I should find a contradiction between short-term and long-term analysis. That is why empirical analysis consist of two separate sections in order to see if my results are consistent with previous papers.

2.4. The study of exporters and non-exporters

Once again, the theory gives a link to higher productivity of exporters over non-exporters. Aw, Hwang (1994) simulated several models in order to compare a market productivity of Taiwanese electric products exporters and non-exporters. Nevertheless, they found a significant difference in productivity levels between exporters and non-exporters in three out of the four products examined. Data showed that exporters tend to be more capital intensive and their sales are superior. This paper showed consistent results with theory by Melitz (2003). Melitz states that trade liberalization increase productivity of the active firms, as well as firms entering the export market after liberalization becomes more skill and technology-intensive than non-exporters. Bustos (2005) have done the separate exporters and non-exporters comparison. The empirical study confirmed that exporters are more skilled intensive than non-exporters. Moreover skill intensity is directly related to income distribution. This statement will be proven in theoretical framework.

Loecker (2006) agrees to previous researches and noticed an increasing over time skill intensity gap between exporting and non-exporting ones. Verhoogen (2008) investigated the skilled workers demand in a sector level analysis. The main conclusion is that the exporter's production is higher quality; hence they pay higher wages to maintain a higher quality labor.

I will try to examine the firm level data on exporters and non-exporters to see whether significant deviations can be noticed. Moreover, I will look up if the workforce, performance measures differ between exporters and non-exporters.

3. The theoretical framework

3.1. Introduction

The model is constructed on two countries with a Dixit-Stiglitz preferences and CES production function. The households are characterized by Dixit-Stiglitz preferences (1977); hence households consume series of imperfect substitutes of aggregate good. The active firms can be described as a large group of monopolistic competition. Each country's production has

a single monopolistic competition sector. Firms use a skilled and unskilled labor for producing. The CES technology is used for a unique variety of an aggregate good. Firms are heterogeneous and the factor share parameters established from a constant elasticity of substitution (CES) production function. In order to make the model simple let's I will make a couple assumptions. 1) The firms reach a higher profit in case of a higher skilled labor share. Assumption gives an opportunity to explain skill intensity independently from a country's size. The market entry and exit processes are not deliberately considered in this model, because of the second assumption. 2) The mass of firms and their distribution is given exogenously. Moreover, in order to construct a model the third assumption has to be drawn. 3) Skilled and unskilled workforce is perfectly mobile between firms within a country, but perfectly immobile between countries. Lastly, 4) Home and foreign countries are symmetrical in all cases.

3.2. CES production function

Production is based on the CES function, where each firm produces its unique variety of an aggregate good. The function is modified by adding an input of skill and unskilled labor and factor specific productivity parameters.

$$q(\phi) = \left[\phi^{\frac{1}{\sigma}}(s\,A_S)^{\frac{\sigma-1}{\sigma}} + (1-\phi)^{\frac{1}{\sigma}}\,(l\,A_L)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma-1}{\sigma}}, \quad 0 \le \phi \le 1, \qquad (1)$$

ϕ- factor share parameter;
s-input of skilled labor;
l- input of unskilled labor;
σ- elasticity of substitution between effective factor inputs;
A_S, A_L- factor specific productivity parameters.

As assumption two states the mass of firms are exogenous. Firms differ with respect to factor share parameter (ϕ). All firms are distributed over the period [0:1] based on exogenously given density parameter *g(ϕ)*. If σ is higher than 1, factors are imperfect substitute in production, while they are perfect complements in production if σ is between 0 and 1.

$$c(\phi) = \left[\phi \left(\frac{w_S}{A_S}\right)^{1-\sigma} + (1-\phi) \left(\frac{w_L}{A_L}\right)^{1-\sigma}\right]^{\frac{\sigma-1}{\sigma}} \quad , \quad 0 \leq \phi \leq 1, \tag{2}$$

w_S- wage of skilled labor;

w_L- wage of unskilled labor.

Firm's production costs function is presented above. The given ϕ has influence, if skilled wages over factor specific productivity parameter ratio is not equal to the same ratio of unskilled labor. Firms minimize the costs according to factor share parameter (ϕ).

3.3. Demand function

Utility function is presented in equation 3. Alternatively, this equation can be called as the aggregation function that explains how households aggregate the varieties q to give the aggregate consumption good Q.

$$Q = \left[\int_0^1 q(\phi)^{\frac{\xi-1}{\xi}} \, g(\phi) N d\phi\right]^{\frac{\xi-1}{\xi}} \quad , \quad \xi \geq 1, \tag{3}$$

Q- aggregate good;

N- the number of active firms;

ξ- elasticity of substitution between the varieties of Q.

The households consume the aggregate good (Q). In order to make the following calculations simpler we use the common practice (Emami Namini, Lopez, 2011) and assume that $\xi = \sigma$. Moreover according to Krugman (1980) both parameters must be above 1 to generate intra-industry trade.

Furthermore, price index P follows up from the equation 3 by dual CES.

$$P = \left[\int_0^1 p(\phi)^{1-\sigma}\ g(\phi)Nd\phi\right]^{\frac{1}{1-\sigma}} = \left[p(\tilde{\phi})^{1-\sigma}\ N\right]^{\frac{1}{1-\sigma}} \quad (4)$$

$\tilde{\phi}$- is the skilled labor share parameter of the aggregate good Q.

Derivation of demand for a single variety can be done by using the Shephard's Lemma. The result follows in equation 5

$$q\ (\phi) = YP^{\sigma-1}\ p(\phi)^{-\sigma} \quad (5)$$

Y- total factor income.

The unknow components of equation 5 are explained in the further equations (6 and 7).

$$Y = w_S S + w_L L = PQ \quad (6)$$

S- country's endowment of skilled labor;

L- country's endowment of unskilled labor.

Given the CES demand structure, the profit maximizing price a firm with productivity parameter ϕ charges is given by:

$$p\ (\phi) = \frac{\sigma}{\sigma - 1}\ c(\phi) \quad (7)$$

As σ is always higher than 1 and $c(\phi)$ is always positive, the price $p\ (\phi)$ is positive as well. The lower the elastisity of substitution between effective factor imputs (σ) is the higher the profit mazimization price will be and the way around.

3.4. Steady state regime

Steady state regime extends the Baxter (1992) set up in monopolistic competition *(equation 7).* I assume a Ramsey growth setting and the steady state is characterized by the following necessary first order conditions (see Baxter, 1992):

$$w_{S,t} + (1-\delta)p\left(\tilde{\phi}\right) = p_t^S$$

$$w_{L.t} = p\left(\tilde{\phi}\right)\left[\tilde{\phi}^{\frac{1}{\sigma}} A_S^{\frac{\sigma-1}{\sigma}} \left(\frac{S_t}{l_t}\right)^{\frac{\sigma-1}{\sigma}} + (1-\widetilde{\phi})^{\frac{1}{\sigma}} A_L^{\frac{\sigma-1}{\sigma}}\right]^{\frac{1}{1-\sigma}} (1-\widetilde{\phi})^{\frac{1}{\sigma}} A_L^{\frac{\sigma-1}{\sigma}}$$

$$w_{S.t} = p\left(\tilde{\phi}\right)\left[\tilde{\phi}^{\frac{1}{\sigma}} A_S^{\frac{\sigma-1}{\sigma}} + (1-\widetilde{\phi})^{\frac{1}{\sigma}} A_L^{\frac{\sigma-1}{\sigma}} \left(\frac{l_t}{S_t}\right)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{1}{1-\sigma}} \tilde{\phi}^{\frac{1}{\sigma}} A_S^{\frac{\sigma-1}{\sigma}}$$

$$p_{t+1}^S + (1+\rho)p\left(\tilde{\phi}\right)$$

First equation stands for a zero profit condition for the households, who lend skilled labor to firms. If $p_t^S = w_{S,t}$, then households realize zero profit from lending out the skilled labor. Second and third equations imply that, in the steady state, factor returns are equal to the value of the marginal product for each factor. Lastly, the fourth equation denotes the Euler equation.

Unskilled labor is numeraire in our case, hence w_L is equal to unity. Therefore, w_S stands for a relative return to the skilled labor, or simply the relative wage of skilled labor. Variable w_S is endogenous and as we will see in the following equations can be compared to $\frac{A_S}{A_L}$. If $w_S > \frac{A_S}{A_L}$, then more unskilled labor intensive firm has larger profits than a more skilled labor intensive one. If $w_S < \frac{A_S}{A_L}$, then more skilled labor intensive firm realize higher profits than more unskilled labor intensive firm. Moreover the households' preferences are not based on the "love of variety" principle. Households maximize their lifetime utility; hence their consumption and investment level choices are based on lifetime utility maximization, in each period. Previously reviewed first order conditions are necessary to derive the relative price of skilled labor in the steady state.

$$w_S = \left[\frac{\left(1-\tilde{\phi}\right)(\rho+\delta)^{1-\sigma} {A_L}^{\sigma-1}}{1-\tilde{\phi}(\rho+\delta)^{1-\sigma} {A_s}^{\sigma-1}}\right]^{\frac{1}{1-\sigma}} \tag{8}$$

ρ- time discount rate;

δ- skilled labor depreciation rate;

$\tilde{\phi}$- the average skilled labor share parameter.

The relative return to skilled labor in a steady state regime is presented in equation 8. Households are in charge of production factors and lend them to firms in order to produce. Ramsey growth model in a steady state regime characterize the way how households behave. The parameters ρ, δ, $\widetilde{\phi}$, σ, A_S, A_L determine the skilled wage in a steady state regime (equation 8).

3.5. Trade liberalization

The model states that trade liberalization leads to a tariff slump to zero level. According to Melitz (2003) the foreign market entrance involves sunk costs. In order to make the model convenient I assume that iceberg transport costs are equal to zero, hence home and foreign countries are perfectly symmetric. According to the theory not all firms enter the new market, Melitz states that just the more productive firms can expand to the foreign market. Due to previous researchers results let's assume that more productive firms are those who produce more skill intensively. After the trade liberalization the relative wage of skilled labor will change. Therefore 3 conditions are important for analyzing the impact of trade liberalization. Country's general equilibrium is characterized by following assumptions:

1) The worldwide demand of each variety equals to production at price $p(\phi) = \frac{\sigma}{\sigma-1} c(\phi)$

2) We assume a zero cutoff profit condition for supplying foreign markets

3) The factor market clearing conditions with the skilled labor endowment S at its autarkic steady state level.

