TRADE AND WAGES IN CHILE – A CONTEMPORARY ANALYSIS

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ABSTRACT

By signing a multitude of free trade agreements (FTA) over the past 20 years, Chile has continued to aggressively open up its market to world trade. Most importantly, the country signed agreements with its biggest trading partners (USA, EU, China) between 2003 and 2006. This case study assesses how these three FTAs affected wages in the Chilean traded goods sector. It therefore seeks to assess the relationship of trade and wages in a more contemporary setting, allowing an assessment of magnitude and mechanisms driving it. The Heckscher-Ohlin-Samuelson (H-O-S) framework hereby provides the theoretical setting. Two main findings can be reported from the results provided in this study: First, no striking influence of trade on wages could be identified. The results do exhibit statistical significance, but their small size seriously diminishes their economic relevance. Second, no clear evidence for the predominance of the H-O-S mechanism are found. Even though H-O-S cannot be fully ruled out in the results as a mechanism that governs the relationship, it is likely not the only, or even most important one.

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1. Introduction

Globalization has been on an unprecedented rise in the past 30 years, fuelled by the opening up to trade of almost all of the world's nations. This has led to widespread assessments of the nature of its impact. Especially so in Latin American countries (LACs), which heavily liberalized their trade regimes at the end of the 20th century under the neoliberal agenda of the Washington consensus. Initial hopes were that trade liberalization would help to close the wage gap, based on the mechanisms of Heckscher-Ohlin-Samuelson (H-O-S) theory. However, this effect failed to materialize in many LACs. Instead, an increased trend in income inequality observed upon cutting their tariffs became the central point of criticism in the majority of LACs.

Albeit these negative experiences, many countries such as Peru, Colombia or Chile have continued to drive an open trade regime. Since the beginning of the 21st century, all three have signed multiple free trade agreements (FTAs). Each with some of their major trading partners. Simultaneously, real wages seem to have grown steadily from the year 2000 on. There is thus reason to assume that trade liberalization continues to shape wages in LACs. The broad goal of this study is to provide evidence about whether the post-2000 development of wages in Latin America is affected by trade and was, in fact, shaped by the ratification of FTAs[1]. First and foremost, it hence investigates the relationship between trade and wages. From the results, implications for the development of the wage distribution due to the FTAs might be drawn – however, this will be merely indicative and will in no way allow the proof of causality.

In order to investigate this, a case study of Chile is conducted. The country provides good circumstances for researching the relationship. On the one hand, Chilean real wages increased steadily and at a sizeable rate since 2003. They also rose comparatively more for the unskilled working population than for the skilled population (in the traded goods sector). On the other hand, Chile signed FTAs with its three biggest trading partners between 2003 and 2006. Together, these three (USA, EU, China) account for over 50% of Chile's trade volume. It is hence not unreasonable to assume that the increased openness to trade had some form of an impact on the country's wages.

The specific goal of the case study is twofold. First, the results should provide an indication of the size of the effect that increased trade has had on Chilean wages in the early

[1] Not much attention has yet been paid to analyzing the relationship of trade and wages with the backdrop of the 21st century in Latin America. The past 17 years have deepened the neoliberal discourse manifested in the rising popularity of international free-trade agreements (FTAs). In Latin America alone, 65 FTAs were signed since 2000, with an equivalently high number of preferential trade agreements.

2000s. Secondly, they also try to clarify if H-O-S theory is the underlying mechanism governing this relationship (which could hint to a benign effect of trade on the wage distribution). To empirically investigate the model, micro-level data from the Chilean household surveys between 2000 and 2009 as well as UN industry-level trade data is combined in a dataset. Subsequently, a number of regressions are run that assess the impact of trade flows (exports, imports) from the FTA countries on Chilean hourly wages. Dividing the sample of the regressions according to skill levels and sectors provides further insights into the presence of H-O-S mechanisms. Robustness tests are also employed to test for the time-sensitivity of the outcomes.

The results indicate that there is neither a striking influence of trade on wages, nor clear evidence for the predominance of the H-O-S mechanism. The results do exhibit statistical significance, but their small size diminishes their economic relevance. Counterintuitive findings to H-O-S theory provide the possibility that other factors, such as trade in intermediate products, carry more explanatory power for the relationship of trade and wages. Furthermore, with the theoretical framework and data at hand, the results make it nearly impossible to draw any implications about the influence of the FTAs on the Chilean wage distribution. At an aggregate level, however, the small size of the effects leads to the broad assumption that they did not have a significant impact.

Chapter 2 goes on to present background information on the Chilean case in more detail. Chapter 3 then provides a review of the related literature on trade and wages in Latin America and stipulates the main hypotheses of the study. Chapter 4 discusses the data sources and presents some descriptive statistics. Chapter 5 empirically evaluates the data and discusses the main results. Chapter 6 concludes.

2. The Case of Chile

Due to its sustained economic stability over the past decades, Chile has become an example of international development efforts. The country's GDP per capita rose by roughly 3% annually[2] in the time span between 1990 and 2016. Its progressive policies (e.g. public expenditures strongly favoring the poor, such as *Chile Solidario*[3]) as well as its low levels of corruption[4] have brought Chile international praise and acclaim.

[2] Available from World Bank: https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?locations=CL
[3] Large-scale social security program targeting over 225,000 vulnerable households to combat extreme poverty.
[4] 24th in the world / 2nd in Latin America according to Transparency International: https://www.transparency.org/news/feature/corruption_perceptions_index_2016

However, this positive Latin American example of development has repeatedly earned criticism for its high income inequality. It has built up a reputation of being one of the world's most unequal societies, currently ranking 19th (6th in Latin America)[5] based on its GINI[6] coefficient. From an empirical standpoint, opinions about the severity and dynamics of Chilean inequality in the 21st century diverge. Some scholars paint a bleak picture where efforts to curb a wide wage gap have had close to no effect (Agostini & Brown, 2010; López & Miller, 2008). On the other hand, an OECD report by Larrañaga (2009) as well as very recent evidence by Parro and Reyes (2017) claim that income inequality has been steadily decreasing since the onset of the new century. Either way, real wages for the overall Chilean workforce increased constantly from 2000 on.

The path of Chilean trade over the same time period is quite eminent: sparked by the wave of drastic trade reform during the late 70s[7], the ratio of exports to GDP in 2004 represented a strong 69%, with roughly two-thirds of these exports being realized under free-trade agreement legislation - tendency increasing (Moreira, 2006). At the same time, Chile continued to aggressively liberalize its economy to trade. Between 2003 and 2006, far-reaching FTAs entered into force with the country's most important trading partners, represented by the USA, the EU, and China (Table 1 provides some key data on each of these agreements). Together, they account (both before and after the implementation) for more than half of annual Chilean trade volume[8]. These trade agreements are hailed by both sides as important trade policy milestones with wide-ranging positive effects for the respective economies (Hornbeck, 2003; Nowak-Lehmann et al., 2007). Furthermore, Chile also signed FTAs with South Korea and Japan at around the same time. These agreements do not match the size and importance of the USA, EU and China agreements. However, they further underline the Chilean commitment to trade liberalization in the early 2000s.

On the basis of these facts, it becomes clear as to why Chile marks an ideal case study candidate for the modern-day implications of the relationship between trade and wages in Latin American countries. For one, a trend of rising Chilean real wages coincides with Chile's implementation of major FTAs. Second, studying the relationship with a modern backdrop can shed new light on the contemporary mechanisms that dictate the relationship. Overall, the sheer

[5] Available from IndexMundi: https://www.indexmundi.com/facts/indicators/SI.POV.GINI/rankings
[6] Coefficient based on the 'Lorenz curve' of a country.
[7] Trade liberalization was a central theme under the Pinochet regime. With guidance from American-educated scholars, known as the 'Chicago Boys', tariffs were gradually cut until the end of the dictatorship in 1990. The blanket tariff applied by Chilean authorities from 1990 on lay at 6% with sector-specific variations.
[8] As stated by OEC: http://atlas.media.mit.edu/nl/profile/country/chl/

size of trade flows affected by the ratification of the three major FTAs provides legitimacy for a new evaluation of the status quo concerning the relationship between trade liberalization and wages in Chile.

Table 1 – Information on Bilateral FTAs signed by and with Chile

Country	Ratification	Entry into Force	Facts
EU	Nov 18, 2002	Feb 1, 2003	- *Discharge of all tariffs and NTBs on traded goods* - *Time horizon: 1-10 years of transition* - *By 2007, 96% of EU tariffs will be erased for Chile*
USA	June 6, 2003	Jan 1, 2004	- *Immediate duty-free regimen for 95% of Chilean exports* - *All tariffs reduced to 0 in 12 years' time*
China	Nov 18, 2005	Oct 1, 2006	- *97% of bilateral trade will be duty-free after 10 years*

Notes. Information taken from the official FTA[9] documents. Tariff base-rate applied by Chile for non-origin products from these countries is 6%.

3. Related Literature on Trade and Wages

Developments of wages in the aftermath of trade liberalization events in Latin American countries (LAC) have been closely monitored and assessed by academia. A wide range of literature exists that tries to unravel the exact mechanisms at work as holistically as possible. Some of the most important theoretical (worldwide) and empirical (LAC-specific) findings of the last two decades are discussed in this section and lay the foundation for the analytical framework used in this paper.

3.1 Theoretical Framework

3.1.1. Heckscher-Ohlin-Samuelson

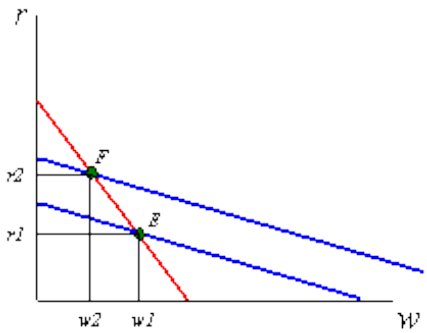
Theoretical groundwork for trade-induced shifts in wages can be found in neoclassical trade theory: The Heckscher-Ohlin (H-O) framework and one of its key components, the

[9] Chile-China FTA – can be found at China FTA Network: http://fta.mofcom.gov.cn/chile/xieyi/freetradexieding2.pdf
Chile-USA FTA – can be found at Office of the U.S. Trade Representative: https://ustr.gov/trade-agreements/free-trade-agreements/chile-fta/final-text
Chile-EU FTA – can be found at EC Trade: http://eur-lex.europa.eu/resource.html?uri=cellar:f83a503c-fa20-4b3a-9535-f1074175eaf0.0004.02/DOC_2&format=PDF

Stolper-Samuelson theorem, provide clear-cut mechanisms by which to create empirical models and hence test the available data.

