Trade Liberalization and Wages in the Dominican Republic

James Sayre

Submitted under the supervision of
Anusha Nath, Amil Petrin,
& David Rahman

to the University Honors Program at the
University of Minnesota-Twin Cities

in partial fulfillment of the
requirements for the degree of
Bachelor of Science, *summa cum laude*
in Economics & Mathematics

May 2016

sayrejay@gmail.com

Trade Liberalization and Wages in the Dominican Republic

Abstract

I examine the impact of modern day trade liberalization on the wages of workers in the Dominican Republic. Upon implementation, the Central American Free Trade Agreement reduced nominal Dominican input tariffs from an average of 12.06% to 2.73% from member countries, particularly the United States, and put regulations in place to remove remaining tariffs in a short time period after that. At the regional level, I find insignificant effects of trade reform on wages. At the occupational level within a region, I find that a 10 percentage point decrease in input tariffs over the time period is associated with 4.5 percentage point lower wage growth over the period 2002 to 2013. Upon considering the heterogeneous effects of trade reform based upon skill levels of workers, I find that the wages of skilled workers experienced slower wage growth than their unskilled counterparts over the period, which is broadly consistent with predictions of the Heckscher-Ohlin Model for a developing country.

Contents

Figures

Chapter 1

Introduction

Trade liberalization, particularly the removal of import barriers such as tariffs or quotas, provides higher access for domestic firms and consumers to purchase goods in international markets. Consumers gain access to a larger, and perhaps higher quality, variety of goods. Domestic firms find it easier to import intermediate goods in their production process. Such firms may have a "love of variety", and are more productive when using a varied bundle of intermediate inputs [Dixit and Stiglitz, 1977]. On the other hand, inefficient firms that produce goods that compute with imports domestically may be hurt by trade, even as the country as a whole gains from trade, by shifting entrepreneurial activity to more productive uses [Holmes and Schmitz, 2001], or other, well established mechanisms.

As some firms benefit and some firms are hurt by opening up to trade, a natural question arises: what is the effect of trade liberalization upon the wages of workers in domestic firms? This is one of the most important questions in international trade, and has generated an extensive literature[1]. The contribution of this paper is to empirically examine and quantify the impact of trade liberalization upon workers in a developing country context, particularly the Dominican Republic. Additionally, I examine the heterogeneous impacts of trade based upon the skill level of workers, and test a key implication of the Heckscher-Ohlin model of international trade.

I test the impact of trade liberalization in the context of the Central American Free Trade Agreement (CAFTA, or CAFTA-DR), which primarily lowered input tariffs in the Dominican Republic on goods imported from the United States and other countries in Central America. One peculiarity of this

[1] See Feenstra and Hanson [2003] and Goldberg and Pavcnik [2007] for a review of the recent literature regarding trade liberalization and wages, particularly in the context of developing countries.

agreement is that it left output tariffs largely unaffected, which allows me to focus solely on the impact of input tariffs. Ultimately, CAFTA reduced average tariff rates from 12.06% to 2.73%, a similar nominal decrease to the reduction in tariffs in Mexico as a result of NAFTA. I construct a panel dataset of labor market outcomes in 2002 and 2013 in the Dominican Republic, which corresponds to one sample 5 years prior to the implementation of CAFTA and six years after. I find that tariffs remained largely constant from 2002-2007, so the change in tariff rates from 2002-2013 can be almost entirely attributed solely to the trade agreement. Furthermore, having a sample six years after the trade agreement allows for firms to fully adjust their composition of inputs and make hiring, firing, and wage decisions according to changes in trade barriers, if one believes there may be a lag in these changes post-CAFTA.

I examine the impact of trade reform at the municipality level, and at the level of each occupation within a municipality, with the expectation that I will find clearer effects of tariff changes at the occupational level. At the municipality level, I find insignificant, and somewhat mixed depending on the specification, effects of trade liberalization. However, at the occupational level, I find that a 10 percentage point decrease in the change in input tariffs is associated with 4.5 percentage point lower wage growth over the period 2002 to 2013. As supporting evidence for this result, I find that workers in occupations in the nontraded sector experienced faster wage growth during the period (about 1.6 percentage points faster) vis-à-vis workers in occupations categorized as competing with imports. Finally, upon estimating my occupational level results on a high and low skill subsample, I find that the wages of skilled workers experienced slower wage growth than their unskilled counterparts from 2002 to 2013. Since I argue that the Dominican Republic is relatively unskilled labor abundant, this is in line with theoretical predictions of the Heckscher-Ohlin Model for a developing country.

Narrowly, my work helps to estimate the effect of CAFTA on the wages of workers in the Dominican Republic, but the results have broader implications. Specifically, I provide further evidence on who gains the most from the removal of trade barriers in developing countries, particularly unskilled workers and laborers not employed by import competing firms, and quantify this effect. Due to the peculiar nature of the Central American Free Trade Agreement, I am able to disentangle the effects of reducing trade barriers on input goods from the resulting effects of lowering tariffs on outputs. This helps to clarify the

channel through which trade liberalization impacts wages, particularly the significant effect of lowering input tariffs (to the contrary, Amiti and Cameron [2012] and others find that lowering output tariffs has insignificant effects). Ultimately, this paper adds to the body of work examining the direct effects of lowered input tariffs on labor market outcomes.

Chapter 2

Context

Over the last several decades, trade barriers have fallen substantially, and agreements promoting free trade between countries have proliferated. One such agreement, the Central American Free Trade Agreement aimed to lower trade barriers between Central American countries and the United States. One of the explicit aims of CAFTA was to phase out tariffs on U.S. imports into member Central American countries, or "progressively eliminate customs duties on originating goods" [Office of the United States Trade Representative].

In 2003, negotiations began on the Central American Free Trade Agreement, with Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and the United States taking part in the discussions. The Dominican Republic joined the negotiations in early January, retitling the agreement the Dominican Republic-Central America Free Trade Agreement. U.S. President George W. Bush signed CAFTA into law in 2005, but it took another two years for the Dominican Republic to fully implement the agreement, which it did on March 1, 2007. Based upon World Trade Organization data, I find CAFTA-DR reduced average Dominican Republic (D.R.) tariff rates on imports from member countries from 12.06% to 2.73% from 2006 to 2007[1]. The magnitude of this decrease on imported American goods is similar to the size of the decrease in Mexican tariffs on American goods as a result of the North American Free Trade Agreement [Goldberg and Pavcnik, 2007]. In recent history, other countries such as Brazil reduced tariff barriers more drastically [Kovak, 2013]; however, this is still economically meaningful, especially since the United States is the largest trading partner of the Dominican Republic, composing 38.6 percent of

[1] Using a import-weighted average of tariff rates for Harmonized System two-digit product codes, the unweighted average decrease is larger.

total imports into the D.R in 2013 [World Trade Organization, a][2].

CAFTA established a moratorium on creating new tariff lines or raising customs duties between the parties involved, and explicitly defined a time table for each good to have its tariffs reduced. Of the goods that the Dominican Republic had formerly placed tariff barriers upon, 70.4% of goods originating from the United States became duty free in 2007, another 6.5% of goods became duty free by 2012 (2013 being the year for which I have survey data for), with the remaining 22.9% of goods having partially reduced tariffs by 2013. In summation, many goods were to be declared duty free initially upon implementation of the agreement, but many more were to have their duties phased out in a period of generally 5-10 years (see Figure 11.0.1 for more information).

Tariffs on most products exported to the United States from Caribbean countries were already duty-free as part of the Caribbean Basin Economic Recovery Act (CBERA), and so CAFTA largely removed ad-valorem taxes on American imports imposed by Carribean countries. Implemented on January 1, 1984, CBERA eliminated U.S. import duties on goods (with certain exceptions) from 20 initial Caribbean countries, including the Dominican Republic. Although other specialized agreements to reduce import tariffs on goods originating from developing countries existed, such as the Generalized System of Preferences, CBERA did not have any "graduation" requirement for countries that became middle or high income, only that eligible goods must have at least 35% of their value added within one or more beneficiary countries [Pelzman and Schoepfle, 1988]. Indeed, based on World Trade Organization data, I find that simple Harmonized System two-digit U.S. import tariff averages were 1.66 for CBERA countries in 2002 and 0.11 for CAFTA-DR countries in 2007. Although this represents a small decrease in export tariffs on the Dominican Republic, the magnitude of this decrease is much smaller than the corresponding decrease in import tariffs. Due to this structure, this allows me to examine the impact of reduced input tariff barriers on local Dominican import-competing producers, without having to examine simultaneous and large changes in output tariffs.