Those 3 assumptions are needed for determine changes after trade liberalization. First assumption let us set the production $q(\phi)$ of of each variety. Second assumpion asesses relative frequency of of the exporting firms. Third one let us investigate relative retur for a skilled labor.

Zero cut-off profit condition for the firms, which penetrate to the foreign market, determines a critical ϕ, which sets the bound between exporters and non-exporters. The bound gives us the distribution perspective as well, hence the number of exporting firms is clear when bound is determined. In a long run the skill intensity becomes flexible and adjusts to the market.

The impact of the trade liberalization is constructed by additional factor demands by the exporting firms to the closed economy, which lead to following demands for skilled and unskilled labor. $L_{fx} = \frac{N_{sx}\, f_x}{{A_L}^{1-\sigma}} \int_{\phi_X^*}^{1} \frac{(1-\phi)c(\phi)^{\sigma} g(\phi)}{1-G(\phi_X^*)}\, d\phi$; $\quad S_{fx} = \frac{N_{sx}\, f_x}{{A_S}^{1-\sigma}} \int_{\phi_X^*}^{1} \frac{\phi w_S^{-\sigma} c(\phi)^{\sigma} g(\phi)}{1-G(\phi_X^*)}\, d\phi$

$s_X = 1 - G(\phi_X^*)$ stand for the share of exporters in the firm distribution. By dividing $L - L_{fx}\ over\ S - S_{fx}$ and solving for w_S we have equation 9.

$$w_S = \left[\frac{L - L_{fx}}{S - S_{fx}} \left(\frac{A_S}{A_L}\right)^{\sigma-1} \frac{\tilde{\phi} + s_X\, \tilde{\phi}_X}{1 + s_X - \tilde{\phi} - s_X\, \tilde{\phi}_X}\right]^{1/\sigma} \tag{9}$$

In order to conclude the changes we have to compare skilled wage expression to the equation before the trade liberalization

$$w_S = \left[\frac{\tilde{\phi}}{1-\tilde{\phi}} \frac{L}{S} \left(\frac{A_S}{A_L}\right)^{\sigma-1}\right]^{\frac{1}{\sigma}} \tag{10}$$

Both fractions on the right side of equation 9 are greater than in equation 8 $\frac{L - L_{fx}}{S - S_{fx}} > \frac{L}{S}\ and\ \frac{\tilde{\phi} + s_X \tilde{\phi}_X}{1 + s_X - \tilde{\phi} - s_X \tilde{\phi}_X} > \frac{\tilde{\phi}}{1-\tilde{\phi}}$, hence we can make the first proposition.

Proposition 1 Wage of the skilled workers increases after the trade liberalization.

The intuition is based on fact that exporters are more skilled labor intensive than non-exporters. After trade liberalization the relative demand for skilled labor increases, hence the relative wage of skilled labor increases as well. Due to the wage of skilled labor (w_S) rise the factor share parameter ϕ has a smaller impact to profit (equation 7). If we consider the extreme $w_S \to \frac{A_S}{A_L}$ the costs of skilled intensive workforce against less skilled intensive labor advantage disappears. In this case even most skilled intensive firms cannot afford to export and we have autarky. The conclusion is that trade liberalization should increase skilled wages (w_S), but to the strictly smaller level than $\frac{A_S}{A_L}$. Thus, the second proposition follows.

Proposition 2 Skilled over unskilled labor input ratio of each firm decreases due the trade liberalization.

3.6. Long-term impact of trade liberalization

Households invest a part of the aggregate consumption good (Q). That leads to skilled labor share parameter of the investment good increase with trade liberalization; hence the price of investment good shrinks. As one unit of investment in period t leads to one unit of skilled labor in t+1, the wage of a skilled labor shrinks likewise. Third proposition follows.

Proposition 3 Wage of the skilled workers shrinks in a long-run, after the trade liberalization.

Lastly, it is important to know how the skill intensity changes in a long-run. Due to the proposition 3 we can see the changes of skilled intensity by looking to equation of the labor share parameter $\phi = \frac{A_S^{\sigma-1}\ \phi w_S^{-\sigma}}{A_L^{\sigma-1}\ 1-\phi}$.

Proposition 4 The skilled labor over unskilled labor ratio of each firm increase in a long-run after trade liberalization.

As I have mention in the literature review, the impact of trade liberalization differs in short-period from the long-period. In next chapter I will examine the theoretical framework by empirical analysis. Expectations are based on proposition 2 and proposition 4. Trade liberalization in short-term should lead to decrease of skill intensity. However, impact in a long-term supposes to be opposite, hence I expect rise in skill intensity.

4. Empirical analysis

4.1. Data description

The data source was the Enterprise Survey by the World Bank (http://www.enterprisesurveys.org). The empirical analysis is focused on firms' performance in Eastern Europe and Central Asia over a period of five non-consecutive years, including 2002, 2005, 2007, 2009 and 2013.An Enterprise Survey is a firm-level survey of a representative sample of an economy's private sector. The survey is based on questionnaire, which covers a broad range of firm's level topics including trade, workforce, finance and performance

measures. Extensive raw data set was used for conducting an empirical analysis. The available data were gathered by the private contractors on behalf of the World Bank. Taking into consideration sensitive business environment, the contractors follow strict survey procedures. The information was presented confidentially, without concrete names of companies. The purpose of this data set is a research based analysis in order to explain the business related processes. Surveys are usually carried out in cooperation with business organizations and government agencies promoting job creation and the economic growth.

The respondents are mainly firms' owners or either leading managers. Labor or sales related questions were conducted with specialists, which work in a relevant sector. Large scale economies consist with 1200-1800 firms being interviewed. Medium size economies typically conduct 360 interviews and smaller economies are represented by around 150 interviews. (World Bank's Enterprise Survey, "Understanding the questionnaire" 2011, www.enterprisesurveys.org)

The primary interest belongs to manufacturing and service sectors, as a core division. The methodology based on separate questionnaires for manufacturing and service companies. Over a 90% of the questions objectively obtain the characteristics of business environment in a particular country. Participants correspond to firms classified with ISIC codes 15-37, 45, 50-52, 55, 60-64, and 72. All participated firms are formally registered and have at least 5 employees.

The sampling methodology is based on random selection. All firms have a same probability of being selected and no weighting of the observations are obtained. Units are grouped within homogeneous groups and simple random samples are selected within each group. This method allows computing estimates for each of the strata with a specified level of precision while population estimates can also be estimated by properly weighting individual observations. The weights are used to take care of the varying probabilities of selection across the different strata. In some cases estimates' predictions leads to the higher accuracy in random sampling, hence lower standard errors. Enterprise Surveys sliced up by firm size, business sector, and country. Firm size division is made according to the number of employees, as following 5-19 small, 20-99 medium, and 100+ employees' large firms. In most of the economies majority of the firms are small and medium sized. Therefore Enterprise

Surveys oversample large firms, since larger firms tend to have a major role in job creation process. The sector breakdown in this thesis is textile, transport, raw materials, chemicals, construction, retail and wholesale, services.

The empirical analysis is based on firms' performance in Eastern Europe and Central Asia over a year 2002, 2005, 2007, 2009 and 2013. Survey sample differ over the years. Starting with year 2002 the overall number of firms were 4872, hence small, medium and large firms. Moreover, in 2005 there were 7553 firms, 2007 surveyed only 1954 firms. Furthermore 2009 contained the largest data sample with 7949 firms and lastly 1756 firms in 2013. Five years panel included 27 countries in Eastern Europe and Central Asia with 26,918 enterprises in total. According to Acs and Szerb (2009) entrepreneurial activity differs significantly from country to country, depending on its stage of development. In order to prevent the analysis from heteroscedasticity we selected more or less equally developed countries. According to Burstein and Vogel (2012) quantitative analysis trade liberalization effect on the skill premium depends on a country's relative size and on its relative factor endowments. Due to the figure 1 results we can conclude that principal variable, skill intensity, distribution over the countries is more or less equal due to averages. The countries are: Albania, Armenia, Azerbaijan, Bosnia, Bulgaria, Belarus, Croatia, Czech Republic, Estonia, Georgia, Hungary, R. of Macedonia, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Moldova, Montenegro, Poland, Russia, Romania, Serbia, Slovakia, Slovenia, Tajikistan, Ukraine and Uzbekistan.

4.2. The methodology

The theoretical framework was used in order to empirically investigate the trade liberalization and income distribution relationship, whether higher export volume leads to fall in skilled intensity in a short-term and rise in a long-term. Since the dataset is characterized by time, cross-section and country specific dimensions a panel data analysis was used as a most appropriate method.

The analysis is based on prediction that trade liberalization leads to relative decrease in skilled intensity due to the skilled wage increase in a short term. Therefore the long-term analysis should show an opposite results. Unfortunately due to the lack of data the wage premium was not investigated, however the theory (equation 10) indicates a direct relationship between

wage premium and skilled intensity. Moreover Amiti and Cameron (2012) have found a significant negative coefficient near to the skill intensity, as a panel regression independent variable to dependent variable wage premium. Following the theory, empirical evidence and regarding to data availability only the ratio of skilled intensity has been considered.

$$Skilled\ Unskilled_{i,t,j} =$$
$$\beta_0 + \beta_1 Capital_{i,t,j} + \beta_2 Export_{i,t,j} + \beta_3 Sales_{i,t,j} + \beta_4 Labor\ Costs_{i,t.j} + \beta_5 Materials_{i,t,j} +$$
$$\beta_6 Capacity_{i,t,j} + \beta_7 Clear\ Export_{i,t,j} + \beta_8 Employees_{i,t,j} + \beta_9 Foreign\ Input_{i,t,j} + \varepsilon_{i,t,j} \quad (11)$$