At its most basic architecture, the H-O model consists of 2 countries (industrialized and developing), 2 factors of production (skilled and unskilled workers), and 2 products (skill-intensive and low-skill-intensive). The industrialized country is relatively well-endowed with skilled workers, whereas the developing country is relatively well-endowed with unskilled workers. Opening up to trade will allow for endowment-based comparative advantage and hence the Stolper-Samuelson mechanism: (1) The industrialized country will export (import) the skill-intensive (low-skill-intensive) product, whereas the developing country will export (import) the low-skill-intensive (skill intensive) product; (2) in the developing country, this means that the low-skill-intensive product will increase in relative price; (3) in the developing country, the unskilled workers will henceforth experience a raise in relative wage vis-à-vis the skilled workers[10] (Stolper & Samuelson, 1941). This is a desired outcome for the developing country as the unskilled majority gains financial power and, in theory, the wage gap decreases. Figure 1 provides a graphical representation of the mechanism.

Figure 1: Stolper-Samuelson Theorem



Source: http://internationalecon.com/Trade/Tch60/T60-5.php

Let Figure 1 represent a developing country[11] with skilled wages (w) and unskilled wages (r). The blue line[12] represents the price of good X, which is low-skill-intensive. The red line[13] represents the price of good Y, which is skill-intensive. Point E is the equilibrium wage. Opening up to trade will increase exports of good X and hence the price of good X. This will

[10] Vice-versa for the industrialized economy.
[11] i.e. well-endowed with unskilled labor.
[12] For black-and-white version: The line starting between r1 and r2 on the r-axis.
[13] For black-and-white version: The line starting at the highest point on the r-axis.

shift the blue line upwards. The relative wage of unskilled wages (r) increases, whereas the relative wage of skilled wages decreases (w). The new equilibrium wage is point F.

The theoretical implications of the Heckscher-Ohlin-Samuelson (H-O-S) framework will be guiding the analysis of this study.

3.2 Empirical Evidence

3.2.1. Neoclassical Approach

Proving the actual explanatory relevance of the H-O-S mechanisms when assessing the effect of trade liberalization on wages is the focus of many scholars researching the topic. A bulk of initial literature investigates the issue in industrialized economies, finding affirmative results to the model's working (Richardson, 1995; Leamer, 1995; Sachs and Shatz, 1996). More importantly for this study, advancements of empirical research in developing countries (and especially in Latin America) have been ample in recent years.

Hereby, the Mexican case of commercial liberalization gains special attention. The country experienced a serious widening of the wage gap simultaneously to trade reform. Esquivel and Rodríguez-López (2003) examine this paradoxical outcome. They find that skill-biased technological change[14], and the skill premium resulting from it, can counter the expected H-O-S outcome of trade openness significantly. They use a "mandated" wage methodology in order to ascertain both technology and trade effects on income separately. Ultimately, their results reveal that H-O-S effects are indeed at work but that skill-biased technological change explains much more of the wage movement.

Attanasio et al. (2004) provide similar findings in their analysis of radical tariff cut episodes in Colombia. However, they see trade itself as a possible driver of a widening wage gap. They state that the increase of the skill premium due to skill-biased technological change is induced by intensified foreign competition. This is especially the case in sectors experiencing the highest tariff cuts and exposure to the world market. Furthermore, they find that unskilled labor-intensive sectors were subject to the largest tariff cuts. This, in turn, led to downward pressure on labor-intensive industry wages. In an H-O environment this would trigger an adjustment mechanism in which workers would move towards more protected sectors. Given that employment shares remained stable over the period of assessment, the authors conclude that this was not the case. Rather, a trend of workers employed informally emerged. They

[14] In the H-O-S model it is assumed that production functions are homogenous. Dropping this (rather unrealistic) assumption enables transfer of (mostly skill-biased) technologies from developed to developing economies.

conclude, however, that the effect of Colombian trade liberalization on wages was small in size.

Similar results were found in Argentina by Galiani and Sanguinetti (2003). They find that, upon opening the economy to trade, especially the unskilled-intensive manufacturing sector experienced high competition by imports. Intensified import penetration hence disfavored unskilled workers, but the effect on wages remained small. This was also found by Green et al. (2001) in an analysis of trade and wages in the Brazilian economy.

Hanson and Harrison (1999) provide an explanation to the somewhat counterintuitive results to H-O-S predictions experienced in middle-income countries (MIC) with an abundance in medium skill-levels (which is the case for Mexico, Colombia and Argentina). Facing competition with yet more unskilled-abundant economies, like China, depresses relative wages of the lesser skilled workers in those MICs.

Their explanation finds resonance with more recent work conducted on trade liberalization in LAC. Bogliaccini (2013) argues that increased openness to trade caused drastic deindustrialization (and a decrease of formal employment in general) in LAC and hence lead to greater inequality.

A last important insight is provided by Meschi and Vivarelli (2009) who conduct a cross-country analysis of income inequality in the light of globalization and increasing international trade. They find that, especially for MICs, destination and origin of the trading partner play a significant role for wage movements. More specifically, the national wage gap increases if trade is intensified with high-income economies. The reason they provide for this result is that transfer of technology, which is likely to favor skilled workers (and hence lead to an increase in the skill premium), is more probable in this case.

3.2.2. Novel Approaches

Availability of data at lower levels of aggregation (i.e. firm and plant level) has brought further insights into the exact channels via which trade can impact wages. This allowed scholars to also relax some of the assumptions of the neoclassical H-O-S model discussed above. Most prominently, the framework constructed in the seminal paper by Melitz (2003) on firm heterogeneity in international trade serves as a theoretical guideline for empirical application. The model states that only the most productive firms engage into exporting after being exposed to trade. The least productive firms are actually forced out of the market as a consequence.

One way how this applies to the wage distribution in developing countries is explained by Amiti and Davis (2011). In a study of Indonesian manufacturing firms and tariffs, they find

that the effect of liberalized trade on wages is dependent on the specific orientation in global trade of the respective firm where workers are employed. When output tariffs face a reduction, workers of firms that sell domestically see their wages fall. Workers of firms that mainly export experience the opposite.

Verhoogen (2008) deepens the understanding of these findings by incorporating a quality upgrading mechanism into the model. In a study of Mexican plants, he finds that wages (both white- and blue-collar) and quality of the most productive manufacturing plants increase when experiencing a national currency devaluation (read: export catalyst). Only these initially more productive plants engage into exporting and improve their quality in order to cater to high-income markets. This discrepancy in wages and quality between more and less productive plants makes for differences *within* a certain industry to become apparent.

Additionally, Brambilla et al. (2010) emphasize that the negative effect on income inequality is exacerbated by an increased demand for skilled labor of productive firms. This is due to their need for meeting quality requirements and export supporting services. Sampson (2014) further adds that there is a premium on wage dependent on the size of the employing firm.

Feenstra and Hanson (2001) coin the importance of trade in intermediate products, an activity that has gained importance in trade activities in recent years. It is ignored in the H-O-S framework on the grounds of assuming only final goods production. The authors claim that 'global production sharing' has had a similar impact on the wage distribution as skill-biased technological change: a negative one. This crystallizes especially in the paper by Amiti and Davis (2011). They find that when input tariffs fall, workers employed at firms that make use of imported inputs enjoy a wage advantage over those that do not.

Drawing from all these findings, Harrison et al. (2011) claim that the understanding of the relationship between trade liberalization and wages has improved significantly. This is due to theoretical developments incorporating heterogeneity, intermediate products, and rigidities in the labor market. However, Goldberg and Pavcnik (2007) point out that, regardless, it would be foolish to draw blanket policy recommendations from these novel findings. Since developing economies in Latin America and around the world are characterized by highly diverse environments, they require very different blueprints for proper trade reform.

3.3 Hypotheses

The theoretical, empirical, and case-specific background was provided in the previous sections. The goal of the ensuing analysis is now to ascertain whether the FTAs that Chile signed with

its three most important trading partners had a significant impact on Chilean wages. The H-O-S model provides a framework of expected effects that guides the hypothesis-building for the investigation. **That way, both the magnitude of the FTA effects and the validity of the H-O-S model[15] (as a governing mechanism) can be assessed.**

Given the different trading partners and skill-levels the following set of hypotheses is stipulated according to H-O-S[16]:

Table 2 – Hypotheses Matrix

FTA signed with	**Effect on Wages of Unskilled Labor in Chile**	**Effect on Wages of Skilled Labor in Chile**
USA	Increase	Decrease
EU	Increase	Decrease
China	Decrease	Increase

Notes. This is based on the assumption that Chile is relatively well-endowed with unskilled (skilled) labor vis-à-vis the USA/EU (China).

The following sections first present the data and methodology used for the investigation. They then continue to discuss the results of the analyses and their implications for the hypotheses stipulated above.

4. Data

4.1 Data Sources

4.1.1. National Household Survey

The micro-level data on income, industry affiliation, and personal characteristics is obtained from the national Chilean household surveys. The ministry of social development (formerly MIDEPLAN) has continuously conducted national inquiries on the socio-economic status quo in two to three year intervals dating back to 1990. The CASEN[17] (Survey of National Socioeconomic Characterization) hence makes for a rich source of specific, longitudinal, and comparable data on income, family composition, housing, occupation, education, health, and poverty level of the population. For this paper, the CASEN surveys conducted between 2000 and 2009 are analyzed; this has several advantages: First, this allows to analyze waves before

[15] i.e. if the direction of the effects in the analysis mirror the expected direction of effects stipulated in H-O-S theory.
[16] as explained above in section 2.1.1.
[17] *Encuesta de **Ca**racterización **S**ocio**e**conómica **N**acional*

(2000 & 2003) and after (2006 & 2009) the implementation of the studied FTAs. Second, the questionnaire methodology - which lays the foundation for data comparability - did not undergo significant changes in this time span[18]. Ultimately, the occupation indicators of the CASEN during this period are given at 4-digit ISIC Rev.2 level which produces highly detailed industry affiliation data.

Despite the homogenous nature of the methodology across the years, a few alterations had to be made in the dataset: First, an addition of two new administrative regions (see map in Appendix 2 for visualization) in the 2006 and 2009 editions of the survey took place. This problem was resolved by restructuring the variable indicating municipality membership[19] (which was not affected by the administrative change) under the new regional apportionment before any regressions were run. Included in the analysis is also **only the working population in the traded goods sector**[20].

4.1.2. Trade

Data on trade at industry-level was taken from the UN Comtrade database. The repository allows very detailed inquiries with differing levels of aggregation, time indicators, and specific product requests. The data obtained for this research represents Chilean exports and imports to and from the main trading partners (USA, EU, China) and the world at the 6-digit HS 1996 level of aggregation for the years 2000, 2003, 2006, and 2009. HS 1996, despite being an older classification system, was chosen as the reporting system due to the fact that it is the easiest to match with the ISIC Rev.2 system used in the CASEN. Two advantages using the UN Comtrade data concerning this particular piece of research stick out: First, the very detailed product specification for Chile enables a smooth matching with ISIC-tables. This therefore provides detailed 4-digit industry-level trade data. Second, the richness of the data makes considering zero trade values to carry information a reasonable assumption.