One relevant consideration for this study is the confounding effects of macroeconomic shocks taking place during my study. The economic crisis of 2008 had worldwide effects, particularly on trading

[2]The United States also receives 56 percent of total exports from the Dominican Republic.

partners of the United States. Although I cannot say anything certain about the impact of macroeconomic shocks on labor markets in the Dominican Republic during my study period, it is clear that labor markets entered a slump during this time. At the municipality level, employment rates fell more or less uniformly from the period from 2002 to 2010[3] (see Figure 10.0.7), despite broad increases in the population during that time (Figure 10.0.6). As corroborating evidence that labor markets experienced a slump, survey data on incomes suggests that the wage rate (measured as 2013 USD per hour) experienced little nominal growth from 2002 to 2013 (see Figure 9.0.1).

[3]These are the years for which demographic statistics are available, unfortunately this data for 2013 is not available.

Chapter 3

Literature Review

There is a considerable existing literature discussing the link between trade openness and changes in the wages of workers. The canonical model of international trade, the Heckscher-Ohlin (H-O) model, predicts that a country abundant in a given factor will specialize in the production of goods that use that factor relatively intensively. In the case of a developing country such as the Dominican Republic, the simple 2×2 H-O model (where the factors are skilled and unskilled labor) suggests that the country will specialize in the production of goods which use unskilled labor relatively intensively in relation to skilled labor. The connection to the income distribution of a nation comes from the related Stolper-Samuelson Theorem, which asserts that as a nation moves from autarky to free trade, the owners of the relatively abundant factor, such as unskilled labor, will find their real incomes rising, while the owners of the relatively scarce factor will find their real incomes falling. Therefore, upon lowering trade barriers, and thus increasing the price of unskilled labor intensive good, unskilled workers may be expected to see their wages increase (assuming no changes in the extensive margin of labor supply). However, empirically validating the Stolper-Samuelson is difficult for several reasons. The Stolper-Samuelson Theorem refers to economy-wide factor returns [Goldberg and Pavcnik, 2007], not the incomes of workers in a given intra-country region. Next, pre-existing data on the proportions of various factors is not easily available for many developing countries, such as the Dominican Republic. Finally, establishing a firm link between tariffs and wages may be difficult in the presence of external macroeconomic shocks. That said, even absent this data, in a Heckscher-Ohlin framework, trade liberalization will be generally expected to reduce the premium for skilled labor in middle-low income or developing countries.

As part of an extensive literature, several papers that examine the effect of trade liberalization on wages,

particularly the wage premium, are Pavcnik, Blom, Goldberg, and Schady (2004), Goldberg and Pavcnik (2004), Mishra and Kumar (2005), Feliciano (2001), and Kaplan and Verhoogen (2005). These papers find mixed results, some find positive associations between trade reform and wages (Goldberg and Pavcnik (2004)), others find negative associations (Mishra and Kumar (2005)), and some find no relationship (Pavcnik, Blom, Goldberg, and Schady (2004), Feliciano (2001)). As noted by Goldberg and Pavcnik [2007], "the heterogeneity of findings in these studies is perhaps not surprising given the large number of possible channels through which trade could affect industry [wages and wage premia]". Therefore, I review some of the literature discussing such channels through which trade reform can affect wages.

One paper which introduces a model of trade liberalization and its effect upon wages is Amiti and Davis [2012], which finds varying impacts of reduced trade barriers based upon the characteristics of firms. Their model suggests that a decline in input tariffs raises the wages of workers at firms using imported inputs, but reduces wages at firms that do not import inputs. Amiti and Davis find that a 10% point fall in input tariffs has an insignificant impact on wages in firms that do not import but increases wages in firms that do import. To replicate these findings, it is necessary to obtain plant-level information on workers' wages, and to determine the composition of inputs into the production process for each firm. My data set, however, does not allow me to link workers to their respective firms, and thus only provides information regarding the average wages of workers in a given occupation. In related work, Amiti and Cameron [2012] examine the decline of input tariffs on the wage skill premium of workers in Indonesia, a country with a large share of unskilled labor. They find that a 10 percentage point decrease in input tariffs reduces the skilled wage premium by 10 percent for firms that import, consistent with the predictions of the H-O model, and suggestive of firms substituting imported inputs for skilled production of those inputs. Looking separately at output tariffs, Amiti and Cameron find no statistically significant impact on the skill premium within firms from changes in barriers applied to output goods.

Another recent paper which explores the heterogeneous impacts of trade upon domestic firms is Holmes and Stevens [2014], which develops a model for how international trade affects domestic plants of varying sizes. Examining the effects of a surge in Chinese manufactured goods on U.S. manufacturers,

Holmes and Stevens find that import competing plants that were large or produced standardized goods either closed down or laid off many of their workers, while smaller firms that produced specialized goods fared better, even *within* a given industry classification. The authors' model suggests that adverse wage impacts due to import competition should be more pronounced in areas where one industry is more concentrated. Although the data I have does not provide detailed on plants and their relative specialization, my firm level data allows one to infer how concentrated an industry/occupation is within a municipality.

Finally, Kovak [2013] examines the effect of trade liberalization on regional wage changes in Brazil. As a result of long standing import substituting industrial policies, in 1987 the average tariff level in Brazil was high; 54.9 percent. However, these were unsustainable, and by 1995, policymakers reduced average tariffs to 10.8 percent. Kovak calculates, for each region, a measure for the share of regional production accounted for by each industry, and then for each of these industries estimates the effect tariff changes have had upon local wages in a region. To estimate these effects using reduced form equations relies upon the exogeneity of tariff changes to industry performance; that tariff changes have not been limited to only certain industries. The author argues that, in the context of Brazil, policy makers had explicit aims to cut tariffs uniformly, without prioritizing one industry over another, which is corroborated by showing that tariff cuts were largest in industries that had high barriers to trade initially. Ultimately, Kovak finds that a region facing 10 percentage point larger tariff-induced price decline experienced a 4.39 percentage point larger wage decline.

Chapter 4

Exogeneity of Tariff Decreases

Before discussing the impact of tariff changes on labor markets in the Dominican Republic, it is first necessary to comment upon the political economy of tariff negotiations. Grossman and Helpman [1994], Brock and Magee [1978], Maggi and Rodríguez-Clare [2007] and others, have observed the potential for special interest lobbies within a country to have a significant impact upon policymakers and their decisions, particularly when deciding which trade barriers to remove and which to leave in place. One consequence of this is that tariff rates and tariff rate reductions could be determined by factors endogenous to firm level wages; tariffs can be viewed as the result of a political process, which may be intertwined with various aspects of the performance of regional labor markets. If this is the case, then estimates for the effect of tariffs on labor market outcomes will suffer from omitted variable bias, if not corrected for. Therefore, I discuss the qualitative and quantitative evidence available on the potential exogeneity of the initial level of trade barriers and tariff rate reductions as a result of CAFTA.

First, note that the level of Dominican trade protection in 2002 bears a large resemblance to tariff barriers in place in 1996[1] (see Figure 10.0.4). Many of these tariff bariers were set decades ago, potentially as the result of a political process that took place twenty years or more prior to CAFTA. Therefore, it is possible that pre-CAFTA level duties on many goods were reflective of prior bargaining, not of modern political processes. If one assumes there may exist institutional constraints preventing lowering tariffs without an intervention from another country (the United States, in this case), then the pre-CAFTA tariff level may be able to be considered an arbitrary result of a historical process.

Although Dominican policymakers negotiated tariff rate reductions bilaterally with the United States,

[1] Detailed information on trade barriers is not available further back than this

regardless, the goal of the agreement was to lower tariffs on all incoming goods. Detailed accounts of the tariff negotiation process suggest that Dominican policymakers, in addition to Dominican Presidents Hipólito Mejía and Leonel Fernández[2], were in favor of achieving broad reductions in input tariffs through CAFTA. Sonia Guzmán de Hernández, the head negotiator in the CAFTA-DR process for the Dominican Republic, writes that the Dominican government estimated that "over 300,000 local jobs depended on the commercial exchange between the two countries", and that these workers stood to benefit from the free trade agreement. Certainly, there were certain local industries, such as shrimp producers, which lobbied against lower tariff rates. However, Guzmán states that Regina Vargo, an assistant U.S. trade representative, claimed that these were political non-starters in the negotiation; emphasizing that there were certain "things you can't say no to". Ultimately, negotiators reached an agreement where trade barriers on 99.5% of all Dominican products sold to the U.S. and 78% of all U.S. goods to sold to the Dominican Republic would be removed entirely by 2012 (if they weren't already duty-free, as was the case for many Dominican exports) [Hernández, 2006]. After the agreement was adopted and ratified, the United States forbade the Dominican Congress from making any further modifications to the agreement, minimizing concerns of political influences that could have taken place after the bilateral negotiation process had ended [Dominican Today].