The empirical analysis starts with the firm level data on skilled intensity regressed by nine independent variables, which explain the core aspects of firm's performance, workforce and trade. Dependent variable skilled unskilled is a relative labor ratio in sector i at time t for firm j. All firms have been divided to following sectors: textile, transport, raw materials, chemicals, construction, retail and wholesale, services. Analysis covers year 2002, 2005, 2007, 2009 and 2013. The main focus is on the independent variable export, which measures overall (direct and indirect) export of each firm. This variable was used in various previous researches (Borjas 1997, Ripoll, 2002, Bustos 2011, Emami Namini, Lopez, 2012 and others). The expected coefficient of export supposed to be negative and lead to decrease in skilled intensity, each single firm should produce less skill intensively, due to relative increase in skilled workers wages in a short-term. However long-term results should be opposite. Next to export other trade related variable is clear export, which stands for days required to clear export through customs. However importance of clear export variable expected to be shallow. This parameter is included due representation of firm's trade related productivity. Other researchers (Eggers, 2006, Parro 2013 and others) include total factor productivity to the model. However I have tried a new perspective to firm's productivity by using clear export variable. The reason behind is variable's direct relationship to trade. Clear export variable is expected to have a negative coefficient. More productive firms should have higher skill intensity than less productive ones. Further explanation of skill intensity brings the control variables, which mainly show general firm performance or either is a labor force related. Capital and materials show the required long term and short term assets for production. Materials represent the sum of total annual costs of raw materials and intermediate goods and

total annual costs of fuel. While, variable capital is a sum of purchases of machinery, vehicles, equipment, land and buildings. Capital as interest of skill intensity was used by Parro, 2013 and Bustos, 2011. Both variables are expected to have a moderate effect to skilled intensity. However both, materials and capital, required unskilled labor to operate with. That is why we expect that enhance in these variables results in unskilled labor intensity rise over skilled labor. In other words both variables projected to be with negative coefficients. Other two control variables labor costs and employees belong to workforce category. Labor costs measures expenditures over one employee and other variable, employees shows the number of workers including full-time and part-time. Labor costs variable was used by Eggers, 2006 and Head, Ries ,Swenson, 1998. According to the authors the variation in average wages mainly reflects to variation in the skill composition of the work force. Higher average labor cost leads to increase in skill intensity, hence coefficient is expected to be positive and significant. The exporters should have a higher average of labor cost variable than non-exporters. Moreover control variable sales give us the information about total annual amount of revenue from selling the products and services. Head, Ries, 2001, Adams, 1999 and Bustos 2011 investigated sales impact on skill intensity. Variable expected to have a minor impact to skilled intensity. Skilled labor demand goes up due to the sales enlargement, hence coefficient supposed to be positive. Lastly foreign input represents proportion of total inputs that are of foreign origin. Variable was included due to previous researches (Berman, Bound, Machin, 1997 and Emami Namini, Lopez, 2012), which had positive findings, by regressing foreign input with skilled intensity and a wage premium. The coefficient expected to be positive due to higher demand for skill workers with a foreign input increase. We can assume that foreign materials require skilled workers to operate with. At least this was a case in papers mentioned before.

Next to skilled intensity measurement as skilled over unskilled workers the alternative proposition is a measurement of university graduates over non-university workers.

$$University\ NonUniversity_{i,t,j} = \beta_0 + \beta_1 Capital_{i,t,j} + \beta_2 Export_{i,t,j} + \beta_3 Sales_{i,t,j} + \beta_4 Labor\ Costs_{i,t,j} + \beta_5 Materials_{i,t,j} + \beta_6 Capacity_{i,t,j} + \beta_7 Clear\ Export_{i,t,j} + \beta_8 Employees_{i,t,j} + \beta_9 Foreign\ Input_{i,t,j} + \varepsilon_{i,t,j} \quad (12)$$

According to previous researches (Acemoglu, 2003, Burstein, Vogel, 2012, Gropello, Sakellariou, 2010) the most used skilled ratio is university degree holders over non holders. Due to rich data set the different perspectives of skilled intensity could be measured. The alternative dependent variable gives us possibility to have a slight different view to the skilled intensity. The data set already contains skilled and unskilled workers division, hence we will see if university degree over non university degree workers results are consistent with skilled over unskilled. I have raised the question of previous researches on skilled intensity reliability. Might be that division by university education is not accurate enough, as not necessarily the university degree holder is a skilled worker and the way around.

4.3. Robustness check

The plant level regression is based on panel data results in year 2002, 2005, 2007, 2009, and 2013. The separate investigations for each year were done in order to find if the overall panel data findings are consistent with yearly base. After the robustness check, no significant deviations from yearly analysis to panel data regression were found. Just slight changes in panel regression over the cross section analysis can be perceived. Even though, the coefficients in table 4 and table 5 are similar.

Second robustness check was based on dependent variable variation. Skilled over unskilled workers was changed to university over non-university workforce. The stability between models was expected as both methods were used by previous researches (Amiti, Cameron, 2011, Parro, 2013, Bustos, 2005). The table 7 represent findings in sector level analysis with dependent variable skilled workers over unskilled workers. Next to that table 8 shows sector level results with university degree holders over non-holders. Table 7 has a significantly higher skill ratio due to the fact that not all skill workers have a university degree. In addition the weight of coefficients differ over two tables. However the robustness check was satisfied as the general insights in both variations are on same track.

Third robustness check was done by comparing an aggregate nation level panel regression to sector level analysis. Table 9 indicates the findings in nation level and table 7 in sector level. Due the separate data samples the variables were changed in nation level investigations. However the significant contradiction between results was not found. The consistency between the nation level and the sector level shows that core part of results remain in both models. In other words the sector level analysis is more extensive, but still contains the same core findings as the nation level regression.

The overall conclusion is that independently from the level of analysis findings should contain just small deviations. However main results stay on the same page.

4.4. Descriptive Statistics

1. **Table. Descriptive statistics for 6 variables of interest**

	Capacity	Capital	Clear export	Employees	Foreign Input	Labor costs
Mean	78.801	752320.88	4.878	98.022	31.53440	21467.55
Maximum	100.00	3.58E+11	991.00	37772.00	100.00	507923.44
Std. Dev.	21.490	4.40E+09	17.397	408.392	37.628	1.12E+08
Observations	25007	18080	14504	42649	25187	28766

Data is in absolute values

2. **Table. Descriptive statistics for the other 6 variables of interest**

	Materials	Non-prod/ Prod	Skilled/ Unskilled	Export	Sales	University /Non
Mean	1.11E+08	6.749813	2.114022	2477293	10201565	0.967953
Maximum	4.13E+11	3891.568	561.7897	5.29E+13	1.00E+14	99.00000
Std. Dev.	3.58E+09	336.9914	250.0708	5.93E+08	5.41E+08	4.011799
Observations	26714	19575	34537	29213	34452	39786

Data is in absolute values

Descriptive statistics are divided to two tables due to a large number of variables. The dataset is in absolute values, which leads to a fairly large numbers in mean and maximum columns. However the cases of variables, expressed by percentages as capitalization, foreign input,

university, non-university workers the mean is easy to evaluate. The same situation is with ratio based variables as skilled over unskilled workers, production over nonproduction workers and university over non-university workers. The core variable of interest, skilled over unskilled workers has a mean equal to 2.11; hence the overall population of skilled workers is higher than unskilled ones. However not all skilled works hold a university degree, as the ratio between university graduates and non-graduates is equal to 0.96. Moreover larger part of employees works in non-production position.

The mean of number of employees in single firm is 98 and annual salary per employee is 21467.55 dollars. The largest firm in the dataset has 37772 workers. The number of observations deviates from smallest sample of 14504 to largest of 42649 observations. In order to contain a large sample sizes some models use a smaller models with lower number of independent variables. The mean and maximum value of materials surpasses the capital. That means that firms have a tendency to invest more to materials than in capital. Of course need of firms depends on sector as well.

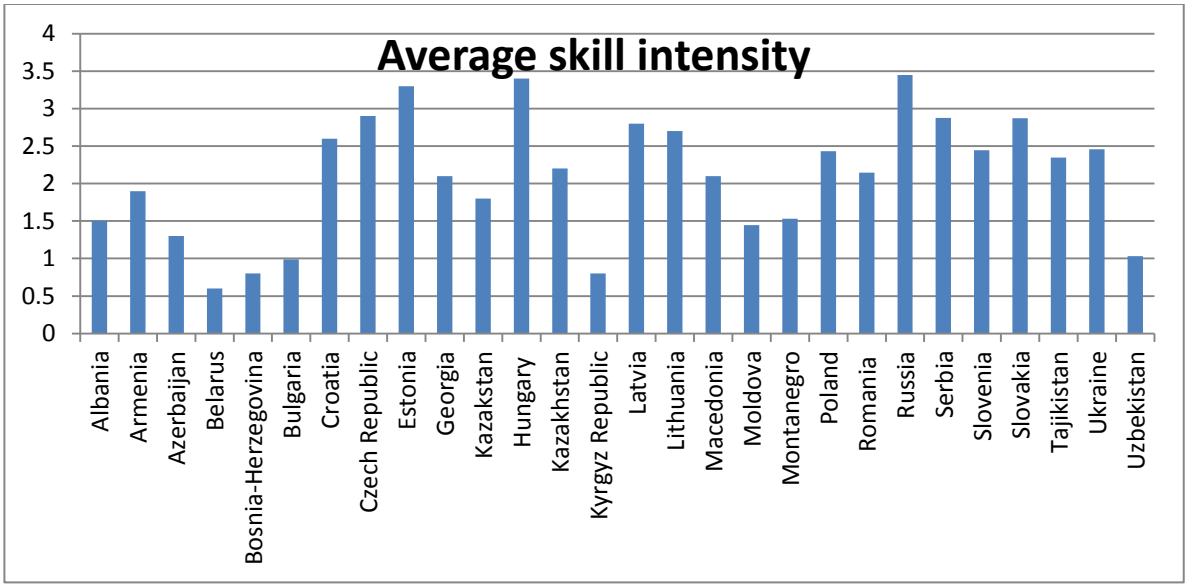
The export variable can be compared to sales in order to see the volume of sales exported. Even though, mean of export is higher than 10millions dollars per year that is just a significant proportion of sales, which is around twenty five percent. However if we take maximum values the proportion is more than twice higher (53%). The descriptive statistics gives a link to trade volume increase with higher sales. According to the mean nearly one third of inputs have foreign roots. Thus, firms use foreign materials or supplies in their production. There are firms, which use only the materials/supplies of foreign origin.

Due to the descriptive statistics I can construct an average firm's profile. According to results average firm has 98 employees. The average annual salary per employee is equal to 21.467 dollars. The average firm's overall export per year is equal to 2.5 million dollars. However the annual sale volume is around 10million dollars, hence export comprises one fourth of sales. Average time to clear export through customs is 5 days. Moreover the ratio of university degree holders over non-holders stands below 1. Number of non-production workers surpasses production workers by nearly 7 times. Finally, skill intensity is 2.11; hence skilled workers volume is more than twice higher than unskilled workers.

4.5. First evidences

Before presenting the results of empirical analysis I will introduce the topic by first evidences. The graphical expressions of data will give the general view to the topic and data on which the further analysis is based on. However due to large volume firm level data, the slight modifications have been done to reach a clear graphical view. Therefore I add the description of modification below the figures to be sure about representative sample.