All trade variables (export and import) had to be converted from 6-digit HS 1996 to represent trade flows according to 4-digit ISIC Rev.2 classification. An 'HS 1996 to ISIC Rev.2 Concordance Table' provided by WITS[21] served as a benchmark to add the trade flows under

[18] The methodology changed drastically with the 2011 CASEN survey (and subsequently for the 2013 and 2015 editions) and therefore has rendered comparability impossible for some indicators. This is (part) of the reason why these editions of the survey were hence not included in the analysis of this paper.
[19] One level below region membership. Chile has over 200 municipalities. Variable was later deleted from the dataset.
[20] ISIC Rev.2 subdivisions 1, 2, and 3. Only the working population was assigned an ISIC code in the surveys. Trade data on UN Comtrade was only provided at a satisfactory level of aggregation for the traded goods sector.
[21] World Integrated Trade Solution – concordance table available from: http://wits.worldbank.org/product_concordance.html

the respective 4-digit ISIC-level together correctly. This resulted in 92 4-digit ISIC-level industries that are covered in this study. The data was then merged with the household survey datasheet to combine occupational industries of individuals with their respective trade flows per year and partner country.

4.2 The Dependent Variable – Chilean Wage

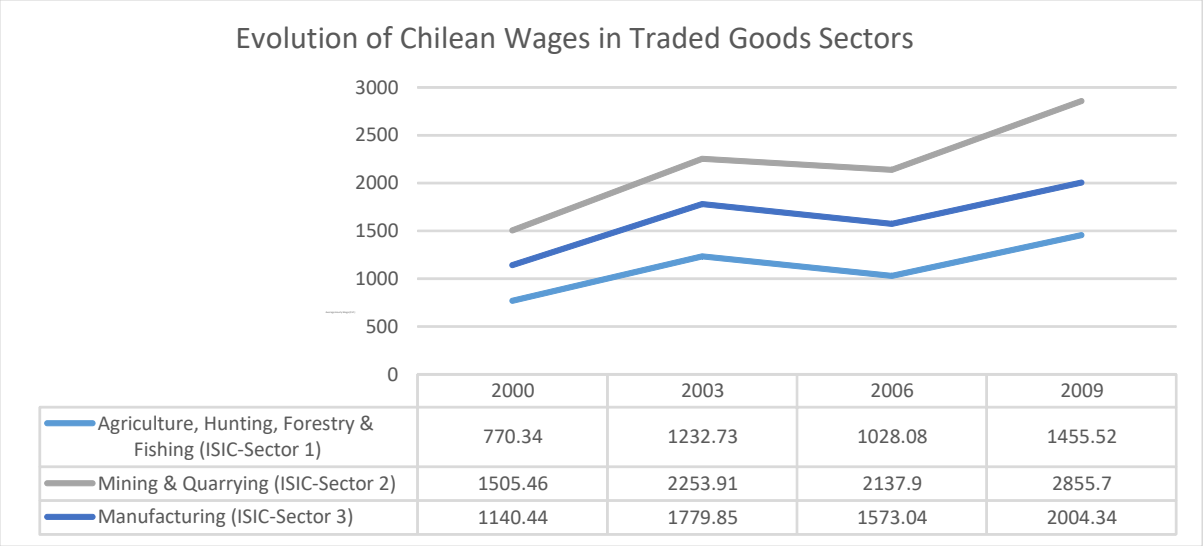
Assessing Chilean wage and its response to trade shocks is the main focus of this study. It therefore serves as the dependent variable in the econometric analysis. The wage variable represents the hourly income from an individual's primary occupation. This was calculated with the help of monthly income and hours-worked indications from the CASEN survey. Hourly income was preferred over monthly income as a wage indication, so that bias in the results stemming from part-time-employed individuals could be avoided. The wages are given in Chilean Pesos (CLP) and are inflation adjusted for the year 2009. The evolution of wage in Chile from 2000-2009 (in 3-year intervals) is presented in Table 3 and Figure 2 along two different strata. This is supposed to provide a preliminary overview of the variable.

Table 3 – Evolution of Chilean Wages along Skill-Levels

	2000	2003	2006	2009
Income[22]				
Monthly Income	165,461	182,390	201,519	251,803
Hourly Wage (General)	912.4	*1,435.1*	1,257.2	1,677.9
Hourly Wage (Unskilled)	644.6	*1,108.2*	968	1,380.3
Hourly Wage (Skilled)	1,315.5	*1,867.3*	1,587.9	1,998
Observations	30,895	33,569	40,439	28,925

Notes. Represents the working population in the traded goods sector. The monthly income and hourly wage variables are quoted in Chilean pesos and inflation adjusted for 2009. The hourly wages of 2003 are in italics to highlight the incongruities explained below.

[22] The average exchange rate between the year 2000 and 2009 was roughly 698 CLP/EUR.



	2000	2003	2006	2009
Agriculture, Hunting, Forestry & Fishing (ISIC-Sector 1)	770.34	1232.73	1028.08	1455.52
Mining & Quarrying (ISIC-Sector 2)	1505.46	2253.91	2137.9	2855.7
Manufacturing (ISIC-Sector 3)	1140.44	1779.85	1573.04	2004.34

Figure 2 - Evolution of Chilean Wages in Traded Goods Sectors

Table 3 and Figure 2 deliver some interesting tendencies. Monthly income rose steadily for the traded goods sector between 2000 and 2009. Hereby, the hourly wage for the unskilled workers increased relatively more than for skilled workers. Wages in the most unskilled-intensive sector (Agriculture) also exhibited the highest percentage growth in comparison to the other sectors[23]. The mining sector further counts with the highest wages throughout the years. Given the importance of the mining sector in Chile's trade portfolio[24], this comes to no surprise. If the wage movements can be related back to changes in the trade environment cannot be stated at this point. Other simultaneously launched (national) policy initiatives could have also induced these outcomes. The precise implications of the wage movements for H-O-S will be discussed in the econometric analysis.

Lastly, the high values for hourly wages in the year of 2003 seemed suspicious. Monthly income follows a roughly linear positive trend throughout the years, whereas hourly wages experience an intermediate peak in 2003. Intuitively, this can only be accounted for by a significant drop in hours worked among the population, which is subsequently reversed in 2006. Such a dramatic rise and drop in productivity seems, however, unlikely. A comparison with OECD data[25] on hours worked in Chile does not show signs of this anomaly. This could hence point to incongruities in the survey collection of hours worked in 2003[26]. In the

[23] 89% in ISIC-Industry 1 compared to 75% in ISIC-Industry 3.
[24] Over 50% of exports according to the OEC: https://atlas.media.mit.edu/nl/profile/country/chl/
[25] OECD data on hours worked available from: https://data.oecd.org/emp/hours-worked.htm
[26] In fact, the distribution of hours worked in 2003 was much more concentrated: Individuals with long working weeks were not present and the mean was located roughly 10 hours below the means from all other years (which hovered around 45 hours/week).

subsequent main analyses, data for 2003 is therefore omitted. It is, however, included in robustness tests that work with monthly income instead of hourly wage data.

4.3 Independent Variables

The independent variables used in this study can be divided into two categories. The various variables on trade flows with the three FTA partners are the main independent variables of interest, which are central to assessing the impact of trade on wages. The second category of independent variables are the control variables. Hereby, trade flows with the rest of the world are added to the regressions. A set of personal characteristics is further incorporated to account for their impact on individuals' wages (building on Mincer (1974)). Each independent variable is briefly discussed and descriptive statistics are provided at the end of this section. A quick overview of all variables can also be found in Appendix 4.

4.3.1. Main Variables of Interest - Trade Variables

Six main trade flow variables are used in this study.

Bilateral Trade Flows with the USA are incorporated in the analysis via two distinct variables: Chilean exports to- and Chilean imports from the USA. Exports hereby represents the total yearly United States Dollar (USD[27]) amount of goods moving from Chile to the USA at 4-digit ISIC-industry level. Imports represents the total yearly USD amount of goods moving from the USA to Chile at 4-digit ISIC-industry level.

Bilateral Trade Flows with the EU are incorporated in the analysis via two distinct variables: Chilean exports to- and Chilean imports from the EU. Exports hereby represents the total yearly United States Dollar (USD) amount of goods moving from Chile to the EU at 4-digit ISIC-industry level. Imports represents the total yearly USD amount of goods moving from the EU to Chile at 4-digit ISIC-industry level.

Bilateral Trade Flows with China are incorporated in the analysis via two distinct variables: Chilean exports to- and Chilean imports from China. Exports hereby represents the total yearly United States Dollar (USD) amount of goods moving from Chile to China at 4-digit ISIC-industry level. Imports represents the total yearly USD amount of goods moving from China to Chile at 4-digit ISIC-industry level.

According to the United Nations Statistics Division (2009), missing values in the UN Comtrade database should be regarded as true zeros and hence as carrying information.

[27] All trade flows used in this study are indicated at 2009 price levels.

Occurrences of these zero trade values were dealt with conforming to the methodology laid out in Wang and Winters (1991): they were replaced with a minimal amount (=1), hence allowing conversion to a valid log-value.

As mentioned in the presentation of the H-O-S model above, exports are the main instigator of relative price (and hence wage) increases for the abundant factor in a country[28]. The export variables therefore carry slightly more importance than the import variables in the assessment of results in subsequent sections.

4.3.2 Controls – Trade Variables

Two further trade variables were incorporated in this study to control for changes in Chilean trade flows to and from the rest of the world during the period under investigation (2000-2009). Most notably, this will control for effects on wages of trade with the Mercosur trading bloc, a South American free trade area with which Chile signed an association agreement in 1996[29]. It will also control for effects from Chile's signature of FTAs with South Korea (2004)[30] and Japan (2007)[31], the largest trading partners (in value) with Chile apart from the three main trading partners of this study (USA, EU, China). Despite the fact that the trade value of these additional agreements is small compared to the main FTAs, it is important to control for them to avoid omitted variable bias.

Hence, **Bilateral Trade Flows with the Rest of the World (RoW)[32]** are incorporated in the analysis via two distinct variables: Chilean exports to- and Chilean imports from the rest of the world. Exports hereby represents the total yearly United States Dollar (USD) amount of goods moving from Chile to the rest of the world at 4-digit ISIC-industry level. Imports represents the total yearly USD amount of goods moving from the rest of the world to Chile at 4-digit ISIC-industry level.