As quantitative evidence suggestive of the uniformity of tariff reductions, I compare the relationship between pre-CAFTA tariff levels and the amount of tariff reduction in figures 10.0.1, 10.0.2 and 10.0.3. If policymakers had the interest in lowering tariffs uniformly, one would expect to see larger tariff reductions on products that initially had higher protection levels. Indeed, for average tariffs on Harmonized System 6 digit product codes (Figure 10.0.1), there is a linear ($R^2 = 0.85$) relationship between the initial amount of protection for a good and the amount of tariff decrease. These qualitative and quantitative facts suggest that Dominican input tariffs were lowered (more or less) uniformly as a result of CAFTA-DR, as desired.

[2]Mejía serving as president of the Dominican Republic from 2000-2004, Fernández serving from 2004-2012.

Chapter 5

Data

Data for this project comes from combining several easily accessible databases, allowing for straightforward replication of my results[1]. To measure the extent of trade liberalization, I estimate the level of trade barriers in the Dominican Republic in 2002 and 2013. These years correspond with the years that household survey data is available for the Dominican Republic. The 2013 household survey results were collected between July and October of 2013; this implies that the later portion of my panel dataset was collected than six years after CAFTA-DR was implemented in March 2007. In theory, this should hopefully be long enough for local labor markets to adjust to new changes in tariff barriers. Between 2002 and 2006, Dominican Republic duties on American goods remained largely constant until the passage of CAFTA (Figure 10.0.3), so the difference in duties between 2002 and 2013 is primarily a result of the free trade agreement.

For tariff data in 2002, I use the World Trade Organization [b] Tariff Analysis database, which provides tariff information at the Harmonized System (HS) six digit level[2]. To compute tariffs in 2013, I employ direct text from the CAFTA-DR bill, provided online by the Office of the United States Trade Representative at the HS eight digit level. The treaty provides information on the base tariff rates of each eight digit good, and the tariff phase out scheme for each good (Appendix 11.0.1). Using information on each phase out scheme, I calculate the estimated tariff for each good in 2013. To combine these sources, I aggregate the CAFTA-DR tariff information to the six digit level using an unweighted average, since, to my knowledge, trade volume statistics are not readily available at the HS eight digit level. I then need to

[1] Additionally, replication code for this paper is available at https://github.com/jaysayre/cafta-dr

[2] The same source also provides harmonized system two digit level information, which I use for Figure 10.0.3

match up industrial products to their respective occupations to calculate the estimated input tariff that a given occupation faces. To do this, I use a standard product to occupation concordance table[3] to convert duties from the Harmonized System 6 digit level to the International Standard Industrial Classification (ISIC) four digit level[4], which I then take simple averages of to aggregate to the ISIC two digit level. For obvious reasons[5], the concordance table matches product information for only some of the occupation codes found in my survey data. Following the convention employed by the literature, I set the corresponding tariff faced by these occupations to zero.

For the survey data previously alluded to, I use two sources. Dominican Republic household survey data for 2002 comes from the Integrated Public Use Microdata Series International (IPUMS) database, produced by the Minnesota Population Center [2015] and conducted by the Oficina Nacional de Estadística, República Dominicana (ONE). The IPUMS data provides information on survey respondents' income (measured as monthly total income in 2002 Dominican pesos), municipality of residence, and occupation, provided at the ISIC two digit level, in addition to a host of other characteristics. Household level data for 2013 comes from the Demographic and Health Surveys (DHS) Program, and is produced by CESDEM and ICF International [2013]. Although the DHS dataset mostly provides information on the health characteristics of survey respondents, it also provides information on a respondent's occupation, place of residence, and occupational income (provided in weekly 2013 Dominican pesos), in addition to other factors. DHS occupational information is provided without reference to any existing occupational/industrial classification system, so I convert it manually to ISIC two digit codes (see Appendix 11.0.2). Although both sources provide weekly income data, I am primarily interested in data on the average wage rate of workers in a given occupation, so I divide this data by the average amount of hours worked per week by occupation (see Appendices 11.0.3 and 11.0.4).

Municipality level regressions

For my estimating equations at the municipal level, I use several sources to estimate the share of economic activity in a given municipality. Information on the number of firms by size (measured in terms

[3]Found at World Integrated Trade Solution (WITS), provided by the World Bank.
[4]Specifically, a table from HS 1996 TO ISIC Rev. 3.1.
[5]For example, it is unclear what effect various inputs tariffs have upon occupations in, say, the service sector.

of number of workers employed) in a given industry at the municipality level in the Dominican Republic is provided by the Directory of Companies and Establishments (*Directorio de Empresas y Establecimientos*) provided by ONE for 2010[6]. This information is provided at the International Standard Industrial Classification four digit level, which I sum up to the ISIC two digit level by municipality and number of workers employed. I then combine this plant level data with IPUMS survey data from 2002 and 2010 to provide clearer estimates of the number of workers employed in each industry. Recalling that occupational data for IPUMS is provided at the ISIC two digit level, I use this to compute the estimated share of industrial activity per municipality for both 2002 and 2010. Next, I merge each ISIC occupation code with the four digit ISIC duties computed above, and then estimate the average level of tariff in a municipality using a weighted average based upon the estimated number of workers in a given occupation in that municipality[7]. Finally, I aggregate the wage rate for workers listed as currently employed by the private sector who have occupations for in the 2013 DHS and 2002 IPUMS survey data to the municipality level and merge this to the average tariff data. To accurately compare changes in wages, I convert 2002 and 2013 Dominican monthly wages in pesos to 2013 US Dollars using the nominal exchange rate.

Occupational level regressions

Next, for my estimating equations at the occupational and municipal level, I aggregate the wage rate for workers listed as currently employed by the private sector in the the 2013 DHS and 2002 IPUMS survey data to the municipal and occupational (ISIC two digit) level, and as above, convert this income data to 2013 United States Dollars. This is then merged with the ISIC tariff data at the national level, which I aggregate to the ISIC two digit level using an unweighted average.

[6]Available online at ONE. Note: this page, in my experience, only works sporadically.

[7]i.e. Average Tariff$_m$ $= \bar{t}_m = \dfrac{\sum_{\text{All occupations}_m} |workers_{o,m}| \cdot t_o}{\sum_{\text{All occupations}_m} |workers_{o,m}|}$, where o is the occupation, m is a municipality, and t is the tariff rate

Chapter 6

Estimation Strategy

In many cases, the method of testing an empirical relationship between several economic variables must be derived from a theoretical model in order to be credible and avoid reporting spurious correlations. In the case of determining the effect of trade liberalization on regional wages, however, the theoretical relationship is well established, either by the Heckscher-Ohlin model, the specific-factors model of regional economies, the model presented by Amiti and Davis, or others. I remain agnostic between these models, but it is clear the relationship between tariff rates and worker wages is well established. Ultimately, I adopt an estimation strategy to examine the effect of changes in tariff rates on wages that bears similarities to each of Kovak [2013], Amiti and Davis [2012], and Amiti and Cameron [2012].

In a given year, the expected reduced form relationship between wages and the tariff rate at the either the municipality level (m) (or occupational level (o), within each municipality) is given by

$$\log(w_m) = \delta_0 \iota + \delta_1 \log(\bar{t}_m + 1) + Y_m \Gamma + Z_m \Theta + \varepsilon_m, \tag{6.1}$$

where w_m is the average wage rate in a municipality, I have $\iota = (1, \ldots, 1)^\top$ so I include a constant term δ_0, $\bar{t}_m$ is the average municipality level tariff rate (see section 5 for details on the construction of this variable for each estimation)[1], Y_m is a matrix formed by time-invariant controls (such as geographic characteristics of municipalities), and Z_m is a matrix formed by time varying characteristics (such as average education levels, measures of firm concentration within a region, or time varying geographic fixed effects). Here, β_1 is my coefficient of interest, ε_m are my municipality level disturbances, and $\log(\cdot)$ is the natural logarithm.

[1] I include 1 in the $\log(t+1)$ to make sure no values are $-\infty$.

As mentioned, I add geographic [2] fixed effects to some of my equations. The rationale for this is that there may be confounding time-varying macroeconomic shocks which effect the wages of workers at the municipality level, outside of my variables of interest. To the degree that these macroeconomic shocks affect the wages of workers, we would expect them to affect wages at the national (or perhaps provincial) level, but have few heterogeneous effects at the regional level. These time varying, national shocks should be absorbed by regional fixed effects.