1. **Figure. Average skill intensity over the countries**



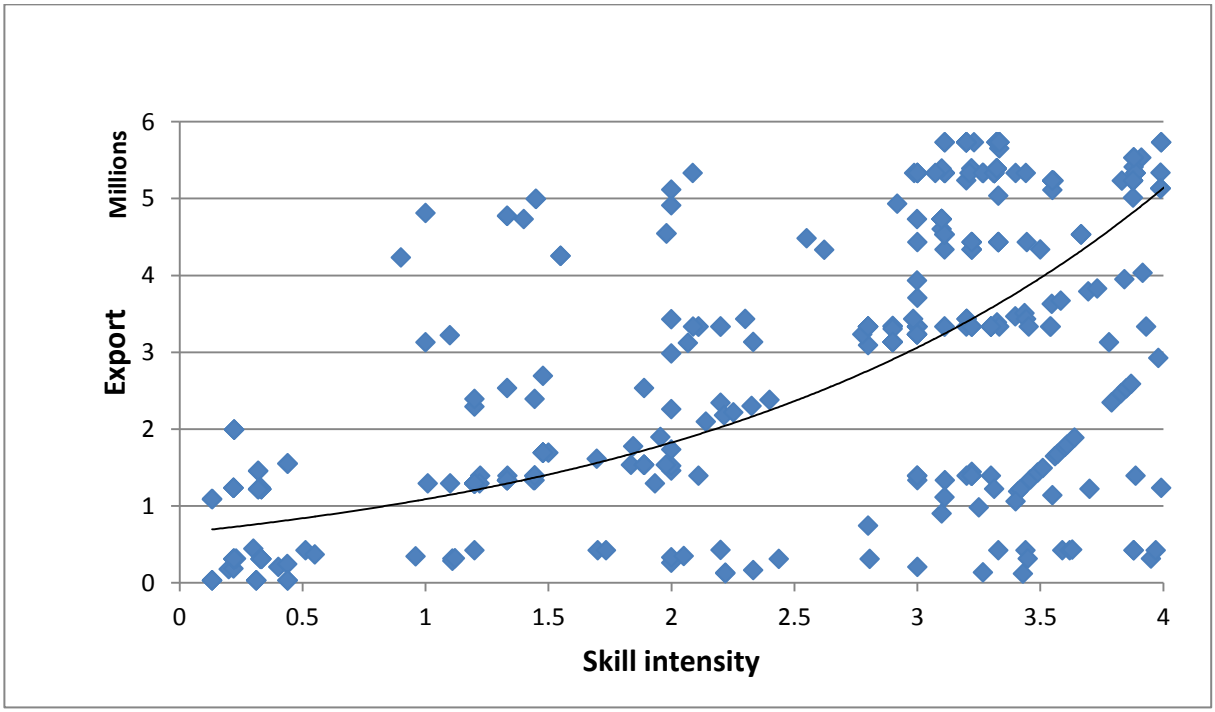
Variable of interest is number of skilled workers over number of unskilled workers average in firm level data. Data distribution was modified for a graphical presentation. 10% of highest and lowest values were excluded in order to have a distribution without outliers and achieve a smooth graphical representation. Firm level data 2002, 2005, 2007, 2009 and 2013

First figure lists all the countries, which are included in analysis. In order to prevent the analysis from heteroscedasticity I aim to select as much as possible equally developed countries. The principal variable, skill intensity, gives a look how the countries differ over the topic of interest. Most simple way is to show the averages over each country. As first graph shows the distribution of skill intensity is between 0.6 and 3.4. Estonia, Hungary and Russia have largest skill intensity. On the other hand Belarus, Bosnia-Herzegovina and Kyrgyz republic have a lowest skilled over unskilled workforce ratio. Majority of the countries surpass a line of two, which means that number of skilled workers is at least twice as much as

number of unskilled workers. According to the graph the deviations of skill intensity averages along the listed countries are relatively small. We have to take into the considerations divergent sample sizes and changes in skill intensity along sectors. Having in mind a unique data construction in each country, I would say that the results of average skill intensity do not let us suspect the heteroscedasticity. The empirical analysis investigates parallel countries.

The second figure consists of two core variables of interest, which are trade and skill intensity. Horizontal axis shows skill intensity from zero to four. Vertical axis indicates volume of export from zero to six millions.

2. **Figure. Scatter plot of export and skill intensity**



Variables of interest are export of firms and skilled workers over unskilled workers. The graph shows a sample from the overall data. 10% of top and bottom values were excluded as outliers. Firm level data 2002, 2005, 2007, 2009 and 2013. Dots stand for separate firms from East Europe and Central Asia.

Second graph is a scatter plot, which consists of the major variables of interest. According to the finding in theory more trade should lead to higher skilled intensity Aw, Hwang (1994), Verhoogen (2008). Data distribution follows the theory, as values follow the increasing trend line. Even though there is some white noise around the trend line, it is casual, as data consist of a wide variety of firms along different countries and sectors. Data distribution leads to

conclusion that more trading firms have higher skill intensity than firms, which trade less. Data, which was used for the graph, consist all year available. Thus, I have reasoning for a further investigation of proposition 4 from theoretical framework. In other words, second graph provide confirmatory evidence that more trade might lead to the higher skill intensity. However the scatterplot is not the most trustable way to find out whether the assumption is correct. That is why in the next table I have done a correlation matric, which gives a start to see the relationships between the selected variables. Before running the regressions I have looked to the data and searched for possible issues that make an analysis less accurate.

3. Table. Correlation matrix of the independent variables

	Export	**Employees**	**Foreign Input**	**Sales**	**Labor Costs**	**Materials**	**Capacity**	**Capital**	**Clear Export**
Export	1.00								
Employees	0.06	1.00							
Foreign Input	-0.01	0.01	1.00						
Sales	0.01	0.00	-0.02	1.00					
Labor Costs	0.27	0.21	0.02	0.00	1.00				
Materials	0.31	0.14	0.00	0.01	0.34	1.00			
Capacity	0.02	0.03	0.03	0.02	0.02	0.03	1.00		
Capital	0.06	0.02	-0.02	0.00	0.05	0.05	0.02	1.00	
Clear Export	0.00	0.03	-0.01	0.00	-0.01	-0.01	0.02	-0.01	1

Firm level data 2002, 2005, 2007, 2009 and 2013

The correlation matrix was done in order to check if independent variables have a high correlation, which might lead to multicollinearity issue. However the results of the matrix give no reason for a further investigation of multicollinearity issue. In most cases variables have a lower than 0.05 correlation coefficient. However, there are some higher correlation results. For instance coefficient between export and labor costs is equal to 0.27. Even so, the relationship is too fragile to create a reason for further investigations of multicollinearity. Due to the correlation matrix I can see that the independent variables were chosen in a right way, hence the variable do nor over collapse each other. Each of variable has own identity and gives a unique insights to the topic of interests.

First evidences give reasoning for further investigations. I do not suspect that data suffers from multicollinearity or heteroscedasticity. Furthermore the scatter plot of trade and skill intensity gives a consistent tendency with the expectations from the theoretical framework.

Next paragraph will gives a deeper understanding of the empirical analysis results in firm, sector, and firm level data.

4.6. Results

4.6.1. Firms selection based on skilled intensity

I will start an analysis with finding out the firm preferences. The aim is to look up whether firm preferences are in favour of more or less skill intensive firms. In order to do that I have constructed two models based on the following regressions. Regressions have firm level skill intensity as a dependent variable. Equation 13 is with a sector level data on the right side. Equation 14 has a nation level data for independent variables.

$$Skilled\ Unskilled_{f,i,t,j} = \beta_0 + \beta_1 Capital_{s,i,t,j} + \beta_2 Export_{s,i,t,j} + \beta_3 Sales_{s,i,t,j} + \beta_4 Labor\ Costs_{s,i,t,j} + \beta_5 Materials_{s,i,t,j} + \beta_6 Employees_{s,i,t,j} + \varepsilon_{s,i,t,j} \quad (13)$$

The dependent variable stays the same in both cases; however the right side of the equation rearranged to the sector level in first case and nation level in second case. The subscripts are as following, *s* for a sector level data, *f* for a firm level data, *i* for a sector, *t* for a time and *j* for a firm.

$$Skilled\ Unskilled_{f,t,j} = \beta_0 + \beta_1 Capital_{n,t,j} + \beta_2 Export_{n,t,j} + \beta_3 Sales_{n,t,j} + \beta_6 Trade\ regulation_{n,t,j} + \varepsilon_{n,t,j} \quad (14)$$

Nation level data consist of slightly different variables. That is why model 2 (equation 14) has a lower number of independent variables. The names of variables are changed as well. Capital is equivalent to capital utilization; export is equivalent to exporting firms and sales to sales exported. The subscript *t* stands for a time and *j* for a country. Both models are expected to give positive coefficients near the export variable; hence the firm selection is towards the higher skilled workers. I have used all the years available for a rich as possible model creation.

4. Table. Analysis by equations 13 and 14 results with skilled over unskilled workers

Variable/Model	1	2
Capital	-0.040* (0.023)	-0.003** (0.005)

Export	0.012* (0.083)	0.036* (0.012)
Employees	-0.011 (0.127)	
Sales	-0.031** (0.081)	0.041 (0.001)
Labor Costs	-0.011 (0.001)	
Foreign Input	0.201 (0.471)	
Materials	-0.054* (0.051)	
Trade Regulation		-0.021* (0.033)
Constant	0.771 (0.357)	0.155 (0.488)
Number of obs	2411	362
R-squared	0.027	0.104
Skilled ratio	2.645	2.645

Robust standard errors, clustered at the 3–digit, period fixed effect included and all active firms included in sample, in parentheses. ** significant at 1%, * significant at 5%, + significant at 10%. 1- firm level skill intensity as dependent variable and sector level data was used for independent variables 2- firm level skill intensity as dependent variable and nation level data was used for independent variables. In model 2 capital is equivalent to capital utilization, export is equivalent to exporting firms and sales to sales exported

Table 4 indicates positive and significant export variable's coefficients in the both models. As I have mentioned before that the long-term analysis in papers by Borjas et. al 1997 and Emami Namini, Lopez 2012 also found a positive trade impact to skill intensity. However the table 4 gives the results to question if firm distribution is in favour of more skill intensive firms. A positive outcome means that firms' selection is in favor of relatively more skill intensive firms. Both, sector and nation level models are in favour of this selection. Due to the results we can expect a further analysis to be in line with propositions, which were made in theoretical framework. In addition, model 1 shows significant outcomes in 4 out of 7 cases. Capital and materials are both significant and negative as I expected. Both variables increase production materials or either production related equipment; hence the increase leads to higher demand of operating workers. The outcomes are similar to Emami Namini, Lopez (2012), where authors found a remote negative coefficient of capital per worker ratio. However, sales are negative, which is a surprise. Due to the increase in sales relative amount of unskilled workers increase as well. However skill ratio is equal to 2.645, hence negative sales coefficient look suspicious by being in favour of unskilled labor. Maybe the sales increase is related with higher demand of unskilled workers, which directly related to

manufacturing a production of addition products needed. Labor costs variable was insignificant. Therefore the coefficient should not be trusted. Negative sign is unexpected near to labor costs variable's coefficient; hence result looks not adequate to elaborate on.