[28] Although this should be the case in an H-O-S environment, imports do not necessarily depress prices for the factor used intensively in the import-competing industry of a country nowadays. This is due to increased trade in intermediate products (which can actually lead to an appreciation of prices for the intensively used factor). Exports, on the other hand, do not count with this possible ambiguity in effects. They are therefore chosen as main control. The impact of intermediate trade is further touched upon in the discussion of the results.
[29] Full text of agreement at: http://www.sice.oas.org/Trade/MSCH/MSCHIND.asp.
[30] Full text of agreement at: http://www.sice.oas.org/Trade/Chi-SKorea_e/CHL_KOR_FullText_e/CHL_KOR_FullText_e.pdf .
[31] Full text of agreement at: http://www.sice.oas.org/Trade/CHL_JPN/text_e.pdf .
[32] Rest of the World = all countries except of the United States of America, the European Union, and China.

4.3.3. Controls - Personal Characteristics Variables

Nine different personal characteristics variables are furthermore incorporated in this study.

Skilled is a dummy variable indicating the skill-level of an individual (skilled=1, unskilled=0). It was created by grouping together the educational attainment indicators from the CASEN survey[33]. A central variable in Mincer (1974)[34] to describe an individual's wage evolution, an indication of skill-level is also crucial to uncover H-O-S effects. This variable will not be directly incorporated in the econometric specification but will be utilized to split the sample into unskilled and skilled workers for investigation.

Rural is a dummy variable that indicates whether an individual lives in an urban (0) or a rural (1) environment. The variable is included to account for discrepancies in wages across geographical areas. Wages tend to be higher in urban areas due to an agglomeration effect (Wheaton & Lewis, 2002).

Female is a dummy variable that indicates the gender of an individual. The variable accounts for gender-specific differences in wages, which are still severe in Latin American countries (Atal & Ñopo, 2009).

Age and **Age squared** are variables indicating the age of an individual. They account for age differences in wages of individuals. Age squared in particular controls for the timely development of this effect. If age squared is negative, this means that the effect of age on wages is less pronounced as individuals get older[35]. The importance of the effect of age on wages is covered in Mincer (1974).

Marital is a dummy variable that indicates whether or not an individual is married. It accounts for differences in wages of single and married individuals. Marriage encourages an increase in hours worked (e.g. to sustain the partner) and can thus also lead to a wage increase. However, this relationship can also be borne from reverse causality (Ahituv & Lerman, 2007).

Indigenous is a dummy variable that indicates the ethnic status of an individual. Discriminatory practices and institutional racism can lead to adverse wage effects for indigenous employees in the workplace (Atal & Ñopo, 2009). Ethnicity's impact on wages is hence also controlled for, as roughly 10% of Chile's population is of indigenous descent[36].

[33] None/primary education = 'unskilled'; secondary/tertiary education = 'skilled'.
[34] He investigated the effect of schooling/educational level on wages.
[35] And vice-versa.
[36] Percentage taken from the 2009 CASEN survey data.

4.3.4. Descriptive Statistics

Table 4 provides the descriptive statistics for all variables used in the econometric analysis.

Table 4 – Descriptive Statistics

Variable	Observations	Mean	Std. Deviation	Minimum	Maximum		
Hourly Wage	100,259	1272.33	3538.5	6.31	370500	in CLP	Wages
Exports (USA)	276	701	641	1	4,670	in Million USD	Trade Flows (Main Independent Var.)
Imports (USA)	276	72.3	79.3	1	1,990		
Exports (EU)	276	679	730	1	7,880		
Imports (EU)	276	28.6	51.1	1	843		
Exports (China)	276	93	435	1	7,810		
Imports (China)	276	25.8	123	1	1,130		
Exports (RoW)	276	568	1,320	1	9,490		Trade Flows (Control Var.)
Imports (RoW)	276	320	280	1	5,760		
Skilled	100,259	0.29	0.5	0	1	Dummy Variables	Personal Characteristics
Rural	100,259	0.56	0.5	0	1		
Female	100,259	0.19	0.39	0	1		
Marital	100,259	0.64	0.48	0	1		
Indigenous	100,259	0.1	0.3	0	1		
Age	100,259	40.65	13.76	15	100		
Age Squared	100,259	1,841.74	1,211.45	225	10,000		

As can be seen from the Table 4, the sample counts with 100,259 responses for individuals and 276 responses[37] for industries. The mean hourly wage over the sample period 2000-2009 is 1272.33 CLP. Individual responses go as high as 370500 CLP per hour and as low as only 6.31 CLP per hour.

The Chilean trade balance has remained positive over the past 20 years which can also be seen in Table 4. Mean exports to all sample countries drastically outperform mean imports. Most of Chilean exports over the sample period went to the USA, which underscores its importance as a neighborhood trading partner for Chile. As in wages, there is ample variability in trade flows indicated by large gaps between minimum and maximum amounts and high standard deviations.

[37] Individuals from the same sector have the same indication of trade flows for a given year. This is why there are only 276 exclusive responses for sectors in the sample (one indication per sector per year).

There is a higher incidence of unskilled workers in the sample, which is in line with the assumption that the country is abundant in unskilled labor. A bit more than half of the sampled population lives in rural areas and the sample is also almost exclusively male. This is due to the fact that traditional values largely prevail in many LAC, which often confines women to unpaid housework. Those women who do find paid work mostly find it in the informal sector[38] (Pribble, 2006). The mean age of the sample is 40.65 years.

5. Empirical Analysis

The following sub-sections represent the empirical analysis. They first present the general methodology for this study, in form of the econometric specification, and then discuss the results of its operationalization. Hereby, different alterations of the specification are assessed to investigate the impact of trade on wages in 21st century Chile. Special focus will lie on testing the H-O-S hypotheses stipulated in chapter 3.3.

5.1 Econometric Strategy

5.1.1. Econometric Specification

In order to allow an econometric analysis of the data at hand, the following specification is used:

(1)

$$\begin{aligned} lnWAGE_{ikt} = {} & \alpha_0 + \beta_1 RUR_{it} + \beta_2 PEOPLE_{it} + \beta_3 FEMALE_{it} + \beta_4 AGE_{it} + \beta_5 AGESQ_{it} \\ & + \beta_6 MARITAL_{it} + \beta_7 INDIGENOUS_{it} + \beta_8 lnEXPORTMAIN_{ktc} \\ & + \beta_9 lnIMPORTMAIN_{ktc} + \beta_{10} lnEXPORTREST_{kt} + \beta_{11} lnIMPORTREST_{kt} \\ & + \delta_{rt} + \delta_{rk} + \varepsilon_{itkc} \end{aligned}$$

Where WAGE is the log hourly wage of an individual *i* in a given year *t*. RUR indicates whether or not an individual *i* lives in a rural area in a given year *t*. PEOPLE indicates the amount of people present in an individual *i's* household in year *t*. FEMALE indicates the individual *i's* gender in year *t*[39]. AGE and AGESQ[40] are typical Mincer variables for experience, representing the age of the respective individual *i* in a given year *t*. MARITAL indicates whether or not an individual *i* is married in year *t* and INDIGENOUS whether or not an individual *i* pertains to an indigenous ethnicity in year *t*[41]. Individuals *i* can be further

[38] The informal sector is not covered in this study.
[39] As individuals are not followed over time.
[40] Included to test for diminishing returns to age.
[41] As individuals are not followed over time.

characterized by working in an industry *k* and sector *s*, living in a Chilean region *r* (see Appendix 2), and having a specific skill level *u*.

The EXPORTMAIN and IMPORTMAIN variables are the main independent variables and indicate total pooled Chilean trade flows per 4-digit industry *k* in a given year *t* from/to the respective main partner countries *c*. Both trade variable indicators are (like WAGE) in log form, in order for the equation to show the relative effect of trade on wages. The relative effect can better inform conclusions of this particular study, as the absolute effect would turn out to be too abstract.

EXPORTREST and IMPORTREST are the control trade variables indicating total pooled Chilean trade flows per 4-digit industry *k* in a given year *t* from/to the rest of the world. They are also converted to log form.

Further included in the specification are two grouped fixed effects to, first and foremost, avoid omitted variables bias as much as possible. Hereby, δ_{rt} is the region-year fixed effect and δ_{rk} the region-industry fixed effect. δ_{rt} controls for erratic differences in regions for a specific year. δ_{rt} hence controls for the impact of, for example, natural disasters (earthquakes[42], forest fires) that have significantly adverse effects on incomes in that region for that year. δ_{rk} controls for systematic, time-invariant differences of the same industries across regions in performance (i.e. higher wages). These differences stem from better connectivity, productivity, or access to finance for an industry in a specific region. ε_{itkc} is the idiosyncratic error.

To show the differential wage effect depending on skill levels *u* and sector affiliation *s*, the regression is run multiple times. The results of this are presented and discussed in section 5.2.

5.1.2. Consideration of Biases

Based on the variables and the econometric specification outlined above, it should be noted that the high-level nature of the trade variables[43] and data restrictions on the personality variables might increase the risk of omitted variable bias. The control variables and grouped fixed effects were incorporated in the equation to eliminate the incidence of this bias as much as possible. The specification might, however, not be able to pick up on nuances at the personal level influencing an individual's wage. These could be variables for which data was not collected by the CASEN and hence not included in this specification either. On the

[42] A natural phenomenon that Chile is very prone to given its geographical location.
[43] i.e. sector-level rather than firm-level data.

macroeconomic side, there remain factors that are not sufficiently captured by the specification and which could have had an influence on the magnitude of trade flows from/to specific countries. If such factors (e.g. a domestic economic crisis in a trading partner country) heavily influence trade flows parallel to the ratification and implementation of the FTA, then the effect of the FTA (i.e. trade flows) on Chilean wages runs the risk of being biased.

Since wages rose significantly throughout the period under investigation, presence of reverse causality is a possibility. The increased purchase power of Chileans might have induced them to buy more abroad, hence increasing imports. This could have happened regardless of the FTAs signed with the trading partner countries. However, due to the sheer size of the trade volume affected by the FTAs, this is an unlikely scenario and therefore not investigated.

Furthermore, the problems with the calculation of hourly wages mentioned in earlier sections (due to poor collection of data on hours worked by individuals in the CASEN) increases the likelihood of measurement error in the dependent variable.

All in all, these limitation have to be kept in mind and results will have to be interpreted with care according to the possible biases identified.

5.2 Results and Discussion

5.2.1. Baseline - Traded Goods Economy

The baseline estimation of the model runs specification (1) in its basic form as shown in chapter 4.1 above. This provides a first hint at the direction of effects, and hence the validity of H-O-S. It does not yet allow a specific look into what role skill levels or specific sectors play in the relationship between trade and wages, however. Table 5 presents the results of running specification (1) on the dataset.

The regression is first run separately for imports (columns 6-9) and exports (columns 2-5) and also for the respective partner countries. Column 1 then shows the magnitude and statistical significance of effects when both trade flows are incorporated in the same regression, also controlling for trade from the rest of the world.