However, I am interested in the effect of the change in tariffs due to CAFTA on the changes in wages in the Dominican Republic, and so I consider the following long differenced equation:

$$\Delta \log(w_m) = \beta_0 \iota + \beta_1 \Delta \log(\bar{t}_m + 1) + \Delta Z_m \Lambda + \nu_m. \tag{6.2}$$

Here, $\Delta \log(w_m) := \log(w_{m,2013}) - \log(w_{m,2002})$, $\Delta \log(\bar{t}_m + 1) := \log(\bar{t}_{m,2013} + 1) - \log(\bar{t}_{m,2002} + 1)$, and $\Delta Z_m := (Z_{m,2013} - Z_{m,2002})$. As this setup is somewhat complex, I provide some interpretation on how to read coefficient estimates of this relationship. It helps to note that using logarithm rules, the long differences can be rewritten as $\Delta \log(w_m) = \log\left(\frac{w_{m,2013}}{w_{m,2002}}\right)$ and likewise for tariffs. From this, the coefficient of interest can be interpreted as follows: a 1 percentage point increase in $(\bar{t}_{m,2013} + 1)/(\bar{t}_{m,2002} + 1)$, which corresponds to a *smaller* decrease in tariffs between 2002 and 2013, is associated with a β_1 percentage point larger increase in wages between 2002 and 2013, all else equal. Inversely, a 1 percentage point larger tariff decline is associated with a β_1 percentage point smaller increase (or larger decrease) in wages between 2002 and 2013, which is my preferred interpretation.

I now expound on the expected sign for the coefficient of interest. Ex ante, the sign of β_1 at the municipality level is somewhat ambiguous – one may expect that workers in inefficient import-competing firms will be hurt by trade liberalization, whereas workers in firms with a "love of variety" may benefit [Dixit and Stiglitz, 1977]. However, in a similar empirical study and reduced form relationship, Kovak [2013] finds municipalities in Brazil that experienced 10 percentage point larger trade liberalization experienced roughly 4 percentage point larger wage declines over a 9 year period. If the context of

[2] Either municipality level or province level fixed effects, where province is one administrative level above the municipality level in the Dominican Republic.

CAFTA-DR and the Dominican Republic is similar, we might expect that $\beta_1 > 0$. Ultimately, I expect that if there is a channel between decreases in input tariffs and changes in wages, it will appear more strongly at the occupational level[3] than the municipality level.

The advantages of such a panel estimation are numerous. First, the long differencing helps wash out measurement error and any problems with unit roots that may appear in a levels equation [Amiti and Cameron, 2012]. Second, the time-invariant controls Y_m (many of which I do not have data for) are wiped away, leaving only time varying characteristics and region-year specific fixed effects, which contain information on exogenous shocks to wages.

That said, there are several challenges to this estimation strategy. The first is that tariff changes may have been limited to only certain industries with insufficient political capital to lobby against them, and so tariff changes reflect endogenous industry performance. However, I make the case that tariff changes due to CAFTA are arguably exogenous to firm and industry performance in Section 4. Furthermore, even if tariff reform is not politically exogenous, and if political economy factors relevant to tariff negotiations are time-invariant, then using long differencing 6.2 would wipe those factors away.

The second concern is that changes in the wage rate from 2002 to 2013 may be a reflection of changes in supply, and not of changes in trade-induced demand. That is, changes in tariffs may lead workers, who are fairly mobile, to migrate within the Dominican Republic towards municipalities with higher average protective input tariffs. In general equilibrium, wages would change accordingly to this shift in supply. To get a sense of demographic and labor market changes in comparison to tariff changes across municipalities in the Dominican Republic, figures 10.0.5 to 10.0.10 plot average tariff rates and population statistics. Note that there are large migrations of people from the rural areas to large cities (such as southern Santo Domingo) during this time. To establish whether or not there is an association between tariff changes and migration, I estimate the reduced form relationship

$$\Delta \log(\text{Outcome of Interest}_m) = \alpha_0 \iota + \alpha_1 \Delta \log(\bar{t}_m + 1) + \eta_m. \tag{6.3}$$

The results of this estimation are displayed in Figure 9.0.3; I estimate whether there is an association at

[3] And correspondingly, even more strongly at the firm level, although I do not have data available at this level.

the municipality level between the change in average tariff rates and the change in population, change in total size of the workforce, and change in the employment rate. I find that (regardless of the inclusion of province level fixed effects or not), changes in tariffs have an insignificant effect on these outcomes. This, and the prior point, lead me to conclude that my estimation strategy will produce unbiased estimates for the effect of trade reform.

For my regressions at the occupation level, I adopt a reduced form relationship similar to that of Equation 6.2, but where wages are averages at the ISIC 2 digit occupational level within a given municipality, and tariffs are converted to occupational averages at the ISIC 2 digit level. Here, my reduced form relationship is given by

$$\Delta \log(w_{m,o}) = \beta_0 \iota + \beta_1 \Delta \log(\bar{t}_o + 1) + \Delta Z_{m,o} \Lambda + X_{m,o} \Omega + v_{m,o}. \tag{6.4}$$

In addition to the explanatory variables in Equation 6.2, I include additional variables that are measured as levels in either 2002, 2010, and 2013 in the matrix $X_{m,o}$. These variables include measurements of the estimated number of workers in the given occupation within a municipality, average education levels for a given occupation/municipality pair, and following from Holmes and Stevens [2014], a measure of the concentration of an occupation within a municipality. One challenge at the occupational level is that many of the occupations listed in my survey data do not have corresponding tariff information (see section 5 for more details). Consistent with the literature, I set the tariff change for these occupations to zero, although in some samples I drop them altogether or include a dummy variable to indicate whether an occupation is non-traded.

At the occupational/municipality level, I expect the effect of reduced trade barriers to have a much clearer impact on the wages of workers than at the municipality level. That said, *ex-ante* the sign of the coefficient of interest may be ambiguous. Following from the theory presented by Amiti and Davis [2012], there may be heterogeneous effects of trade reform on workers, depending on the characteristics of their respective firms. Upon lowering trade barriers, firms that import intermediate inputs may raise wages relative to non-importing firms, or firms that compete with inputs. As my data does not distinguish firms based on these characteristics, the sign of β_1 may be hard to predict. However, if higher trade barriers

were initially enacted to protect firms that compete with inputs, then I may expect that $\beta_1 > 0$. In other words, I expect that, on average, occupations facing larger tariff decreases were concentrated in industries that competed with imports to begin with. If this is the case, then upon inclusion of a dummy variable to indicate whether an occupation is classified as being in the non-traded sector (where the dummy equals one if the occupation does not produce traded goods), that coefficient should be negative (in general, I expect this coefficient to have the opposite sign of β_1). For the coefficient corresponding to occupation concentration, the expected sign comes from Holmes and Stevens [2014]. The authors' model suggests that adverse wage impacts due to import competition should be exaggerated in regions where one industry is more concentrated, so I expect that this coefficient is negative. I only include a measure of baseline occupation concentration in 2002, as one might expect that firm concentration after the implementation of CAFTA is endogenous to tariff rates.

Heterogeneity based on Education Levels

Consistent with the predictions of the Heckscher-Ohlin Model, I wish to test whether opening to trade reduces the wages of skilled laborers relative to unskilled laborers, as unskilled labor is relatively abundant in the Dominican Republic[4]. As such, I wish to test whether there are varying effects of trade reform on wages for high and low skilled workers. To test this, I subset my full dataset into two samples: one where all the respondents have only a primary-level education or below (0-8 years of education), or a secondary level education or higher. Although these subsamples do not fully capture whether a respondent performs a task that is high or low skilled for employment, on average I expect this distinction to reflect skilled or unskilled employment. Once I have split up the samples based on education levels, I then repeat all the same calculations as in the full sample. From here, I test the reduced form relationship given in Equation 6.4 for each of these subsamples.

[4]To see this, refer to Figures 9.0.1 and 9.0.2, which shows that on average, education levels in the Dominican Republic, as measured in years of education, are less than high school level. To the degree that education is a reliable proxy for skill level (I believe this is a reasonable assumption), this implies that the Dominican Republic is relatively abundant in unskilled labor.

Chapter 7

Results

I estimate the reduced form relationships above, particularly equations 6.2 and 6.4, using ordinary least squares (OLS) estimation. At the municipality level, Figure 9.0.4 displays the results of the estimation of equation 6.2. The main coefficients of interest (β_1's) are those displayed in the $\Delta \log(t+1)$ row. In the simplest specification (column 1), I observe that a 10 percentage point decrease in the tariff rate change between 2002 and 2013 is associated with a 2.9 percentage point larger decrease in the wage rate change between 2002 and 2013, ceteris paribus, which is a statistically significant result. However, upon including province level fixed effects (column 2), the point estimate for β_1 decreases, and is no longer statistically significant. In other specifications, the coefficient estimate is mostly statistically insignificant, but generally positive (i.e. $\beta_1 > 0$, as expected).