Even though second model consist of less observation and lower number of variables, the r-square result is higher than the first model's. Second model consist of trade regulation variable, which is negative to skilled premium, hence more regulation increase the unskilled workers number over skilled ones. This variable is a general version of a trade tariff variable, which was used in a large number of papers (Bustos, 2011, Amiti, Cameron 2012 and others). However this variable is available just in a firm level and has a relatively low number of observations. Capital is significant and has a negative coefficient, which is consistent with model 1. Correspondingly coefficient is lower than in model 1.

To sum up, introduction to further analysis was drawn. Table 4 outcomes support the claim that firm selection is in favour of more skill intensive firms. Next to that, the first look to control variables was done. In order to have a deeper look to trade liberalization and income distribution, I will run a short-term and a long-term regressions separately.

4.6.2. Short-term and long-term firm level analysis

5. Table. Short-term firm level data analysis

Variable/Model	1	2	3	4
Capital	-0.067* (0.083)	-0.001 (0.001)	-0.022* (0.001)	-0.001 (0.001)
Clear Export	0.014* (0.006)	0.061 (0.071)	0.025 (0.001)	0.012* (0.005)
Export	-0.002* (0.083)	-0.046** (0.012)	-0.027* (0.012)	-0.034* (0.005)
Employees	0.001 (0.001)	0.341 (0.251)	0.600* (0.259)	0.001 (0.001)
Sales	-0.001 (0.001)	0.001 (0.001)		
Labor Costs	-0.001 (0.001)	0.076** (0.016)	0.039** (0.014)	
Foreign Input	-0.001 (0.001)	0.259 (0.239)		-0.001 (0.001)
Materials	-0.093* (0.081)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
Capacity	0.001 (0.003)			
Constant	0.441 (0.307)	2567 (1407)	5057 (8684)	0.540 (0.109)
Number of obs	1221	1030	1414	2382

R-squared	0.017	0.099	0.041	0.007
Skilled ratio	0.813	2.645	2.585	0.932

Robust standard errors, clustered at the 3–digit firm–year level data used for dependent and independent variables, period fixed effect included, only firms that survived in the period, in parentheses. ** significant at 1%, * significant at 5%, + significant at 10%. 1-,university degree over non-university workers 2-skilled over unskilled workers 3- skilled over unskilled workers reduced version 4- university degree over non-university workers reduced version

Short-term analysis was made in year 2009 due to the riches sample size. The empirical analysis examines proposition 1 and 2 from theoretical framework. The prediction is that more trade in short-term leads to relative skilled wage increase. However due to skilled labor expensiveness the firms use less skilled labor per unit output. That is why the more trade is expected to lead to skill intensity shrink (proposition 2). In the other words, the export variable should be negative in the firm level analysis, as well as in the sector level continuously. Additionally I will look to control variables in order to determine how the skill intensity is influenced by them.

The firm level panel regression analysis examines different variations of the skill ratio. First and fourth models contains skilled over unskilled labor ratio as the dependent variable, other two models consist with university over non-university workers, as the dependent variable. First two models are expanded, with the maximum number of control variables in order to reach the best explanation of dependent variable. On the other hand in model 3 and model 4 I use a have different strategies. Number of control variables was reduced to reach higher number of observation. Mainly just the significant variables were used in models 3 and 4. The different variations were simulated till the best one was picked up.

The principal aspect of the analysis is export influence to dependent variable. The negative export coefficient is expected due to findings in previous researches (Burstein, Vogel, 2012, Emami Namini, Lopez, 2012). The findings completely fulfilled the expectations. Export variable is significant in all 4 models and has a negative coefficient. Export was more or less equally influential in model 2, 3 and 4. However model 1 has a significantly lower coefficient, which can be effected by a lowest skill ratio. First and last models have a skill ratio below unity, on the other hand other two models have skill ration above 2.

Capital and labor costs variables have an impact in two models, due to fitting in to significance level. Moreover materials have a negative impact to skill intensity. Both

variables are related to unskilled labor, hence negative impact to skill intensity seems reasonable. Since capital lead to machinery, vehicles and equipment growth more unskilled workers are needed to operate, hence the relative skill ratio abate. The coefficient of the capital variable is negative in all four models. Next to that, variable material is significant in model 1. The coefficient is negative, hence skill ratio deterioration fallows enhance in materials. Results show that materials are unskilled labor related. Variable consist of costs of raw materials and intermediate goods, which are operated by unskilled labor.

A control variable labor cost is the most influential one, as it could have been expected. Labor costs have a direct impact to skill wages, as variable measures a relative return per one employee. The larger the amount of labor costs per employee is the more skill intense firm is.

Reduced versions of both dependent variables perform worse. Even though the number of observations increase with the control variables reduction, the r-squared results drastically falls. However in case of skilled over unskilled workers as a dependent variable the reduced version have a higher number of the significant variables. Model 3 contains capital and employees next to export and labor costs. On the other hand reduced version of university and non-university workers performs worse in all possible ways. Even the number of observation increased just slightly with reduction of three variables.

Moreover, the clear export variable gives the link to the skilled workforce required in order to clear the customs. The variable was significant in model 2 and 4. Both models contains educated over non-educated employees as dependent variable. Every additional day to clear customs leads to higher skill intensity. The amount of specialist required for export procedures is higher, while the process is more complicated, hence takes longer. Results are similar to the total factor productivity impact to skill intensity, which was measured by Emami Namini, Lopez (2012) and Parro (2013).

Sales variable is insignificant in both cases that have been used. However the poor data of this parameter might be the reason of insignificant performance. Maybe the sector level analysis gives more influential results, which would be interesting to evaluate.

Lastly, variable employees was significant in model 3. Furthermore this variable had extremely high positive coefficient (0.6). This case might be explained by a large volume of

small firms within the sample. Due to the small number of employees, each worker makes a substantial influence. According to results of third model each employee increase skill ratio by 0.6; hence for instance ten additional employees makes a skill ratio equal to 8.58.

The short-term analysis stays in a line with theoretical framework on trade liberalization and income distribution. In addition the expected influence of control variables is confirmed as well. Majority if cases satisfy the expectations. Even though the short-term analysis gives positive results, it is just a one side of the way how to look to the topic interest. There is a need for the long-term analysis. Thus, table six presents the regressions of at least a two period data.

6. Table. Long-term firm level data analysis

Variable/Model	1	2	3	4
Capital	0.014	-0.051*	-0.009*	0.001
	(0.233)	(0.021)	(0.001)	(0.304)
Clear Export	-0.024	0.030*	0.002	0.003*
	(0.053)	(0.071)	(0.009)	(0.022)
Export	-0.002*	0.006**	-0.009	0.052*
	(0.083)	(0.012)	(0.012)	(0.082)
Employees	0.023	0.074	0.001*	0.033
	(0.001)	(0.251)	(0.023)	(0.001)
Sales	0.021	0.004*		
	(0.021)	(0.001)		
Labor Costs	0.014	0.031*	0.101**	
	(0.022)	(0.016)	(0.001)	
Foreign Input	0.021*	0.004		
	(0.001)	(0.239)		
Materials	-0.033**	-0.006	-0.003	-0.001
	(0.001)	(0.022)	(0.008)	(0.001)
Capacity	0.002			
	(0.003)			
Constant	0.988	5627	1340	0.240
	(1.307)	(5233)	(1872)	(1.309)
Number of obs	5821	6830	7414	4982
R-squared	0.022	0.102	0.021	0.027
Skilled ratio	1.713	1.945	1.335	0.732

Robust standard errors, clustered at the 3–digit firm–year level data used for dependent and independent variables, period fixed effect included, only firms that survived in the period, in parentheses. ** significant at 1%, * significant at 5%, + significant at 10%. 1-,university degree over non-university workers 2-skilled over unskilled workers 3- skilled over unskilled workers reduced version 4- university degree over non-university workers reduced version

The long-term analysis is based on data from year 2002, 2005, 2007, 2009 and 2013. The structure of analysis stays the same as on the short-term. The core change is period of analysis

extension, which should give an opposite results in terms of trade. Export variable is expected to be positive due to the proposition 4 in the theoretical framework.

The analysis fulfils the expectations. 3 out of 4 models were significant. In majority of significant models export variable was positive; hence more trade in long-term leads to higher skill intensity. Model 2 and 3 findings support the claim that I have founds a consistency with a theoretical framework. Moreover a positive trade coefficient was found in both variation of dependent variable; hence independently from perspective to skill intensity the trade liberalization should lead to higher skill intensity. Therefore as a higher demand for skilled workers is a reasoning of skilled labor wage decrease, I can admit that skilled wage shrinks. My findings are sequential to previously written paper by Borjas, Freeman and Katz (1997), where authors found a relative skill wage decline due to trade increase. Authors have estimated that implicit labor supply embodied in trade flows. Imports embody labor thus serving to augment effective domestic labor supply. However if we consider skill premium expressed by education level, then impact of trade have even greater weight. Coefficient in model 4 is 0.052 comparing to 0.006 in model 2, where skilled ratio is measured by number of skilled workers over unskilled workers.

The number of employees has a remote impact. Unfortunately variable was significant only in case, model 3. To remember, significance of employees was found only once in a short-term analysis as well. Hard not to notice that coefficient became drastically smaller over time. According to findings impact of number of employees shrinks over time. Or we cans suspect that model in a long-term consisted of a higher number of observations, which led to more accurate findings. On the other hand sales and labor costs variables perform better. Both have significance in model 2. However the impact of labor costs variable surpasses the impact of sales, as variable is directly related to skill intensity. Labor costs variable is also significant in model 3. I can admit that labor costs is one of the most influential variable. Most importantly the impact stays influential over time. In model 3 coefficient of labor costs variable even enhanced by reaching a 0.101 level.