Individual regressions of imports on wages from all partner countries do not exhibit statistical significance and remain small in size (a change of less than 1% in Chilean wages for every 100% increase in imports). This is not a surprising result, since the amount of Chilean exports is much higher than the amount of imports to/from the main countries over the investigated time period. Taking into account that Chile is considered unskilled-labor abundant (like China), H-O-S theory would expect Chinese imports to negatively impact Chilean wages. However, this does not seem to crystallize. Controlling for imports from the rest of the world

Table 5 – Baseline (Trade Flows on Wages – Traded Goods Sector)

	TOTAL	EXPORTS				IMPORTS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Trade flows (ln)	Total	Total	USA	EU	China	Total	USA	EU	China
Exports to USA	-0.00459**	-0.00357	-0.00203						
	(0.00191)	(0.00301)	(0.00270)						
Exports to EU	0.00419**	0.00349*		0.000337					
	(0.00146)	(0.00164)		(0.00158)					
Exports to China	-0.000761	-0.00144			-0.000838				
	(0.000795)	(0.000897)			(0.000827)				
Exports to RoW	-0.00242	0.00202							
	(0.00418)	(0.00391)							
Imports from USA	-0.00692					-0.00466	-0.00232		
	(0.00541)					(0.00544)	(0.00299)		
Imports from EU	0.00645					0.00358		0.00201	
	(0.00460)					(0.00418)		(0.00366)	
Imports from China	-0.00266					-0.00366			-0.00221
	(0.00292)					(0.00260)			(0.00227)
Imports from RoW	0.00394***					0.00337**			
	(0.00109)					(0.00122)			
Personal Char.	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-Year FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-Industry FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	100,247	100,247	100,247	100,247	100,247	100,247	100,247	100,247	100,247
R-squared	0.255	0.255	0.255	0.255	0.255	0.255	0.255	0.255	0.255

Notes. Regressions showing the baseline effect of trade flows on Chilean hourly wages (traded goods sector) per FTA trading partner and the rest of the world. The year 2003 is excluded in these regressions (see explanation above). Standard errors are robust and clustered at the regional level. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

does not change the significance on the coefficients of the main import variables. It does show, however, that imports from the rest of the world seem to have had a positive and statistically significant effect on wages (5% significance level in column 6, 1% significance level in column 1). This raises the issue of trade in intermediate products for wages in contemporary trade. Intermediate products might be shipped to Chile from the (developed) world for final assembly, creating opportunity for increases in jobs and wages. This does not necessarily invalidate H-O-S theory, as it focuses strictly on trade in finished goods. Nonetheless, this result reveals that other mechanisms might play a role in governing the contemporary relationship between trade and wages.

With industrialized nations like the USA and the European Union, H-O-S theory predicts a positive development of wages in Chile after ratification of FTAs. This is, in fact, the case for Chilean exports to the EU. When controlled for exports to the other main countries and the rest of the world, the coefficient exhibits a statistically significant positive effect (10%

significance level) on Chilean wages. At a 0.35% increase in wages for every 100%[44] increase in exports to the EU, this effect is rather small, however. When controlling for imports and trade with the rest of the world, the coefficient increases in statistical significance (5% significance level) but its size increases only slightly (0.42% increase in wages for every 100% increase in exports to the EU). A counterintuitive result is the negative coefficient on Chilean exports to the USA, which even becomes statistically significant (5% significance level) when controlling for imports and exports to other countries (column 1). This would technically invalidate the H-O-S hypothesis in this particular case, if the effect is not due to an external shock that could deliver an explanation. As seen in earlier chapters, Chilean wages tend to have increased in the time period 2000-2009. A negative relationship would hence mean that Chilean exports to the USA decreased significantly at a specific point in time. The data shows that, indeed, Chilean exports to the USA collapsed from 2006 to 2009[45]. A likely explanation of this is the drastic decrease of US demand (for both domestic and foreign products) in the aftermath of the 2007-2008 financial crisis. The external shock to demand, instigated by the credit crisis, could hence cover up H-O-S tendencies in the results. This possible omitted variable bias hence calls for care when interpreting these results.

Effects from FTAs might not be most pronounced in the direct aftermath of their ratification. Rather, these could become more salient in the medium-run. A robustness test with the 3-year lags was therefore carried out to check for time-delayed wage adjustments to changes in exports/imports. Table 8 in Appendix 5 presents the outcomes of this robustness check. Indeed, the results show that the abovementioned effects are more pronounced (albeit still small in size). Most interestingly, imports from China now do seem to exhibit a statistically significant negative effect (1% significance level) on Chilean wages (as expected in H-O-S). The coefficients on imports from the USA and the EU also gain statistical significance (at the 10% and 5% level respectively), increasing the possibility that a share of Chilean imports from these countries was in intermediate goods. Time therefore seems to be an important factor to take into account for a more precise estimation of the effect of trade on wages. Nonetheless, comparison of the robustness test results with the original specification needs to be handled with care. The year 2003 needed to be included (to create the 3-year lags) which required a

[44] Over the observed time period the Chilean exports and imports to/from the partner countries did, indeed, double. The effects in the table can hence be characterized as the 'FTA effect'.
[45] Information taken from the time series of trade data in the dataset.

change of the dependent variable from hourly to monthly[46] wages. There might hence be a loss of precision in the wage indications of the robustness checks[47].

It can be seen from this baseline estimation already that the effects of FTA-induced trade on wages lack economic relevance. Albeit being statistically significant, their actual size is small compared to the magnitude of change that Chilean wages experienced over the same time period (see chapter 3.2 above). From a theoretical perspective, however, questions remain. First hints that H-O-S could govern the relationship between trade and wages in Chile can be found in Table 5 above: Exports to the EU seem to have positively influenced Chilean wages, while imports from China seem to have had a detrimental effect on the worker's primary incomes. If these tendencies can be validated is now assessed in more detail.

5.2.2. Skill Levels

The differential wage effect of the ratified FTAs depending on skill levels in the Chilean population is assessed. Hereby, specification (1) is run both on the sample of only unskilled and only skilled individuals. Table 6 presents the results of these regressions.

Column 1 represents the same results as Column 1 of Table 5: the effect of trade on wages in the aggregated Chilean traded goods sector. Column 3-4 and 5-6 show how wages of unskilled and skilled workers were affected respectively.

Wages of unskilled workers, as laid out in H-O-S theory, are positively affected by increased Chilean exports to the EU. The coefficient is statistically significant (5% significance level) but small in size, as in section 5.2.1. above. It decreases only slightly when controlling for exports and imports to/from the rest of the world. The FTA could have hence increased demand by the EU for unskilled-intensive products from Chile. This, following H-O-S theory, could have led to the observed increase in unskilled Chilean wages. Chilean imports from the rest of the world seem to have positively affected unskilled Chilean wages (1% significance level). This is also the case for European imports (10% significance level) but the effect vanishes once trade from the rest of the world is controlled for. Either way, this could be yet another indication of intermediate goods trade benefitting Chilean workers.

Skilled workers experience a comparatively drastic (2.39% per 100% increase in exports to the USA) fall in wages due to exports to the USA. As mentioned before, however, this relationship is likely to be inverted and can be explained by an external shock (see 5.2.1.).

[46] Since the year 2003 presented incongruities for the calculation of hourly wages (see above).
[47] Since monthly wages might bias how wages from part-time or short-term workers are evaluated.

Table 6 – Skill Levels

	(1)	(2)	(3)	(4)	(5)	(6)
Trade flows (ln)	All	All	Unskilled	Unskilled	Skilled	Skilled
Exports to USA	-0.00459**	-0.00509**	-0.00172	-0.00185	-0.0239***	-0.0248***
	(0.00191)	(0.00177)	(0.00287)	(0.00258)	(0.00479)	(0.00481)
Exports to EU	0.00419**	0.00415**	0.00362**	0.00385**	0.00258	0.00159
	(0.00146)	(0.00152)	(0.00159)	(0.00175)	(0.00475)	(0.00460)
Exports to China	-0.000761	-0.000884	-0.00306***	-0.00282**	0.0197***	0.0187***
	(0.000795)	(0.000848)	(0.00101)	(0.00112)	(0.00373)	(0.00342)
Exports to RoW	-0.00242		-0.000106		-0.00919	
	(0.00418)		(0.00404)		(0.00549)	
Imports from USA	-0.00692	-0.00508	-0.0113*	-0.00819	0.0132	0.0121
	(0.00541)	(0.00564)	(0.00559)	(0.00598)	(0.0130)	(0.0139)
Imports from EU	0.00645	0.00638	0.00672	0.00780*	-0.00293	-0.00419
	(0.00460)	(0.00432)	(0.00425)	(0.00442)	(0.0103)	(0.0103)
Imports from China	-0.00266	-0.00146	-0.00181	-0.000375	-0.00283	-0.00381
	(0.00292)	(0.00256)	(0.00250)	(0.00203)	(0.00784)	(0.00810)
Imports from RoW	0.00394***		0.00639***		-0.00303	
	(0.00109)		(0.00147)		(0.00419)	
Personal Char.	YES	YES	YES	YES	YES	YES
Region-Year FEs	YES	YES	YES	YES	YES	YES
Region-Industry FEs	YES	YES	YES	YES	YES	YES
Observations	100,247	100,247	70,966	70,966	29,281	29,281
R-squared	0.255	0.255	0.254	0.254	0.273	0.272

Notes. Regressions showing the effect of trade flows on Chilean hourly wages of workers with differing skill levels and in connection with different FTA trading partner countries and the rest of the world. The year 2003 is excluded in these regressions (see explanation above). Standard errors are robust and clustered at the regional level. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

In line with the hypotheses built on H-O-S theory, skilled wages are positively affected by increased Chilean exports to China (1.97% per 100% increase in exports to China, 1% significance level). The magnitude of this effect even increases slightly as trade to the rest of the world is controlled for.

To ensure the robustness of the results over time, the 3-year lags of the trade flows are regressed on unskilled and skilled wages (Table 9 in Appendix 5). The delayed effect of trade on wages does not majorly change the results on exports for the unskilled. Only the somewhat counterintuitive negative wage response to increased exports to China loses statistical significance. On imports, however, the lags reveal a statistically significant (5% significance level) negative effect on Chilean unskilled wages by Chinese imports. This is in line with H-O-S predictions. Imports from the EU seem to affect the Chilean unskilled wages positively (5% significance level), providing a further piece of evidence for intermediate goods trade. For skilled workers, imports from China now exhibit strong negative statistical significance (1% significance level). Together with an also strongly significant (1% significance level) delayed

positive effect of exports to China for skilled workers (as predicted in H-O-S), this leads to an interesting conclusion: It is likely that both Chile and China possess a comparative advantage for specific skill-intensive products. In the years after ratification of the FTA, these advantages intensify leading to both positive and negative wage responses for the skilled labor force in different skill-intensive industries[48]. This scenario is not unlikely, given that the Chinese economy has continued to climb up global value chains in certain technologies (e.g. computer chips).