At the occupational level, Figure 9.0.5 displays the results of the estimation of equation 6.4. Again, the main coefficients of interest (β_1's) are those displayed in the $\Delta \log(t+1)$ row. In every specification, the point estimates for β_1 are all positive and highly statistically significant at the 1% level. Examining the results in column 3, which includes municipality level fixed effects, I observe that a 10 percentage point decrease in the tariff rate change is associated with a 4.5 percentage point larger decrease in the wage rate change between 2002 and 2013, ceteris paribus. In column 4, I include in my sample the occupations that are nontraded, which decreases my point estimate for β_1 slightly, indicating that workers not exposed to the direct effects of trade liberalization experienced larger wage growth during the period. Corroborating this, I include a dummy variable for whether an occupation is nontraded, and find that workers in occupations not facing competition from imports experienced .16 percentage point faster wage growth during my study period vis-à-vis workers in the traded sector. In column 6, I include a measure of

occupation/firm concentration within a municipality, which takes values in the interval $[0, 1]$. I find that occupations which are more highly clustered within a municipality experience larger wage growth during the period of trade liberalization, all else equal. This is inconsistent with the predictions of Holmes and Stevens [2014], however, this result is statistically insignificant. In column 7 I interact this measure of occupation concentration with the initial trade barriers faced by an occupation. Upon inclusion of this interaction, I still do not obtain the desired negative coefficient on the tariff change/occupation concentration interaction term, although this is again statistically insignificant. Surprisingly, including the number of workers in a municipality seems to have no effect on my results, suggesting that there are no heterogeneous impacts of trade liberalization in larger/smaller regions of the country.

For my occupational results segregated by the educational level of workers, see Figures 9.0.6 and 9.0.7. Between the two tables, many of the results remain broadly similar. In both, the coefficients of interest (β_1) are positive and statistically significant. For both, I consider a variety of different specifications for robustness, but the main column of interest in both is column 3, which includes municipality level fixed effects. In the high skill sample, I observe that a 10 percentage point decrease in the tariff rate change is associated with a 3.6 percentage point larger decrease in the wage rate change between 2002 and 2013, all else equal. In the low skill sample, I observe that a 10 percentage point decrease in the tariff rate change is associated with a 1.3 percentage point larger decrease (or smaller increase) in the wage rate change between 2002 and 2013, all else equal. Therefore, these tables suggest that relatively skilled workers were more adversely affected by trade liberalization than unskilled workers, a result consistent with the predictions of the Heckscher-Ohlin model.

Chapter 8

Conclusion

One of the most important questions in international trade is the effect of trade liberalization upon domestic firms and the wages paid to their workers. In this paper, I quantify the impact of the Central American Free Trade Agreement (CAFTA-DR) upon the wages of workers in the Dominican Republic at various levels of aggregation. The trade agreement has exploitable peculiarities, particularly that it lowered input tariffs on imports from member countries (including the United States) into the Dominican Republic but left export tariffs largely unchanged. Furthermore, I argue that the trade liberalization largely occurred uniformly, which minimizes concerns that tariff changes are endogenous to prior industry performance. Using panel estimation, I examine the effect of changes in tariffs from 2002 to 2013 on worker wage rates during the same period at both the municipality level and at the level of each occupation within a municipality. Since CAFTA was implemented in 2007, this panel allows for local labor markets to fully adjust to new changes in tariff barriers, and since tariffs remain largely constant between 2002 and 2006, changes in duties between 2002 and 2013 are mainly due to the free trade agreement, and not other sources. Additionally, I examine the heterogeneous impacts of trade based upon the skill level of workers, and test a key implication of the Heckscher-Ohlin model of international trade.

Ultimately, at the municipality level, I generally find no statistically significant effects of trade reform on the average wages of workers within a municipality. Since at this level I am examining the effect of an average tariff, weighted by the share of firms in each sector within a municipality, on average wages, it is natural to expect that this relationship will not be well established. However, at the occupational level, I find that a 10 percentage point decrease in the change in input tariffs during the period is associated with 4.5 percentage point lower wage growth during the study period. To corroborate these I findings, I find

workers in occupations in the nontraded sector experienced faster wage growth during the period than their counterparts in the traded sector. Finally, upon duplicating my estimating equations on both a high and low skill subsample, I find that the wages of skilled workers experienced slower wage growth than their unskilled counterparts from 2002 to 2013. If the Dominican Republic is relatively unskilled labor abundant (I present evidence that this is indeed the case), this is in line with theoretical predictions of the Heckscher-Ohlin Model for a developing country.

In this paper, I provide some of the first estimates of the effect of the Central American Free Trade Agreement on labor markets in the Dominican Republic. As free trade has become a contentious political issue, quantifying the effects, and winners and losers, of recent trade agreements is important in and of itself. However, due to the structure of the free trade agreement I am able to examine one particular channel through which trade reform affects wages, and contribute to the body of work focusing on the heterogeneous effects of import tariffs on wages.

Chapter 9

Tables

National statistics, 2002 and 2013

year	duty	income	edu	pop	empop
2002	9.090764	1.431982	9.140800	55242.200000	20481.251613
2010	1.751566	NaN	8.977756	60937.296774	19544.870968
2013	1.542419	1.469766	8.177072	NaN	NaN

Figure 9.0.1

Income measured as average hourly wage rate for respondents in terms of 2013 USD, duty is average municipality level tariff (see data section for construction), edu is average years of education of survey respondents. 2013 education data comes from the DHS, whereas 2002 and 2010 education data comes from IPUMS International. pop is the average population of each municipality, and empop is the average employed population in a given municpality.

Summary statistics at the provincial level, 2002 and 2013

Province	duty2002	duty2013	edu2002	edu2013	pop2002
Distrito Nacional	8.240694	1.399397	11.652920	10.053191	910076
Azua	8.183071	1.753554	6.673492	6.757792	208857
Baoruco	8.322165	1.164303	8.272419	6.676802	91480
Barahona	9.974991	1.152558	7.868843	8.018119	179239
Dajabon	7.928187	1.134944	8.369262	7.914828	62046
Duarte	9.021363	2.150494	7.696067	8.264359	283805
Elias Pina	8.318384	0.981835	7.842340	4.170476	63879
El Seibo	11.631243	2.669896	6.219797	4.947990	89261
Espaillat	8.223223	1.654410	7.977944	8.108730	225091
Independencia	9.533839	1.156563	7.978710	6.521484	50833
La Altagracia	9.982569	1.786783	6.806431	6.957379	182020
La Romana	8.413022	1.294545	8.513383	7.738636	219812
La Vega	10.979687	2.487073	7.293923	7.205999	385101
Maria Trinidad Sanchez	8.741044	1.645261	7.940342	8.760175	135727
Monte Cristi	9.753788	2.061071	7.011730	6.029448	111014
Pedernales	10.943896	2.475274	7.120327	5.285714	21207
Peravia	9.504346	1.125880	7.032138	7.596199	169865
Puerto Plata	8.656353	1.606013	7.895205	9.336413	312706
Hermanas Mirabal	9.787518	1.182684	8.771925	7.679012	96356
Samana	6.817380	0.666834	7.455959	7.902262	91875
San Cristobal	7.379443	1.433770	8.032860	7.803579	532880
San Juan	9.465810	1.388402	7.987854	5.739059	241105
San Pedro De Macoris	9.755582	1.132217	7.313653	7.423306	301744
Sanchez Ramirez	9.407157	1.497831	8.391827	7.505265	151179
Santiago	8.647065	1.775339	7.471126	7.336411	908250
Santiago Rodriguez	8.681414	1.505634	8.338438	8.020489	59629
Valverde	10.690356	2.246039	7.437436	7.623996	158293
Monsenor Nouel	7.752975	0.811129	8.657205	9.550799	167618
Monte Plata	9.026874	1.131544	7.453535	6.097778	180376
Hato Mayor	11.226879	1.671579	6.722243	7.027014	87631
San Jose De Ocoa	12.703298	3.480024	5.852583	7.000490	62368
Santo Domingo	8.129143	0.878310	9.181434	9.282954	1821218

Figure 9.0.2

duty is average provincial level tariff (see data section for construction), edu is average years of education of survey respondents. 2013 education data comes from the DHS, 2002 education data comes from IPUMS International. pop is the total population of a province.