Capital and materials stays in a same position as in short-term analysis. Negative coefficient leads to skill intensity shrink due to higher demand for unskilled workers in order to operate with additional capital or materials. However the impact of both variables rises within a

longer period. This is a reasonable insight as variables are more distinctly expressed, hence the results should be more accurate. Higher number of observations leads to higher significance. In the long-term those two variables have a similar impact to skill intensity as a lobor costs. However higher numbers in capital and materials might lead that company operates in production sector, which can be less skill intense than services. So far I can just predict that, as sector level analysis comes afterwards.

To conclude the long-term findings it is important to notice a consistency with theoretical framework. Furthermore, richer sample sizes led to a higher accuracy of coefficients. Lastly, consistency with short-term period was recognized in terms of control variables performance.

4.6.3. Sector level analysis

7. Table. Long-term sector level analysis with dependent variable skilled over unskilled workers

Variable/Sector	Textile	Retail/ wholesale	Services	Raw materials	Chemicals	Construction	Transport
Capital	-0.014 (0.092)	-0.001 (0.001)	-0.001 (0.002)	-0.007 (0.015)	-0.014* (0.020)	-0.044 (0.038)	
Export	0.035* (0.274)	-0.086 (0.035)	0.006* (0.012)	-0.076 (0.905)	0.012* (0.041)	-0.006* (0.040)	0.087* (0.052)
Employees	0.215** (0.018)	0.311** (0.018)	0.082** (0.004)				
Sales	0.001 (0.003)	-0.001 (0.001)	-0.001 (0.001)	-0.007 (0.001)	-0.001* (0.003)	-0.001 (0.001)	0.002 (0.001)
Labor Costs	0.009 (0.061)	-0.001 (0.001)	0.005 (0.020)	-0.016* (0.018)	-0.004** (0.209)	0.003 (0.009)	-0.026 (0.014)
Foreign Input	1726 (0.049)						
Materials	-0.004 (0.012)	-0.008** (0.027)	-0.002 (0.005)	-0.001 (0.002)	-0.003* (0.009)	0.009* (0.007)	0.247** (0.004)
Constant	1403 (1293)	2343 (6490)	2871 (8865)	4945 (1078)	4444 (1626)	2934 (6886)	1845 (5834)
Number of obs	815	3341	1508	1141	1393	1172	731
R-squared	0.021	0.029	0.071	0.017	0.021	0.022	0.737
Skill ratio	2.758	1.129	3.042	0.613	1.379	1.132	1.126

Dependent variable is a skilled worker over unskilled workers, sector level data was used for dependent and independent variables, robust standard errors, clustered at the 3–digit sector–year level, period fixed effect included; only firms that survived in the period, in parentheses. ** significant at 1%, * significant at 5%, + significant at 10%.

Sector level analysis gives a deeper knowledge of the topic of interest. So far firm level analysis was in a line with theoretical framework. However sector level analysis divides data to 7 clusters by the activity each firm does. This section contains long-term data in order to have a richer sample. I will start with skilled over unskilled workers as a dependent variable.

As the table 7 shows all skill ratios surpass the value of unity. Positive coefficients lead to skill intensity rise and skill wages shrink and the way around. Plant level analysis is based on separate regressions for each sector. All 7 sectors have their own skill ratios, which show how skill intense the sector is. That is the main difference comparing sector level analysis to previously done firm level investigations. I can suspect demand diversity dependently on the sector.

Due to distinctive specifications of each sector the results differ as well. The skill intensity is highly dependent on sector. General idea behind the results is that services are more skilled intense than production sectors. Skill ratio is a decisive aspect to take into consideration.

Textile sector have a riches model, which contains 7 independent variables and a constant. Export and employees variables are significant and independent variables explain 2% of skill ratio. As expected export has a positive impact. Textile sector is sensitive to export changes. Within the enlarged value of export by 1.000 (unity) the skill ratio is increased by 0.035, hence the skilled workers demand increase by 3.4% relative to unskilled workers. Variable employees, which stand for number of workers, have a high significance (below 1%). The coefficient is ex high comparing to export or other control variables. One employee's increase leads to 21% rise in skill ratio. Excessive influence might be affected by having small firms within the sample. As in firm level data investigations were noticed, the employees variable's coefficient varies over the models. However the more employees the firm have the higher proportion of skilled workers firm contains. This claim is consistent with a skill ratio, which is equal to 2.76. I have to conclude that textile sector is moderately skill intense.

Retail and wholesale sector has a skill ratio coefficient equal to 1.129, which is significantly lower than previously analysed textile sector. As the panel regression shows, the export variable is not significant. Nevertheless export influence is relatively high; hence every single point of export increase leads to 0.086 slump in skill ratio. Employees variable is significant as well, in the previous case. This time employees variable is even more influential. The overall number of workers has an impact to skill ratio and income distribution. Additional employee leads to higher inequality between income distribution of skilled and unskilled workers. Materials are also significant in retail and wholesale sector. The impact is smallest comparing to export and employees. But a small coefficient shrink participate in the skill ratio

move towards the unity. Unity level of skill ratio would mean an equal skilled and unskilled labor distribution over the sector. What is important to notice that retail and wholesale sector contains most observations in sample. This fact may have played a key role in having more accurate results than previously researched sector. However r-square result is not something to be proud of in this case. Model explains nearly 3% of skill intensity.

Services sector follows the previous trend. The Export and employees variables are in significance level. The coefficients are consistent with other sectors. Positive and small export coefficient enhances the skill ratio and brings wages premium down. Furthermore, rise in employees' number works in the same way, hence boost skill intensity. The services sector is driven by human workforce that is why materials and capital insignificance are expected. In addition the core part of workforce contains skilled workers; hence the positive result of variable employees is expected. The increase in overall number of employees leads to increase in skilled workers in more cases than in unskilled workers, hence skill ratio increases. R-squared result shows that services sector's model explains the skill ratio better than other two models that were summarized before. To sum up, services sector is immensely skill intense. Due to sector specific, services have a relatively low volume of trade comparing to other sectors. That is why dependency mainly relies on employees.

Raw materials model's r-squared result is lowest between all sectors. However model contains 1141 observations, which is more than some other sectors. The negative export coefficient is insignificant as in the retail and wholesale sector. Labor costs variable satisfies the significant requirements and has a negative sign before 0.016 coefficient. Usually this variable is expected to have a negative coefficient, as the higher labor costs leads to lower skilled labor intensity and wages of skill labor increase. Due to the wage increase firms have a greater labor expenses. However skill ratio in this sector is below unity, for a first time. Raw materials sector contain more unskilled workers than skilled ones. This might is a unique case so far. Lower skill ratio means even higher dominance of unskilled workers. Due to the demand increase the wage of unskilled works rise up as well. This is the reasoning of a negative labor costs variable in case of raw materials sector.

Chemicals model has a moderate sample size, which contains 1393 observations. Even though, the results are consistent comparing to other sectors. More trade in a long-term

enhance the skill ratio. Next to that sales variable is significant for a first time. Sales coefficient is negative and extremely small. According to results sales decrease the skill ratio; hence the skill and unskilled workers are more equally distributed. Labor costs variable is significant as well and has a negative impact in chemicals sectors, as in previously reviewed raw materials sector. However in this case skill ratio is above the unity level. That is why skill intensity works from the perspective of changes in a skill workforce. Furthermore chemicals sector is also affected by capital and materials. Both variables are significant and negative. Even so the coefficients are extremely small this is a first case of significance. Chemicals sector is dependent on capital and materials that is why both variables have influence to skill intensity as well.

Construction sector stands out with a negative export variable. However this phenomenon can be easily explained. Model contains only one period of data. As the theory states short time impact of trade is negative to skill intensity. Next to that sector has a most equal skilled over unskilled employees' ratio, which is 1.032. Skill ratio in construction sector is close to unity, hence skilled and unskilled labor is nearly balanced. Export has a required small negative coefficient, which contributes to reducing skill ratio. On the other hand materials have a significant positive impact. The increase in materials leads to higher diversion between skilled workers and unskilled workers. This is the first case of a positive coefficient next to materials variable. Might be that materials in construction sector are needed more for skilled workers to operate than for unskilled ones. The r-squared result is consistent with previously analysed sectors and lies around 2%.

Lastly, Transport sector analysis contains four independent variables and a constant. Only export and materials satisfy the significance requirements. Export variable is highly influential. Positive coefficient enhances skill ratio by 0.087 within each unity (1.000$) increase in materials. Moreover materials variable have a positive coefficient, which means that increase in materials value by one unity (1.000$) leads to increase in skill ratio by 0.247. Once again materials variable stands for a higher demand of skilled workers. Next to that model has a surprisingly high r-squared result, which might not be trustable due to a huge deviation from other models.

Altogether sector analysis let me see the uniqueness of each sector. General firm level analysis goes in line with theoretical framework. However sector level analysis differs in some cases. But the diversity of sectors has a logical explanation behind the divergences from the expectations. For instance services sector has a five times higher skill intensity than the raw materials sector. This fact changes the perspective of investigations. Coefficients might change to the opposite side due to skill intensity distribution. In particular labor costs variable is expected to be positive, as increase in overall costs leads to increase to number of skilled workers, as their salary is greater than unskilled workers. However in case of raw materials, this variable is negative. The reason behind is a relatively higher demand of unskilled workers. Next to that a closer look to the cases explains the results. To clarify I can use a construction sector, which has a negative trade coefficient. However this result is influenced by one period model. Furthermore investigations to the sector level data will be done by changing a dependent variable.

8. Table. Long-term sector level with a dependent variable university graduate over non-university workers

Variable/Sector	Textile	Retail/ wholesale	Services	Raw materials	Chemicals	Construction	Transport
Capital	0.001** (0.001)	-0.006 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.021 (0.001)	0.301 (0.092)	
Export	0.068** (0.005)	-0.059 (0.003)	0.050** (0.007)	0.050** (0.006)	-0.053* (0.014)	0.061** (0.005)	0.049** (0.008)
Employees	0.031 (0.091)	-0.051 (0.945)	-0.001 (0.001)				
Sales	0.001 (0.001)	-0.021 (0.001)	0.092 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	0.001** (0.001)
Labor Costs	-0.001 (0.001)	-0.033* (0.004)	-0.001 (0.001)	0.008* (0.001)	-0.001 (0.001)	0.001 (0.001)	0.001** (0.001)
Foreign Input	0.006* (0.003)						
Materials	-0.001 (0.001)	-0.022* (0.013)	0.001 (0.001)	-0.001 (0.001)	-0.092 (0.041)	-0.003 (0.081)	0.001* (0.001)
Constant	5.701 (0.381)	5.493 (0.231)		4.839 (0.494)	5.335 (1.097)	5.679 (0.364)	1845 (5834)
Number of obs	673	3016	1261	1125	1291	1002	493
R-squared	0.261	0.114	0.036	0.053	0.049	0.149	0.167
Skill ratio	0.542	0.989	1.771	0.633	0.665	0.506	0.661

Dependent variable university workers over non-university educated. Sector level data was used for dependent and independent variables. Robust standard errors, clustered at the 3–digit sector–year level, period fixed effect included, only firms that survived in the period, in parentheses. ** significant at 1%, * significant at 5%, + significant at 10%.