Evidence for the validity of the H-O-S mechanism therefore remains blurry. Some of the results seem to be fully in line with the hypotheses, whereas others open the door for additional mechanisms that could better explain the way by which the FTAs affected Chilean wages. In one last alteration of the main regression, different sectors are assessed to provide more clarity on the validity of an H-O-S mechanism for this case study.

5.2.3 Analysis by Sector

So far, analysis has lumped together all industries, of which many were fundamentally different (e.g. mining and manufacturing). A final set of regressions based on specification (1) therefore pools individuals according to 3 big sectors and runs the regression separately for each group.

Chile is considered to be unskilled-labor abundant[49]. If H-O-S mechanisms were to be responsible for the relationship between trade and wages in the aftermath of Chilean ratification of the FTAs, then the same effects should roughly be observed across sectors. Table 7 presents the results of this exercise. Industry-affiliation (4-digit ISIC-level) was used to pool individuals under a specific sector (1-digit ISIC-level).

Columns 1-3 show the results for the agricultural sector. In line with H-O-S expectations, unskilled worker's wages increase with an increase of exports to the rest of the world (1.95% per 100% increase in exports to RoW). This is because the biggest share of these agricultural exports to the rest of the world is likely to go to Japan, an economy with a highly-skilled workforce but scarce in geography allowing for large-scale farming activities. The remaining coefficients do not exhibit any statistical significance.

In the mining sector (columns 4-6) unskilled wages (2.17% per 100% increase in exports to the EU) profited from increased exports to the EU. Whereas this is generally in line

[48] A positive one in those where the comparative advantage persists on the Chilean side, a negative one if not.
[49] Especially in its traded goods economy.

Table 7 – Analysis by Sector

	SECTOR								
	Agriculture, Hunting, Forestry & Fishing			*Mining & Quarrying*			*Manufacturing*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Trade flows (ln)	All	Unskilled	Skilled	All	Unskilled	Skilled	All	Unskilled	Skilled
Exports to USA	-0.0141	-0.0145	-0.150	-0.0342***	-0.0286***	0.0102	-0.00485*	-0.000414	-0.0212***
	(0.0153)	(0.0147)	(0.136)	(0.00689)	(0.00712)	(0.0789)	(0.00262)	(0.00267)	(0.00439)
Exports to EU	0.00297	0.00228	0.0153	0.0324**	0.0217**	-0.0260	0.00229	0.00156	0.00285
	(0.0127)	(0.0129)	(0.101)	(0.0119)	(0.00920)	(0.0524)	(0.00164)	(0.00171)	(0.00536)
Exports to China	-0.00867	-0.00571	0.0307	-0.00390	-0.00330	-0.0146	0.00189*	-0.000373	0.0188***
	(0.00736)	(0.00713)	(0.0849)	(0.00822)	(0.00895)	(0.0509)	(0.00103)	(0.00129)	(0.00347)
Exports to RoW	0.0236***	0.0195**	0.0469	-0.00238	0.000222	0.0347	-0.0143***	-0.0152***	-0.000751
	(0.00759)	(0.00855)	(0.0831)	(0.00876)	(0.00654)	(0.0327)	(0.00346)	(0.00394)	(0.00908)
Imports from USA	-0.0829	-0.0865	-0.453	-0.0274	-0.0164	0.0617	-0.00912*	-0.0163***	0.0162
	(0.0534)	(0.0542)	(0.383)	(0.0252)	(0.0210)	(0.0387)	(0.00505)	(0.00537)	(0.0178)
Imports from EU	0.0117	0.0160	0.0801	-0.0104	-0.00812	-0.0480	0.0179**	0.0177**	-0.00891
	(0.0112)	(0.0107)	(0.144)	(0.00857)	(0.00617)	(0.0304)	(0.00716)	(0.00642)	(0.0154)
Imports from China	0.0121	0.00783	0.112	-0.00413	-0.00532	-0.0254	-0.00300	0.00207	-0.00872
	(0.0105)	(0.0103)	(0.0709)	(0.00935)	(0.00889)	(0.0606)	(0.00463)	(0.00414)	(0.00914)
Imports from RoW	0.0161	0.0186	-0.0381	-0.000949	-0.00105	0.0138	0.00706***	0.00970***	-0.00823*
	(0.0347)	(0.0357)	(0.217)	(0.0198)	(0.0200)	(0.0828)	(0.00219)	(0.00235)	(0.00461)
Personal Char.	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-Year FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-Industry FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	67,706	52,305	15,401	4,687	2,967	1,720	26,467	14,307	12,160
R-squared	0.210	0.220	0.258	0.235	0.244	0.190	0.207	0.217	0.278

Notes. Regressions showing the effect of trade flows on wages of workers with differing skill levels in different Chilean sectors and with different FTA trading partner countries and the rest of the world. Individuals are pooled according to their 1-digit sector affiliation. The year 2003 is excluded in these regressions (see explanation above). Standard errors are robust and clustered at the regional level. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

with H-O-S, trade in natural resources tends to be subject to forces unrelated to comparative advantage (e.g. world market prices, political/national security implications). It is therefore difficult to confidently relate the observed effect in the mining sector to the ratification of FTAs and subsequently an H-O-S mechanism. The mining sector also provides much fewer observations than the other two sectors. This can generally decrease the accuracy of the results in this particular sector.

As a non-commodity sector, trade in manufacturing products is much more comparative advantage-based. This makes it the most interesting sector to seek validation for H-O-S. The results (columns 7-9) do not provide striking evidence, however. The coefficients on unskilled wages are positive for exports to the EU, but they are not statistically significant. It can hence not be stated with confidence that there is, in fact, a positive wage response to an increase in exports to these countries. An interesting result is that unskilled wages exhibit a positive

statistically significant (1% significance level) effect to an increase in imports from the EU (1.77% per 100% increase in imports from the EU) as well as from the rest of the world. This could be more evidence for the fact that intermediate products are sent to Chile for final assembly in Chilean manufacturing plants. The only results that validate some of the H-O-S hypotheses can be found in column 9. Skilled wages respond positively (1% significance level) to an increase in exports to China, and negatively (1% significance level) to exports to the USA.

The robustness test (Table 10 in Appendix 5) with 3-year lags delivers interesting findings for the agricultural sector. Unskilled wages respond negatively to increased exports to, and imports from, the EU. This could be due to the heavily subsidized European agricultural markets[50] that make their agricultural products more competitive, and hence tradable to Chile (since most tariffs have also been reduced to 0%). As these products enter the Chilean market, they compete with the products of the labor force in the Chilean agricultural sector. This could have led to the observed negative wage response that is counterintuitive to H-O-S. Either way, politics of food security could possibly shape trade behavior in agricultural products much more than comparative advantage. This makes a clear-cut analysis of H-O-S effects problematic in this specific sector. Nonetheless, more H-O-S tendencies for agriculture can now be found in the table as unskilled wages are positively affected by exports to the USA (5% significance level).

The effects in the mining sector diminish significantly when assessing delayed effects. Only exports to the rest of the world seem to now favor both wages of the unskilled and the skilled (10% and 1% significance level respectively).

For the manufacturing sector, the lags sustain the H-O-S tendencies and also show that unskilled wages are positively affected by exports to the EU (5% significance level). As suspected, the manufacturing sector therefore exhibits more H-O-S relevant tendencies in wage responses to increased trade than other sectors. However, these results do not provide overwhelming clarity about the validity of H-O-S, as too many contradicting effects are still present in the table.

All in all, the sector-specific analysis dismantles much of the (already weak) aggregate-level evidence found for an H-O-S mechanism to be the dominant mechanism regulating the relationship. It thus seems that other factors are also (more) likely to have governed the

[50] In the EU: Under the Common Agricultural Policy (CAP). Non-trade barriers (NTBs) in the form of high quality standards for imports could have also caused this effect.

relationship between Chilean trade and wages during the country's important FTA ratifications in the early 2000s.

6. Conclusion

Many academic studies of the relationship between trade and wages in Latin America focus on the continent's period of massive trade liberalization in the 80's and 90's. Chile was chosen in this paper to serve as a case study of the modern-day implications of the relationship between trade and wages in LAC. The country's real wages have risen constantly since 2003, concurrent to the ratification of important bilateral FTAs signed with Chile's biggest trading partners. This provided adequate circumstances to investigate the two core questions of this study in a contemporary environment: Whether trade has a significant effect on Chilean wages, and if this relationship is governed by the Heckscher-Ohlin-Samuelson theory of international trade.

The findings show that neither a striking influence of trade on wages, nor clear evidence for the predominance of the H-O-S mechanism are present. The results do exhibit statistical significance, but their small size seriously diminishes their economic relevance. It is hence much more likely that national measures (such as *Chile Solidario)* explain the surge in (unskilled) Chilean wages rather than the ratified FTAs. Furthermore, findings counterintuitive to H-O-S theory provide the possibility that other factors such as trade in intermediate products or security policies carry more explanatory power for the relationship of trade and wages. Even though H-O-S cannot be fully ruled out in the results as a mechanism that governs the relationship, it is likely not the only, or even most important one. Furthermore, with the theoretical framework and data at hand, the results make it nearly impossible to draw any implications about the influence of the FTAs on the Chilean wage distribution. At an aggregate level, however, the small size of the effects leads to the broad assumption that they did not have a significant impact.

The findings could carry important lessons for policy makers across Latin America. They implicate that contemporary trade liberalization does not significantly shape wages. It might hence not be the best tool to be used in the fight against prevailing income inequality on the continent. Progressive social reforms possibly have a much larger impact on the wage distribution. Nonetheless, one has to acknowledge that this paper represents a case study. Translating the Chilean findings to other countries in the neighborhood must be done under careful consideration of differences (or similarities) in economic factors and development.

Underlining this advice is the presence of limitations in the execution of this Chilean case study. First and foremost, this case study focused exclusively on the traded goods sector. This neglects possible shifts and developments in service sector wages induced by increased trade liberalization. By not investigating this relationship as well, the above results on the impact of trade on wages therefore cannot be applied to the whole Chilean economy. Furthermore, the main results of the case study are rather indicative than to provide a true causal effect.

Additional limitations arise from possible biases in the econometric specification. Incongruities in the household replies for hours worked in the year 2003 CASEN rendered the calculation of hourly wages useless for that year. The result was an uneven spread of years covered and no analysis of lagged trade flow effects on hourly wages. Comparison of some robustness checks with the main analyses is hence only restrictively possible. Furthermore, this methodological shortcoming of the household survey might have affected other years, albeit to a lesser extent, and hence could have led to measurement error in the dependent variable. Omitted variable bias can also be present in the results as there remain factors that are not sufficiently captured by the specification and which could have had an influence on the magnitude of trade flows from/to specific countries. If such factors (e.g. a domestic economic crisis in a trading partner country) heavily influence trade flows parallel to the ratification and implementation of the FTA, then the effect of the FTA (i.e. trade flows) on Chilean wages runs the risk of being biased. As discussed above, reverse causality was not deemed to bring significant limitations to this particular study.