Summary statistics at the provincial level, 2002 and 2013 (continued)

Province	emprate2002	emprate2010	income2002	income2013	pop2010
Distrito Nacional	0.680864	0.558596	2.610931	2.402139	965040
Azua	0.536060	0.418833	0.876307	1.059907	214311
Baoruco	0.455652	0.350401	1.018178	1.250049	97313
Barahona	0.512306	0.387926	1.713665	1.341210	187105
Dajabon	0.589380	0.457170	1.195142	1.164268	63955
Duarte	0.576135	0.471745	0.769377	1.314396	289574
Elias Pina	0.471521	0.292214	1.073069	0.835818	63029
El Seibo	0.590494	0.465563	0.728377	0.965732	87680
Espaillat	0.613326	0.534692	1.224801	1.287659	231938
Independencia	0.454935	0.376758	1.290767	1.233975	52589
La Altagracia	0.669881	0.637948	1.240365	1.129366	273210
La Romana	0.679967	0.532364	1.200504	1.519451	245433
La Vega	0.596732	0.503689	0.861513	1.225923	394205
Maria Trinidad Sanchez	0.553301	0.481833	0.871600	1.354070	140925
Monte Cristi	0.589138	0.474859	0.789282	1.290063	109607
Pedernales	0.627069	0.549792	1.304174	1.004340	31587
Peravia	0.596822	0.459732	0.764039	1.169369	184344
Puerto Plata	0.607972	0.490467	0.902419	1.039885	321597
Hermanas Mirabal	0.581598	0.453808	0.845411	1.175354	92193
Samana	0.547195	0.461109	0.888578	1.523580	101494
San Cristobal	0.614950	0.493485	1.035849	1.194254	569930
San Juan	0.490393	0.422654	1.078948	0.998734	232333
San Pedro De Macoris	0.647417	0.485386	0.861584	0.982007	290458
Sanchez Ramirez	0.531247	0.438957	0.880525	1.488925	151392
Santiago	0.653234	0.533027	0.903622	1.312270	963422
Santiago Rodriguez	0.525596	0.406506	0.913203	1.277552	57476
Valverde	0.657002	0.536210	0.898341	1.263166	163030
Monsenor Nouel	0.559126	0.470477	1.047613	1.437918	165224
Monte Plata	0.579148	0.450097	1.200484	1.198388	185956
Hato Mayor	0.591947	0.452315	0.852228	1.642278	85017
San Jose De Ocoa	0.612520	0.517947	0.834089	1.241903	59544
Santo Domingo	0.634053	0.530573	1.500772	1.330638	2374370

Figure 9.0.2

Income measured as average hourly wage rate in terms of 2013 USD within a province. emprate is the employment rate, calculated as the total employed work force of a province over the total provincial population of working age. pop is the total population of a province.

Municipality level effect of tariff changes on migration and size of work force

	Log Change in	Population	Log Change in	Employed Workers	Log Change in	Employment Rate
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	−0.00	0.04	-0.15^{***}	-0.13^{***}	-0.20^{***}	-0.20^{***}
	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.02)
$\Delta \log(t+1)$	−0.03	−0.02	−0.01	−0.03	0.03	−0.01
	(0.05)	(0.04)	(0.06)	(0.04)	(0.04)	(0.02)
Province FE	No	Yes	No	Yes	No	Yes
R^2	0.01	0.42	0.00	0.42	0.01	0.45
N	155	155	155	155	155	155

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$, Clustered-robust standard errors in parentheses

Figure 9.0.3

Observations are municipalities in the Dominican Republic (second administrative level), and tariffs are averages of estimated tariffs for ISIC 2 digit occupational codes, weighted by the number of workers in a given occupation in that municipality (see section 5 for more details). Standard errors are clustered at the province level. Columns 2, 4, and 6 have province level fixed effects. "pop" is the estimated population in a given municipality, "empop" is the size of the work force employed by the private or public sector (excludes self-employment). Employment rate is calculated as the total employed work force of a municipality over the total municipal population of working age.

Municipality level effect of tariff changes on change in log wage rate from 2002 to 2013 (measured in 2013 USD)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	0.45***	0.08	1.07***	0.68	0.27	−0.00	0.56	−0.58
	(0.16)	(0.14)	(0.26)	(0.47)	(0.20)	(0.44)	(0.70)	(0.97)
$\Delta \log(t+1)$	0.29*	0.18	0.22	0.27	0.20	−0.08	0.17	−0.82
	(0.16)	(0.15)	(0.17)	(0.17)	(0.16)	(0.42)	(0.38)	(0.71)
edu02			−0.12***	−0.16***			−0.11	−0.14***
			(0.04)	(0.05)			(0.19)	(0.05)
edu10			0.04	0.04			−0.00	0.22
			(0.04)	(0.04)			(0.18)	(0.14)
edu13				0.10***			0.10***	0.10***
				(0.02)			(0.02)	(0.02)
chngedu					0.07	−0.06		
					(0.04)	(0.20)		
$\Delta \log(t+1) \times$chngedu						−0.14	−0.05	
						(0.19)	(0.18)	
$\Delta \log(t+1) \times$edu10								0.19
								(0.12)
Province FE	No	Yes	No	Yes	Yes	Yes	Yes	Yes
R^2	0.03	0.43	0.10	0.60	0.45	0.45	0.60	0.61
N	130	130	130	130	130	130	130	130

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$, Clustered-robust standard errors in parentheses

Figure 9.0.4

Observations are municipalities in the Dominican Republic (second administrative level), and tariffs are averages of estimated tariffs for ISIC 2 digit occupational codes, weighted by the number of workers in a given occupation in that municipality (see section 5 for more details). Standard errors are clustered at the province level. edu is average years of education of survey respondents in a municipality in a given year, and chngedu is the change of average years of education from 2002-2010.

Effect of tariff changes on change in log wage rate from 2002 to 2013 (measured in 2013 USD)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	0.46^{***}	0.33^{***}	0.40^{***}	0.35^{***}	0.46^{***}	0.36^{***}	0.23^{*}	-0.01	0.24^{**}
	(0.06)	(0.04)	(0.07)	(0.05)	(0.07)	(0.08)	(0.13)	(0.13)	(0.11)
$\Delta \log(t+1)$	0.49^{***}	0.40^{***}	0.45^{***}	0.38^{***}	0.45^{***}	0.44^{***}	0.35^{***}	0.38^{***}	0.45^{***}
	(0.05)	(0.04)	(0.05)	(0.04)	(0.05)	(0.05)	(0.09)	(0.07)	(0.05)
nontraded					-0.16^{*}				-0.18^{*}
					(0.09)				(0.09)
occupationconc02						1.55	5.49		
						(0.95)	(3.71)		
$\Delta \log(t+1) \times$ occupationconc02							2.70		
							(2.36)		
numworkers02								0.00^{*}	
								(0.00)	
$\Delta \log(t+1) \times$ numworkers02								0.00	
								(0.00)	
numworkers10									0.00^{***}
									(0.00)
$\Delta \log(t+1) \times$ numworkers10									-0.00
									(0.00)
Municipality FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nontraded Included	No	Yes	No	Yes	Yes	No	No	No	Yes
R^2	0.06	0.07	0.27	0.24	0.24	0.27	0.27	0.28	0.25
N	980	1184	980	1184	1184	980	980	980	1184

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$, Clustered-robust standard errors in parentheses

Figure 9.0.5

Observations are each occupation within a municipality. Tariff rates are estimated duties for each ISIC 2 digit occupational code, using a concordance table from HS1996 to ISIC Rev.3.1. Standard errors are clustered at the municipality level. numworkers is the estimated number of workers within a municipality in the given occupation. occupationconc is the measure of the concentration of a ISIC 2 digit occupation within a municipality. nontraded is a binary variable taking the value one if an occupation has no corresponding tariff information, and so the change in tariff rate has been set to zero.