The structure of analysis follows from the previously done sector level investigations. In order to have a wider perspective of skilled intensity we used university degree workers over non-degree workers, as dependent variable. As a matter of fact this way of measuring the skilled intensity is most wide spread among the previous researchers (Gieseckea, Heisig, Solga, 2014, Barrett, 2001, Rutkowski, 2007). The core question is whether the results with different approach to skill intensity are consistent.

Due to the different approach to skill intensity the skill ratio is significantly different. All sectors have a decidedly lower skill ratio. The explanation is that non-university graduates' work in a skills required position, hence skilled labor volume is greater than university graduate labor. Next to that, the overall analysis contains a smaller amount of observations due to dependent variable change. R-squared results improved in construction, retail and textile sectors. On the other hand transport sector's result has fallen by a large number. From 0.737 to 0.167

Capital has influence only in textile sector. However the impact is minimal, hence lower than 0.001. In other models variable contains a negative sign, as usual. Just a construction sector gives a positive coefficient. Nevertheless this variable suffers from a high standard errors result, hence is not satisfies the significance level. Export variable is positive in all models, which consist of more than one period of data. However chemicals sector is an exception. Employees variable is not significant in all cases that was used. Sales impact was not noticed as well. Variable has an extremely small influence to transport sector and no significant impact in other cases. Labor costs variable differ over the sectors. As I have found before in some models the coefficient is negative in other cases positive. Even so, in case of a new perspective to skill ratio I do not see a clear trend that determines changes. Probably table 7 contains a more accurate view to skill ratio. Despite that fact, I can still see similar findings in both ways. Foreign input was used only once. More foreign input leads to a higher skill ratio. This trend was noticed in a firm level analysis as well. Once again the Amiti, Cameron (2012) states opposite. Finally, a variable materials was influential in two cases. A noticeable impact of this variable has a retail and wholesale sector. This is not surprisingly, as this sector depends on usage of materials.

Even though I have used a new perspective to skill intensity, trends are on the same page as in previous sector level analysis. Positive coefficient of export follows the expectation and theoretical framework. Materials and capital stay with a negative impact to skill intensity. Sales and labor costs decrease skill ratio, as it was seen previously. Moreover, a variable employees was insignificant in all cases. Even though foreign input was included just in a first model, it was significant and positive, as expected. Berman, Bound, Machin (1997) have a same findings in their paper. The skill intensity rises with a higher proportion of foreign input.

4.5.4. Nation level analysis

The nation level analysis contains a different data set. However the data source remains the same (Enterprise Survey by the World Bank). Nonetheless in nation level case we have a completely separate analysis. The nation level data have slight differences comparing to firm level data. The variables contain the overall percentage perception of the nation according to performance of enterprises and trade related relationships. In nation level analysis we are missing few variables comparing with firm level regressions. On the other hand we do have a new variables included as well. Data set has a time variation over 2002, 2005, 2008, 2009 and 2013. Analysis is based on the following countries: Albania, Armenia, Azerbaijan, Bosnia, Bulgaria, Belarus, Croatia, Czech Republic, Estonia, Georgia, Hungary, R. of Macedonia, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Moldova, Montenegro, Poland, Russia, Romania, Serbia, Slovakia, Slovenia, Tajikistan, Ukraine and Uzbekistan. Every country's profile consists with at least 3 year of data.

$$Skilled\ Unskilled_{t,j} = \beta_0 + \beta_1 Exporting\ firms_{t,j} + \beta_2 Sales\ Exported_{t,j} + \beta_3 Age_{,t,j} + \beta_4\ Capacity\ utilization_{t.j} + \beta_5 Clear\ Export_{t,j} + \beta_6 Trade\ regulation_{t,j} + \beta_7 Formal\ training_{t,j} + \varepsilon_{t,j} \quad (15)$$

The equation 15 aims to figure out the skilled over unskilled labor relationship between trade and control variables. The subscripts contain t for time and j for country. First independent variable exporting firms shows the proportion of exporting companies within the country. The variable contains companies, which directly and indirectly export at least 1% of their sales. Sales exported variable stands for the percentage of direct and indirect export volume over the total sales volume. Capacity utilization is based on comparison of the current output with the

maximum output possible using the current inputs. Trade regulation variable presents the percentage of firms identifying customs and trade regulations as a "major" or "very severe" obstacle. This variable was widely used by other researchers (Bustos 2011, Amiti, Cameron, 2012, Amiti, Davis, 2012 and others). This variable is expected to have a negative coefficient Clear export gives the average number of days to clear direct exports through customs. Lastly, formal training is a percentage of firms offering formal training programs for its permanent, full-time employees.

$$Non-production\ production_{t,j} = \beta_0 + \beta_1 Exporting\ firms_{t,j} + \beta_2 Sales\ Exported_{t,j} + \beta_3 Age_{,t,j} + \beta_4\ Capacity\ utilization_{t.j} + \beta_5 Clear\ Export_{t,j} + \beta_6 Trade\ regulation_{t,j} + \beta_7 Formal\ training_{t,j} + \varepsilon_{t,j} \quad (16)$$

Furthermore analysis continues with alternative perspective to the skill intensity. The dependent variable was changed to percentage of production workers over non production workforce. The independent variables stay the same. This way of analysis was used by (Amiti, Cameron, 2011, Scheve, Slaughter, 2001, Katz, Margo, 2013). The rich dataset allows for a two ways of analysis in order to have a look to skill intensity.

9. Table. Long-term nation level analysis results

Variable/ Model	**1**	**2**
Exporting Firms	0.016* (0.056)	0.004* (0.002)
Sales Exported	0.011 (0.039)	0.002* (0.001)
Age	0.024 (0.168)	0.008 (0.006)
Capital Utilization	0.192** (0.065)	-0.001 (0.002)
Clear Export	-0.247* (0.136)	-0.006 (0.005)
Trade Regulation	-0.073* (0.068)	0.001 (0.002)
Formal Training	0.068* (0.035)	0.001* (0.001)
Constant	-13.602 (5.666)	0.304 (0.228)
Number of observation	78	78
R-squared	0.292	0.389
Skill ratio	1.750	0.372

Nation level data. Period fixed effect was included. Robust standard errors, clustered at the 3–digit nation–year level, in parentheses. ** significant at 1%, * significant at 5%, + significant at 10%, 1-skilled over unskilled workers, 2- non-production over production workers.

Nation level analysis is most general view to the topic. At the same time I am interested to investigate whether findings are consistent with firm and sector level data. I have not found a research paper, which constructs an analysis on trade liberalization and income distribution from three different perspectives.

Nation level data clearly states that the proportion of exporting firms increase leads to skill ratio enhance within the country, hence more exporting firms lead to higher skill intensity. This finding is completely consistent with a long-term analysis in firm and sector levels. Both models have significant positive coefficients. However the influence of number of exporting firms in first model is greater. Second variable gives the ratio of sales realized abroad over sales realized inside the country. The higher the export level the more skill intensive country is. Even though the coefficient is smaller than first independent variable's, results are still consistent with expectations. Third variable, age of the firm was insignificant in both models. Even so both models have a positive coefficient, which let us know that maybe older firms are more likely to be the ones that hold a higher skill ratio. Capital utilization shoes a productivity of operations in ventures within a country. Capital utilization leads to higher skill ratio. There is a demand increase for a skill labor with need to increase productivity.

On the other hand clear export variable is also related to productivity of firm. The longer it takes to clear production through customs the less productive firm's work is. For sure there is a macro level factors as well, but let's assume that this variable is based solely on ventures. First model has a significant result near to the line of clear export variable. Moreover coefficient is extremely influential. Every single additional day to deal with export leads to decline of skill ratio by 0.247. On the other hand this result is logical due to necessity of unskilled workers, which deal with products that additional day. For instance inventory handlers, loaders and so on. Trade regulation variable is important in our analysis, as this variable show the openness of trade. More regulated markets should have lower skill intensity. Once again first model demonstrates a significant result. Furthermore trade regulations indeed lowers skill ratio. The coefficient is relatively high. Each firm's market valuation in favour of large regulations contributes in 0.073 slump of skill ratio. My findings are consistent with Bustos 2011, Amiti, Cameron, 2012. Correspondingly formal training works in opposite direction. More trained the workers are more likely they will work in a

skilled position. This variable cures the issue of skill ratio if country has it. Politics and other decision makers can have a direct impact to skill intensity increase by funding formal trainings. Variable is significant in both variables. Nevertheless formal trainings have a greater impact in first model.

To sum up, nation level analysis is a simple way how to look to trade liberalization and income distribution topic. General approach is more smooth to talk about and at the same time do not consider deeper insights. Next to that, findings are in line with expectations. I can already admit that in order to examine theoretical framework the researcher can use any type of data. According to my findings independently whether I used firm, sector or nation level data all conclusions agreed to skill intensity increase in long-term and decline in a short-term. However each dataset give a unique approach to topic and additional insights.

4.5.5. Exporters and Non-Exporters analysis

The next analysis based on division between exporters and non-exporters. Previously used firm's performance and trade related control variables and the skill intensity will be investigated. The trade related measurements are excluded from non-exporters analysis, since firms do not perform any exporting activities. In this case the consistency with previous models will be researched, as well as the overall skill ratio results.