The way forward for research should orientate itself at some of the findings of this paper. First of all, quality and coverage of concise (Chilean) firm and plant-level data is constantly improving. These datasets can be used to analyze the effect of trade on wages at a much more disaggregated level. Given the weak explanatory power of the models used in this research, this can shine new light on mechanisms that truly govern the relationship. The results in this paper also called for a closer investigation of intermediate goods trade in the Chilean manufacturing sector. This could improve the understanding of the effect outsourcing has on Chilean wages. In a broader sense, other case studies of countries with similar FTA and wage trajectories can be drafted to support the generalizability of findings of this paper. Valid examples are countries like Peru and Colombia, who have signed FTAs equal in magnitude and importance and whose wages have risen since the year 2000. Most importantly, new national case studies of Chilean wages should shine light on the impact of progressive social policies. If trade liberalization does not lie at the core of wage developments (as shown in this

case study), it is still worth investigating what specific policy does. This can provide important inputs in the fight against income inequality for other Latin American governments.

With many bilateral tariffs in Chile approaching zero in this decade, trade liberalization of the country will come close to completion. It might then be the right time to veer priorities back from international to national policy solutions to shape wages. Especially because trade liberalization failed to have a meaningful benign impact on wages in 21st-century Chile.

APPENDIX 1 - Bibliography

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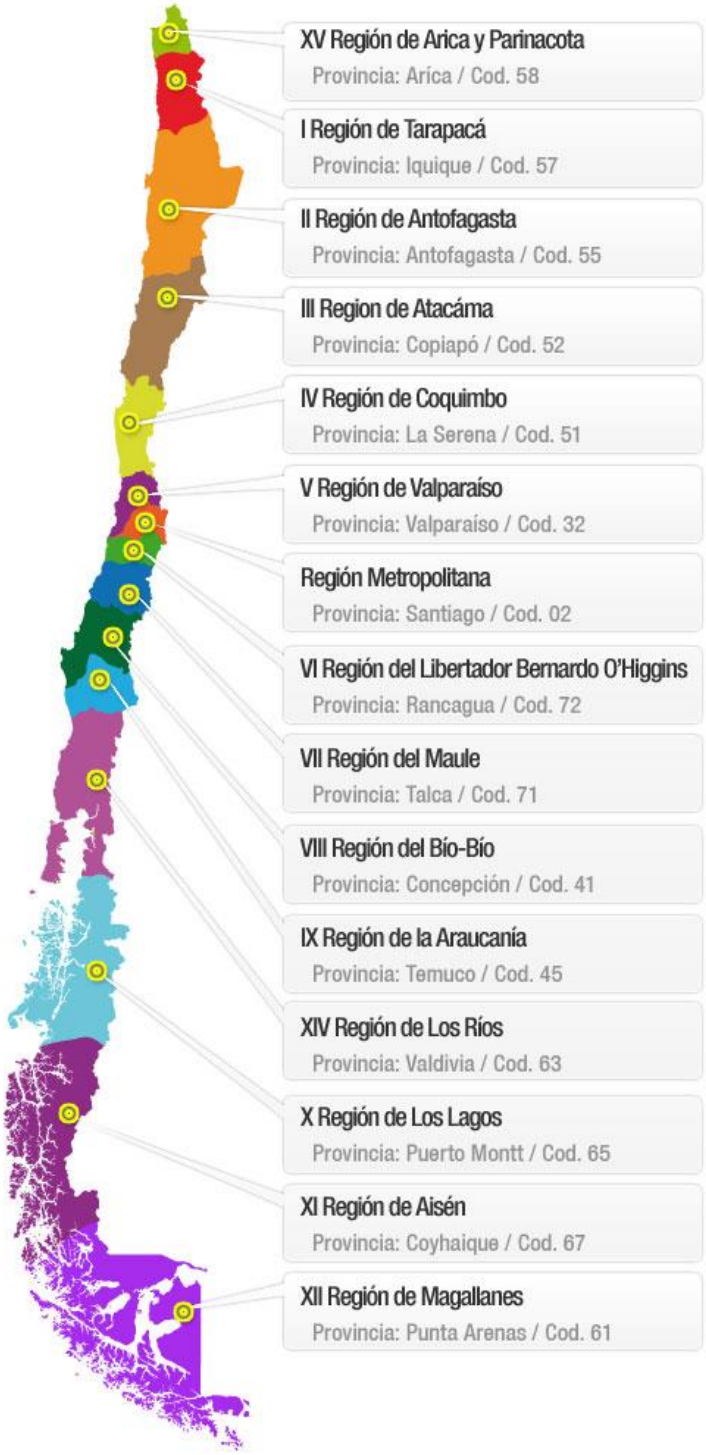
APPENDIX 2 – Map of Chile (including new regions XIV and XV)



Source: http://mapa-de-chile.blogspot.nl/2013/04/mapa-regiones-de-chile.html

APPENDIX 3 – ISIC Rev. 2 Codes

1-Digit	2-Digit	4-Digit
1 - Agriculture, Hunting, Forestry and Fishing		
	11 - Agriculture and Hunting	
		1110 - Agriculture and Livestock Production
		1120 - Agricultural Services
		1130 - Hunting, Trapping and Game Propagation
	12 - Forestry and Logging	
		1210 - Forestry
		1220 - Logging
	13 - Fishing	
		1301 - Ocean and Coastal Fishing
		1302 - Fishing not elsewhere classified
2 - Mining and Quarrying		
	21 - Coal Mining	
		2100 - Coal Mining
	22 - Crude Petroleum and Natural Gas Production	
		2200 - Crude Petroleum and Natural Gas Production
	23 - Metal Ore Mining	
		2301 - Iron Ore Mining
		2302 - Non-Ferrous Ore Mining
	29 - Other Mining	
		2901 - Stone Quarrying, Clay and Sand Pits
		2902 - Chemical and Fertilizer Mineral Mining
		2903 - Salt Mining
		2909 - Mining and Quarrying not elsewhere classified
3 - Manufacturing		
	31 - Manufacture of Food, Beverages and Tobacco	
		3111 - Slaughtering, Preparing and Preserving Meat
		3112 - Manufacture of Dairy Products
		3113 - Canning and Preserving of Fruits and Vegetables
		3114 - Canning, Preserving and Processing of Fish, Crustacea, and Similar Foods
		3115 - Manufacture of Vegetable and Animal Oils and Fats
		3116 - Grain Mill Products
		3117 - Manufacture of Bakery Products
		3118 - Sugar Factories and Refineries
		3119 - Manufacture of Cocoa, Chocolate and Sugar Confectionary
		3121 - Manufacture of Food Products not elsewhere classified
		3122 - Manufacture of Prepared Animal Feeds
		3131 - Distilling, Rectifying and Blending Spirits
		3132 - Wine Industries
		3133 - Malt Liquors and Malt

	3134 - Soft Drinks and Carbonated Waters Industries
	3140 - Tobacco Manufactures
32 - Textile, Wearing Apparel and Leather Industries	
	3211 - Spinning, Weaving and Finishing Textiles
	3212 - Manufacture of Made-up Textile Goods except Wearing Apparel
	3213 - Knitting Mills
	3214 - Manufacture of Carpets and Rugs
	3215 - Cordage, Rope and Twine Industries
	3219 - Manufacture of Textiles not elsewhere classified
	3220 - Manufacture of Wearing Apparel, except Footwear
	3231 - Tanneries and Leather Fishing
	3232 - Fur Dressing and Dyeing Industries
	3233 - Manufacture of Products of Leather and Leather Substitutes, except Footwear and Wearing Apparel
	3240 - Manufacture of Footwear, except vulcanized or molded Rubber or Plastic Footwear
33 - Manufacture of Wood and Wood Products, Including Furniture	
	3311 - Sawmills, Planning and other Wood Mills
	3312 - Manufacture of Wooden and Cane Containers and Small Cane Ware
	3319 - Manufacture of Wood and Cork Products not elsewhere classified
	3320 - Manufacture of Furniture and Fixtures, except primarily of Metal
34 - Manufacture of Paper and Paper Products, Printing and Publishing	
	3411 - Manufacture of Pulp, Paper and Paperboard
	3412 - Manufacture of Containers and Boxes of Paper and Paperboard
	3419 - Manufacture of Pulp, Paper and Paperboard Articles not elsewhere classified
	3420 - Printing, Publishing and Allied Industries
35 - Manufacture of Chemicals and Chemical, Petroleum, Coal, Rubber, and Plastic Products	
	3511 - Manufacture of Basic Industrial Chemicals except Fertilizers
	3512 - Manufacture of Fertilizers and Pesticides
	3513 - Manufacture of Synthetic Resins, Plastic Materials and Man-Made Fibers except Glass
	3521 - Manufacture of Paints, Varnishes and Lacquers
	3522 - Manufacture of Drugs and Medicines
	3523 - Manufacture of Soap and Cleaning Preparations, Perfumes, Cosmetics and other Toilet Preparations
	3529 - Manufacture of Chemical Products not elsewhere classified
	3530 - Petroleum Refineries
	3540 - Manufacture of Miscellaneous Products of Petroleum and Coal
	3551 - Tyre and Tube Industries
	3559 - Manufacture of Rubber Products not elsewhere classified
	3560 - Manufacture of Plastic Products not elsewhere classified
36 - Manufacture of Non-Metallic Mineral Products, except Products of Petroleum and Coal	
	3610 - Manufacture of Pottery, China and Earthenware
	3620 - Manufacture of Glass and Glass Products
	3691 - Manufacture of Structural Clay Products

3692 - Manufacture of Cement, Lime and Plaster
3699 - Manufacture of Non-Metallic Mineral Products not elsewhere classified
37 - Basic Metal Industries
3710 - Iron and Steel Basic Industries
3720 - Non-Ferrous Metal Basic Industries
38 - Manufacture of Fabricated Metal Products, Machinery and Equipment
3811 - Manufacture of Cutlery, Hand Tools and General Hardware
3812 - Manufacture of Furniture and Fixtures primarily of Metal
3813 - Manufacture of Structural Metal Products
3819 - Manufacture of Fabricated Metal Products except Machinery and Equipment not elsewhere classified
3821 - Manufacture of Engines and Turbines
3822 - Manufacture of Agricultural Machinery and Equipment
3823 - Manufacture of Metal and Wood Working Machinery
3824 - Manufacture of Special Industry Machinery and Equipment except Metal and Wood Working Machinery
3825 - Manufacture of Office, Computing and Accounting Machinery
3829 - Machinery and Equipment except electrical not elsewhere classified
3831 - Manufacture of Electrical Industrial Machinery and Apparatus
3832 - Manufacture of Radio, Television and Communication Equipment and Apparatus
3833 - Manufacture of Electrical Appliances and Houseware
3839 - Manufacture of Electrical Apparatus and Supplies not elsewhere classified
3841 - Ship Building and Repairing
3842 - Manufacture of Railroad Equipment
3843 - Manufacture of Motor Vehicles
3844 - Manufacture of Motorcycles and Bicycles
3845 - Manufacture of Aircraft
3849 - Manufacture of Transport Equipment not elsewhere classified
3851 - Manufacture of Professional and Scientific, and Measuring and Controlling Equipment not elsewhere classified
3852 - Manufacture of Photographic and Optical Goods
3853 - Manufacture of Watches and Clocks
39 - Other Manufacturing Industries
3901 - Manufacture of Jewelry and Related Articles
3902 - Manufacture of Musical Instruments
3903 - Manufacture of Sporting and Athletic Goods
3909 - Manufacturing Industries not elsewhere classified