Heterogeneity: Effect of tariff changes on change in log wage rate from 2002 to 2013, high skill sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	0.30^{***}	0.37^{***}	0.40^{***}	3.17^{***}	-2.30^{***}	0.37^{***}	-2.72^{***}	2.89^{***}	-2.66^{***}
	(0.05)	(0.10)	(0.05)	(0.31)	(0.36)	(0.12)	(0.41)	(0.31)	(0.38)
$\Delta \log(t+1)$	0.44^{***}	0.48^{***}	0.36^{***}	0.17^{*}	0.29^{***}	0.37^{***}	0.28^{***}	0.16^{**}	0.30^{***}
	(0.05)	(0.07)	(0.06)	(0.09)	(0.09)	(0.09)	(0.09)	(0.07)	(0.09)
nontraded		−0.11		−0.04	−0.08	−0.00	1.58^{**}		−0.12
		(0.12)		(0.13)	(0.13)	(0.14)	(0.70)		(0.13)
edu02				-0.22^{***}				-0.22^{***}	
				(0.03)				(0.02)	
edu13					0.20^{***}		0.24^{***}		0.20^{***}
					(0.03)		(0.03)		(0.03)
Change in employment						−0.00			
						(0.00)			
edu13:nontraded							-0.13^{**}		
							(0.06)		
numworkers02								0.00^{**}	
								(0.00)	
$\Delta \log(t+1) \times$numworkers02								−0.00	
								(0.00)	
numworkers10									0.00^{***}
									(0.00)
$\Delta \log(t+1) \times$numworkers10									-0.00^{*}
									(0.00)
Municipality FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.08	0.08	0.29	0.41	0.37	0.29	0.38	0.41	0.38
N	765	765	765	765	765	765	765	765	765

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$, Clustered-robust standard errors in parentheses

Figure 9.0.6

Observations are each occupation within a municipality. Tariff rates are estimated duties for each ISIC 2 digit occupational code, using a concordance table from HS1996 to ISIC Rev.3.1. Standard errors are clustered at the municipality level. The high skill sample only contains survey respondents with 9 or more years of education. numworkers is the estimated number of workers within a municipality in the given occupation, and change in employment is the change in numworkers from 2002 to 2010. edu is average years of education of workers in an occupation within a municipality in a given year. nontraded is a binary variable taking the value one if an occupation has no corresponding tariff information (i.e. it produces goods that are not traded) and so the change in tariff rate has been set to zero.

Heterogeneity: Effect of tariff changes on change in log wage rate from 2002 to 2013, low skill sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	0.37***	0.57***	0.30***	0.82***	0.20	0.49***	0.21	0.69***	0.16
	(0.05)	(0.08)	(0.06)	(0.15)	(0.18)	(0.10)	(0.20)	(0.21)	(0.25)
$\Delta \log(t+1)$	0.15***	0.29***	0.13**	0.15*	0.23***	0.24***	0.23***	0.06	0.22***
	(0.05)	(0.07)	(0.06)	(0.08)	(0.07)	(0.07)	(0.07)	(0.06)	(0.07)
nontraded		−0.34***		−0.18	−0.26**	−0.29**	−0.31		−0.29**
		(0.10)		(0.12)	(0.11)	(0.12)	(0.31)		(0.12)
edu02				−0.09***				−0.10***	
				(0.03)				(0.03)	
edu13					0.04		0.04		0.04
					(0.03)		(0.03)		(0.03)
Change in employment						0.00			
						(0.00)			
edu13:nontraded							0.01		
							(0.07)		
numworkers02								0.00	
								(0.00)	
$\Delta \log(t+1) \times$numworkers02								0.00	
								(0.00)	
numworkers10									0.00
									(0.00)
$\Delta \log(t+1) \times$numworkers10									0.00
									(0.00)
Municipality FE	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.01	0.02	0.24	0.27	0.25	0.25	0.25	0.26	0.25
N	734	734	734	734	734	734	734	734	734

$^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$, Clustered-robust standard errors in parentheses

Figure 9.0.7

Observations are each occupation within a municipality. Tariff rates are estimated duties for each ISIC 2 digit occupational code, using a concordance table from HS1996 to ISIC Rev.3.1. Standard errors are clustered at the municipality level. The low skill sample only contains survey respondents with 0-8 years of education. numworkers is the estimated number of workers within a municipality in the given occupation, and change in employment is the change in numworkers from 2002 to 2010. edu is average years of education of workers in an occupation within a municipality in a given year. nontraded is a binary variable taking the value one if an occupation has no corresponding tariff information and so the change in tariff rate has been set to zero.

Chapter 10

Graphs

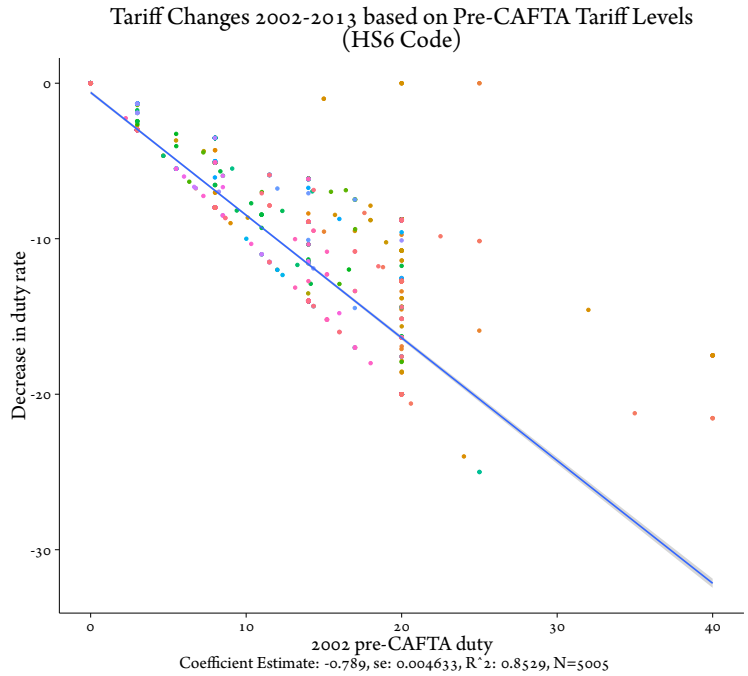


Figure 10.0.1

Source: Central American Free Trade Agreement, Office of the United States Trade Representative & World Trade Organization, author's calculations