10. Table. Long-term exporters and non-exporters analysis results

Variable/ Model	1	2	3	4
Capital	0.001* (0.006)	0.001 (0.001)	-0.001* (0.001)	-0.001 (0.001)
Export	0.023* (0.336)	0.001* (0.001)		
Employees	0.089 (9744)	-0.001 (0.001)	-0.022 (0.233)	0.001 (0.004)
Sales	-0.003 (0.008)	-0.001 (0.001)	0.001** (0.001)	-0.001 (0.001)
Labor Costs	-0.006 (0.314)	0.001 (0.001)	-0.031* (0.013)	0.092 (0.001)
Foreign Input	0.379* (6575)	-0.018* (0.011)	0.968 (0.899)	-0.008* (0.020)
Materials	-0.021 (0.161)	0.001 (0.001)	-0.008* (0.004)	-0.048 (0.001)
Capacity	0.095* (0.088)	-0.044 (0.016)	0.886 (0.816)	-0.022* (0.032)
Clear Export	0.604 (1274)			

Constant	-1070 (7169)	5.089 (1.334)	5778 (1338)	6.778 (2.636)
Number of obs	1321	1314	312	315
R-squared	0.141	0.037	0.053	0.634
Skill ratio	2.944	2.697	0.937	0.610

Firm level data, sample consists of all available firms. Period fixed effect is included. Model 1 contains only exporters and the dependent variable is skilled over unskilled workers. Model 2 contains just exporters and dependent variable is university over non university workers. Model 3 contains just non-exporters and dependent variable is skilled over unskilled workers. Model 4 contains just non exporters and dependent variable is university over non university workers.

In order to follow the theory review I have done an analysis based on trade characteristic. Table 10 illustrates division between exporters and non-exporters. Division was made by looking whether firm has a larger than zero export volume. I will take a look to exporters and non-exporters perspectives over the control variables in firm level analysis.

Firstly, let's take a look to skill ratios. According to Aw, Hwang (1994) exporters tend to be more skill intensive. Indeed, the gap between exporters and non-exporters is huge. First and second models respectively have a 2.944 and 2.697 skill ratios. On the other hand non-exporters results are even below the unity. I can surely state that exporters are more skill intense than non-exporters.

Secondly, export variable is significant and positive in both cases. However control variable's results differ over model one and two, hence the skill intensity counting methodology determinates the results. In case of skilled over unskilled workers the coefficients are different from university over non-university workers, as I have noticed over the all investigations. In all cases relative density of university graduates is significantly lower than relative skilled workers density.

What is interesting to notice is a negative labor costs coefficient, which was met before. However in most cases labor costs coefficient is negative, when skill ratio is below unity. Simply higher demand of unskilled workers lowers the skill ratio. Next to that foreign input results are unusual as well. Variable was expected to be positive, as the previous analyses and other researchers (Berman, Bound, Machin, 1997) show. Even though model two and model four have significant and negative coefficients. This case might be explained with more explicit information about the sample. Due to the general firm level analysis I can only guess the reason behind. Negative coefficient might occur due to large number of firms from

production sectors. Due to foreign input increase the work flow for unskilled workers increase as well and as a consequence demand of unskilled workers increases. My findings of are consistent with Emami Namini, Lopez (2012) results. The coefficient of foreign input in their paper was 0.1547.

Capital and materials variables performed poorly. Even so, I can notice a stable negative trend near to the significant cases. Lastly capacity utilization variable is related to productivity or to say in other words how well organized the firm's work is. Previously done nation level analysis show a positive sign next to capacity utilization variable. First model is consistent with previous findings. Nevertheless model four is against. Non-exporting firms decrease skill intensity due to higher capacity utilization.

R-square results are higher than usual. Model four demonstrates one of the best r-square; hence 63% of skill intensity is explained by independent variables. Moreover first model performs most significant variables. 4 out of 9 independent variables were found as influential.

In summary, I have found exporters are more skill intense than non-exporters. Due to low skill intensity labor costs rise initiates a decrease relative number of skilled workers. However in case of exporting firms' analysis the impact is opposite.

5. Conclusion

I have stated in introduction that research papers on trade liberalization and income distribution have found mixed evidences. Some authors' state that more trade leads to more equal income distribution, although other researchers have an opposite findings. However the theoretical framework showed that distinction between short-term and long-term analyses have a crucial impact. Findings are premised on the assumptions that households can accumulate the skilled labor and firms are heterogeneous in factor intensities. Firm heterogeneity means that large firms are more productive, more likely to export and import, and pay higher wages. Theoretical framework provides confirmatory evidence that short-term impact of more trade is negative to skill intensity. Although skilled labor wages surge with

influence of more trade. On the other hand long-term impact of more trade is positive to skill intensity and negative to skilled wages.

The theoretical part indicated a mix evidences between papers with diverse data level. That is why I have done a separate firm, sector, nation level analysis. Despite small deviations in each level the overall findings were consistent independently from level of data.

Firstly I have found out that firm's selection is in favour of more skill intense firms. Afterword I have examined a short-term and long-term firm level analysis. The short-term analysis stays in a line with theoretical framework. The long-term findings follow expectations as well. Furthermore, richer sample sizes led to a higher accuracy of coefficients. Even so, the consistency with short-term period was recognized in terms of control variables performance.

Secondly, I have done a sector level analysis, which allowed me to see the uniqueness of each sector. All firms were clustered to following sectors: textile, retail and wholesale, services, raw materials, chemicals, construction, transport. Even though, sector level analysis differs from firm level in some cases. However the diversity of sectors has a logical explanation behind the divergences from the expectations. Results showed that skill ratio is a decisive aspect to take into consideration. Moreover I have found that services related sectors are more skill intensive than manufactory related sectors. Higher number of employees increase skill ratio when it's higher then unity and declines then it's lower. Rise in sales have a positive impact in most cases but at the same time variable initiates just a slight changes. Increase in labor costs leads to a moderate size enhance in skill intensity. Foreign input in materials contributes in surge of skill intensity as well. Lastly, material and capital have an opposite influence. Both variables initiate a negative impact to skill intensity.

Thirdly, I have done a nation level analysis. Trade regulations lead to slump in skill intensity. Older firms tend to be more skill intensive. Countries with greater ratio of exporting firms have larger skill intensity. Formal trainings are one of the solutions to increase the skill ratio in a nation level. . Politics and other decision makers can have a direct impact to skill intensity increase by funding formal trainings. Next to that, skill ration measured by education level is

significantly smaller than measured by skilled and unskilled workers. That means that not all skilled workers have a university degree.

Lastly, empirical analysis showed that exporters are significantly more skill intense than non-exporters. All the insights make a space for discussions about East Europe and Central Asia region's development. All evidences show that countries should aim for trade openness and promote the trading with abroad to local firms. Benefits of trade are clear to see. Firstly, more trade leads to income equality. Secondly, more trade goes hand in hand with a higher labor qualification. Maybe, policy makers should even considerate initiating a consulting or other help to local firms in order to reach a higher number of trading firms and higher overall volume of trade. Next to that the focus should be on manufacturing sectors, which in most cases are less skill intense.

6. References

- Acemoglu, Daron (2003) Patterns of Skill Premia, Review of Economic Studies, 70(2): 199-230.
- Adams (1999) The Structure of Firm R&D, the Factor Intensity of Production, and Skill Bias, The Review of Economics and Statistics, Vol. 81: 499-510
- Amiti, Cameron (2011) Trade Liberalization and the Wage Skill Premium: Evidence from Indonesia.
- Arbache (2001) Trade liberalization and Labor Market in Developing Countries: Theory and Evidence, School of Economics, University of Kent, Canterbury, Kent, CT2 7NP, ISSN 1415-4765.
- Ariel, Vogel (2010) Globalization, Technology, and the Skill Premium: A Quantitative Analysis,The National Bureau of Economic Research, NBER Working Paper No. 16459.
- Aw, Hwang (1994) Productivity and the export market: A firm-level analysis, Department of Economics, Pennsylvania State University, The World Bank, Washington, DC, USA, Journal of Development Economics Vol. 47 (1995) 313-332.
- Berman, Bound, Machin (1997) Implications of Skill-Biased Technological Change: International Evidence, Quarterly Journal of Economics, Vol. 113, no. 4 : 1245-1280
- Burstein, Vogel (2012) International Trade, Technology, and the Skill Premium, Columbia University and NBER, East Asia,.World Bank Policy Research Working Paper No. 5379.
- Bustos (2005) The impact of trade liberalization on skill upgrading. Evidence from Argentina, Universitat Pompeu Fabra. Departament d'Economia i Empresa, Working paper.
- Bustos (2011) Trade Liberalization, Exports, and Technology Upgrading: Evidence on the Impact of MERCOSUR on Argentinian Firms, CREI and Universitat Pompeu Fabra 08005-Barcelona, Spain, The American Economic Review, Volume 101, Number 1, February 2011, pp. 304-340.
- Eggers (2006) International Outsourcing and the Productivity of Low-Skilled Labor in the EU, Economic Inquiry, Vol. 44, No. 1, pp. 98-108.

- Emami Namini, Lopez (2012) Factor Price Overshooting with Trade Liberalization: Theory and Evidence, Scottish Journal of Political Economy 60. 2: 139–181.
- Galiania, Sanguinetti (2003) The impact of trade liberalization on wage inequality: evidence from Argentina, Universidad de San Andre´s, Department of Economics, Universidad Torcuato Di Tella, , Buenos Aires, Argentina, Journal of Development Economics 72 497 – 513.
- Gieseckea, Heisig, Solga (2014) Getting more unequal: Rising labor market inequalities among low-skilled men in West Germany, International Sociological Association Research Committee 28 on Social Stratification and Mobility, Research in Social Stratification and Mobility 39 1–17.
- Gropello, Sakellariou (2010) Industry and Skill Wage Premiums in East Asia, The World Bank East Asia and Pacific Region Education Unit, Human Development Sector, Working Paper 5379 WPS5379 3
- Head, Ries, Swenson (1998) Attracting foreign manufacturing: Investment promotion and agglomeration, Regional Science and Urban Economics 29 (1999) 197–218.
- Head, Ries (2001) Offshore production and skill upgrading by Japanese manufacturing firms, Journal of International Economics 58 (2002) 81–105
- Katz, Margo (2013) Technical Change and the Relative Demand for Skilled Labor: The United States in Historical Perspective, The National Bureau of Economic Research, Cambridge, Working Paper 18752
- Mishra, Kumar (2005) Trade Liberalization and Wage Inequality: Evidence From India, IMF Working Paper Western Hemisphere Department, WP/05/20
- Parro (2013) Capital-Skill Complementarity and the Skill Premium in a Quantitative Model of Trade, American Economic Journal: Macroeconomics, 5(2): 72–117
- Ripoll (2002) Trade liberalization and the skill premium in developing economies, Department of Economics, University of Pittsburgh, USA, Journal of Monetary Economics 52 (2005) 601–619.
- Scheve, Slaughter (2001) Globalization and the Perceptions of American Workers, Institute for International Economics, Washington, DC 79-86.