Source: https://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=8

APPENDIX 4 – Variables List

Variable	Variable Definition	Coding
	ID Variables (used for pooling individuals and for Fixed Effects)	
Year	Specifies the year	2000, 2003, 2006, 2009
Region ID	Region in Chile individual is living in	Each region has a corresponding ID between 1-15
Sector ID	ISIC Rev.2 sector in which individual is working	Each sector has a corresponding 1-digit ID
Industry ID	ISIC Rev.2 industry in which individual is working	Each industry has a corresponding 4-digit ID
	Dependent Variables	
Hourly Wage	Indicates the hourly wage of an individual	Numerical values (log form)
Monthly Income	Indicates the monthly wage of an individual	Numerical values (log form)
	Main Independent Variables (Trade Flows)	
Trade Flows with USA	Indicates the various Chilean trade flows (exports, imports) with the USA as well as their 3-year lags	Numerical values (log form)
Trade Flows with EU	Indicates the various Chilean trade flows (exports, imports) with the EU as well as their 3-year lags	Numerical values (log form)
Trade Flows with China	Indicates the various Chilean trade flows (exports, imports) with China as well as their 3-year lags	Numerical values (log form)
	Independent Variables - Controls (Trade Flows)	
Trade Flows with Rest of the World (RoW)	Indicates the various Chilean trade flows (exports, imports) with the Rest of the World as well as their 3-year lags	Numerical values (log form)
	Independent Variables - Controls (Personal Characteristics)	
Rural	Indicates if individual lives in rural setting	0=Urban; 1=Rural
People in Household	Number of people residing in the household of the individual	Numerical values
Female	Indicates if individual is female	0=Male; 1=Female
Age / Age Squared	Indicates (squared) age of individual	Numerical values
Marital	Indicates marital status of individual	0=Single; 1=Married
Indigenous	Indicates whether individual pertains to indigenous tribe in Chile	0=No; 1=Yes
Skill	Indicates the skill level of the individual *[Variable constructed by author]*	0=Unskilled; 1=Skilled

APPENDIX 5 – Robustness Checks

Table 8 – Lag of Baseline (3-Year Lag / 2003 included / Monthly Income as Dependent Variable)

	TOTAL	EXPORTS				IMPORTS			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lag of trade flows (ln)	Total	Total	USA	EU	China	Total	USA	EU	China
Exports to USA	-0.00829***	-0.00772***	-0.00608***						
	(0.00277)	(0.00249)	(0.00166)						
Exports to EU	0.00573*	0.00611**		0.000270					
	(0.00280)	(0.00255)		(0.000886)					
Exports to China	0.00120	0.000230			-0.000886				
	(0.00156)	(0.00166)			(0.00109)				
Exports to RoW	-0.00815***	-0.00463**							
	(0.00184)	(0.00197)							
Imports from USA	0.00950*					0.00852	-0.00124		
	(0.00526)					(0.00568)	(0.00332)		
Imports from EU	0.00488**					-0.00199		-0.00321*	
	(0.00175)					(0.00185)		(0.00157)	
Imports from China	-0.00664***					-0.00513**			-0.00490**
	(0.00202)					(0.00225)			(0.00211)
Imports from RoW	-0.00140					-0.00324			
	(0.00333)					(0.00348)			
Personal Char.	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-Year FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-Industry FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	102,922	102,922	102,922	102,922	102,922	102,922	102,922	102,922	102,922
R-squared	0.254	0.253	0.253	0.253	0.253	0.253	0.253	0.253	0.253

Notes. Regressions showing the baseline effect of 3-year lagged trade flows on Chilean hourly wages (traded goods sector) per FTA trading partner and the rest of the world. In these regressions, the dependent variable is the log of monthly wages. This is done to allow the incorporation of the year 2003 and hence a proper creation of the 3-year lag. Standard errors are robust and clustered at the regional level. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

Table 9 – Lag of Skill Levels (3-Year Lag / 2003 included / Monthly Income as Dep. Var.)

	(1)	(2)	(3)	(4)	(5)	(6)
Lag of trade flows (ln)	All	All	Unskilled	Unskilled	Skilled	Skilled
Exports to USA	-0.00829***	-0.00975***	-0.00369	-0.00488*	-0.0235***	-0.0252***
	(0.00277)	(0.00258)	(0.00261)	(0.00246)	(0.00734)	(0.00774)
Exports to EU	0.00573*	0.00529*	0.00563*	0.00552*	0.00833*	0.00797
	(0.00280)	(0.00281)	(0.00286)	(0.00287)	(0.00465)	(0.00468)
Exports to China	0.00120	-0.000169	-0.00153	-0.00246	0.0154***	0.0130***
	(0.00156)	(0.00184)	(0.00143)	(0.00164)	(0.00438)	(0.00409)
Exports to RoW	-0.00815***		-0.00578**		-0.0161**	
	(0.00184)		(0.00226)		(0.00652)	
Imports from USA	0.00950*	0.00698	0.00269	0.00192	0.0132	0.0102
	(0.00526)	(0.00453)	(0.00433)	(0.00418)	(0.00799)	(0.00987)
Imports from EU	0.00488**	0.000389	0.00393**	0.00115	-0.00493	-0.00916
	(0.00175)	(0.00163)	(0.00153)	(0.00158)	(0.00611)	(0.00612)
Imports from China	-0.00664***	-0.00511*	-0.00434**	-0.00282	-0.0156***	-0.0150***
	(0.00202)	(0.00275)	(0.00178)	(0.00182)	(0.00354)	(0.00334)
Imports from RoW	-0.00140		0.00110		-0.000910	
	(0.00333)		(0.00213)		(0.00764)	
Personal Char.	YES	YES	YES	YES	YES	YES
Region-Year FEs	YES	YES	YES	YES	YES	YES
Region-Industry FEs	YES	YES	YES	YES	YES	YES
Observations	102,922	102,922	73,075	73,075	29,847	29,847
R-squared	0.254	0.253	0.248	0.248	0.306	0.306

Notes. Regressions showing the effect of 3-year lagged trade flows on Chilean hourly wages of workers with differing skill levels and in connection with different FTA trading partner countries and the rest of the world. In these regressions, the dependent variable is the log of monthly wages. This is done to allow the incorporation of the year 2003 and hence a proper creation of the 3-year lag. Standard errors are robust and clustered at the regional level. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1

Table 10 – Lag of Analysis by Sector (3-Year Lag / 2003 included / Monthly Income as Dep. Var.)

	SECTOR								
	Agriculture, Hunting, Forestry & Fishing			*Mining & Quarrying*			*Manufacturing*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lag of trade flows (ln)	All	Unskilled	Skilled	All	Unskilled	Skilled	All	Unskilled	Skilled
Exports to USA	0.208**	0.202**	-0.262	-0.0157*	-0.0110*	-0.0352	-0.00677**	-0.00174	-0.0208***
	(0.0747)	(0.0699)	(0.345)	(0.00789)	(0.00619)	(0.0483)	(0.00291)	(0.00273)	(0.00493)
Exports to EU	-0.0510***	-0.0496***	0.0891	0.0116	0.0156	0.0224	0.00549***	0.00442**	0.00750
	(0.0158)	(0.0159)	(0.150)	(0.0100)	(0.00889)	(0.0221)	(0.00166)	(0.00180)	(0.00509)
Exports to China	-0.0406**	-0.0363**	0.101	0.000412	0.00495	0.0150	0.00223**	-0.000494	0.0145**
	(0.0159)	(0.0146)	(0.110)	(0.00812)	(0.00520)	(0.0281)	(0.00103)	(0.000960)	(0.00520)
Exports to RoW	0.0319*	0.0307*	-0.112	0.0159*	0.0138*	0.0631***	-0.0158***	-0.0150***	-0.00699
	(0.0164)	(0.0152)	(0.0822)	(0.00824)	(0.00776)	(0.00836)	(0.00357)	(0.00408)	(0.00907)
Imports from USA	-0.00749	0.00684	0.0868	-0.00588	-0.00870	0.0491	0.0132	0.00441	0.0195
	(0.0354)	(0.0315)	(0.183)	(0.0150)	(0.0159)	(0.0427)	(0.00833)	(0.00739)	(0.0167)
Imports from EU	-0.114**	-0.111**	0.179	0.000385	0.00238	-0.0121	-0.00914	-0.00839	-0.0166
	(0.0465)	(0.0434)	(0.201)	(0.00325)	(0.00209)	(0.0246)	(0.00591)	(0.00736)	(0.0166)
Imports from China	-0.00169	-0.00489	-0.00767	-0.00639	9.48e-05	0.0172	-0.00620*	0.000418	-0.0204**
	(0.00932)	(0.00847)	(0.0611)	(0.00960)	(0.00662)	(0.0292)	(0.00334)	(0.00318)	(0.00849)
Imports from RoW	-0.0108	-0.0141	-0.139	-0.00570	-0.0128*	-0.0562	0.00307	0.00473	-0.0119
	(0.0369)	(0.0354)	(0.341)	(0.0115)	(0.00701)	(0.0449)	(0.00436)	(0.00289)	(0.0171)
Personal Char.	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-Year FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-Industry FEs	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	69,720	53,894	15,826	4,650	2,944	1,706	27,258	14,747	12,511
R-squared	0.185	0.191	0.285	0.224	0.242	0.219	0.227	0.237	0.309

Notes. Regressions showing the effect of 3-year lagged trade flows on wages of workers with differing skill levels in different Chilean sectors and with different FTA trading partner countries and the rest of the world. Individuals are pooled according to their 1-digit sector affiliation. In these regressions, the dependent variable is the log of monthly wages. This is done to allow the incorporation of the year 2003 and hence a proper creation of the 3-year lag. Standard errors are robust and clustered at the regional level. Statistical significance: *** p<0.01, ** p<0.05, * p<0.1