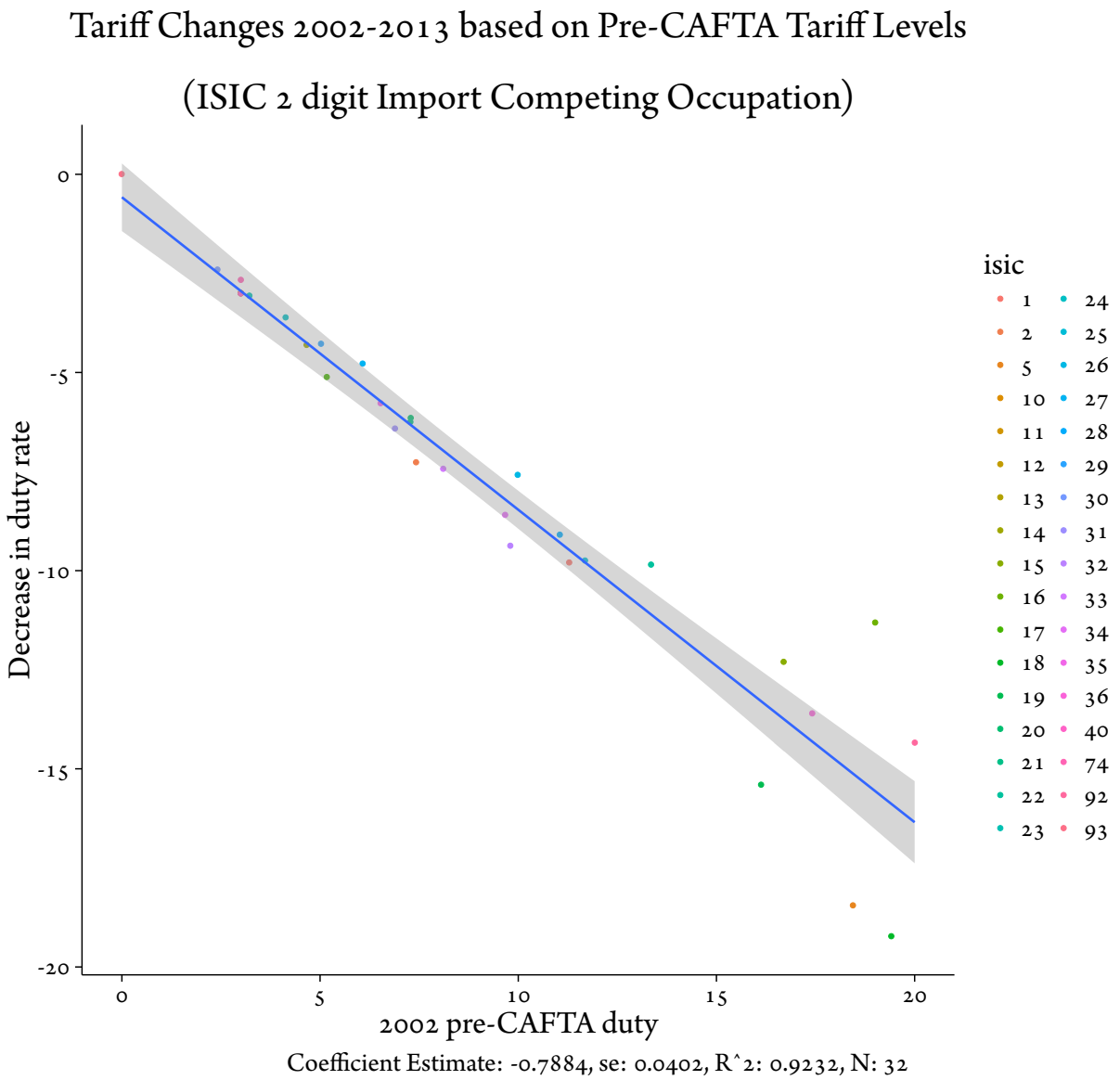
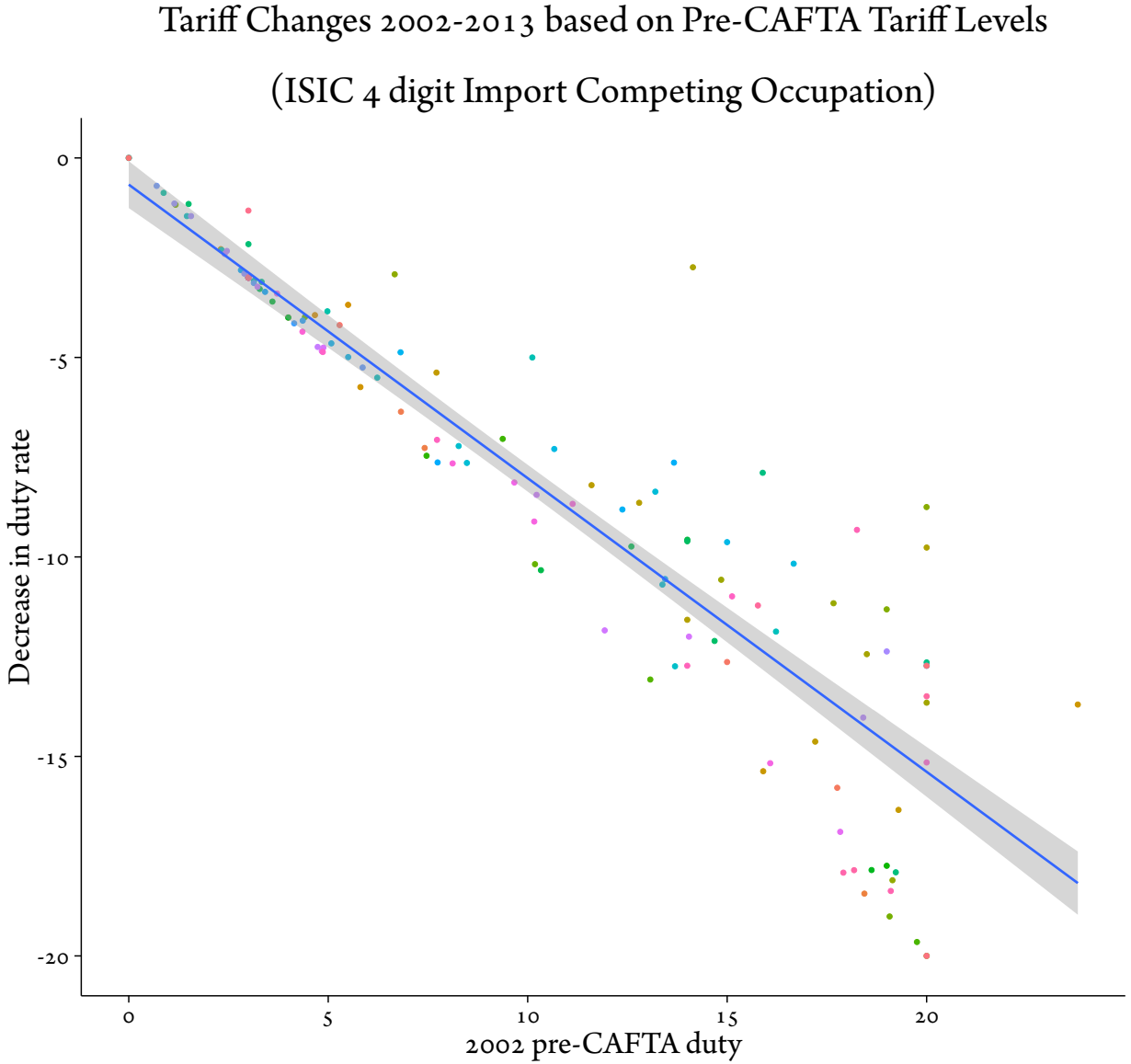


Figure 10.0.2

Source: Central American Free Trade Agreement, Office of the United States Trade Representative & World Trade Organization, author's calculations



Coefficient Estimate: -0.7359, se: 0.02554, R^2: 0.8539, N: 142

Figure 10.0.3

Source: Central American Free Trade Agreement, Office of the United States Trade Representative & World Trade Organization, author's calculations

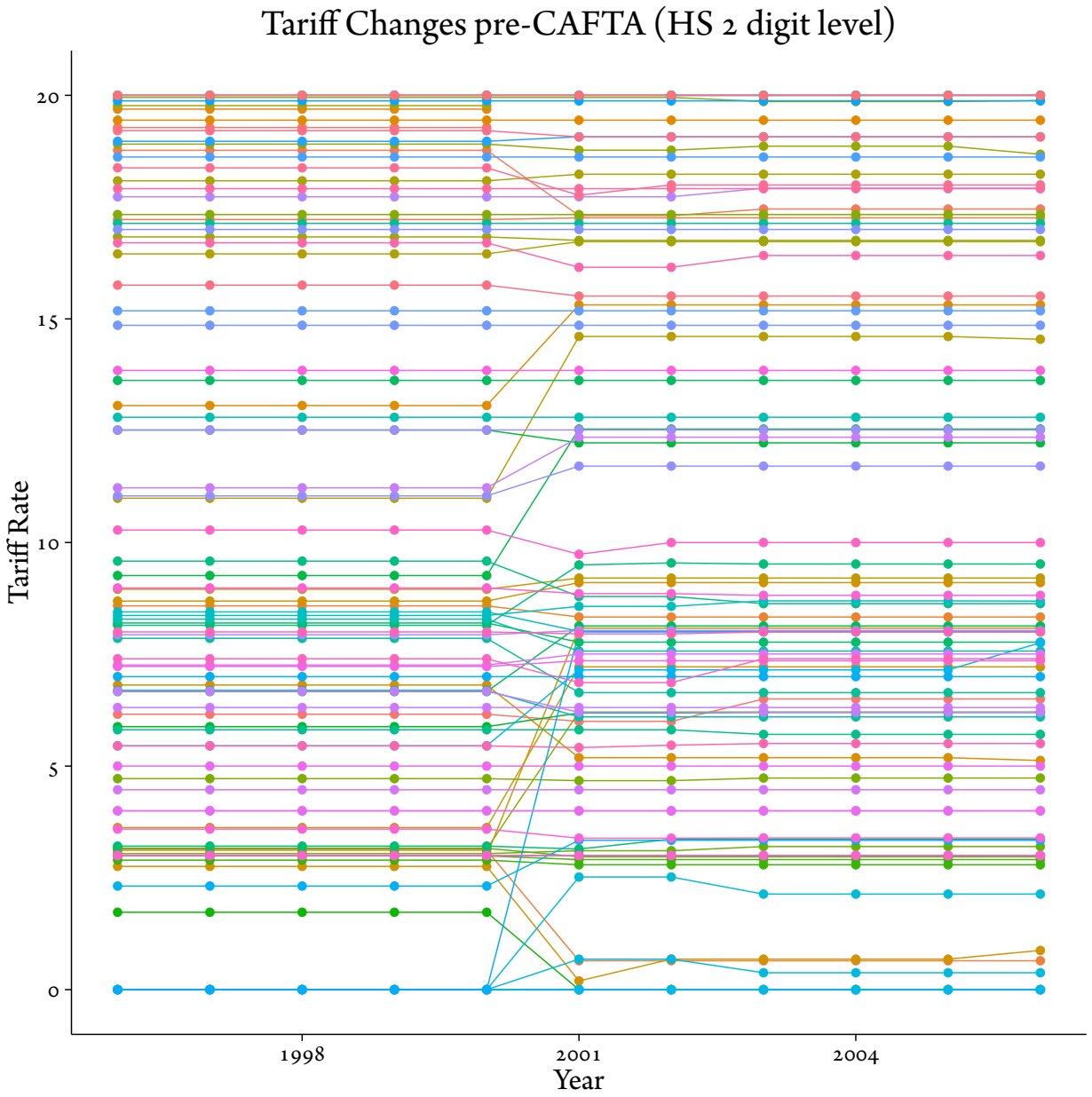


Figure 10.0.4
Source: World Trade Organization

Change in total employed workforce by municipality from 2002 to 2010

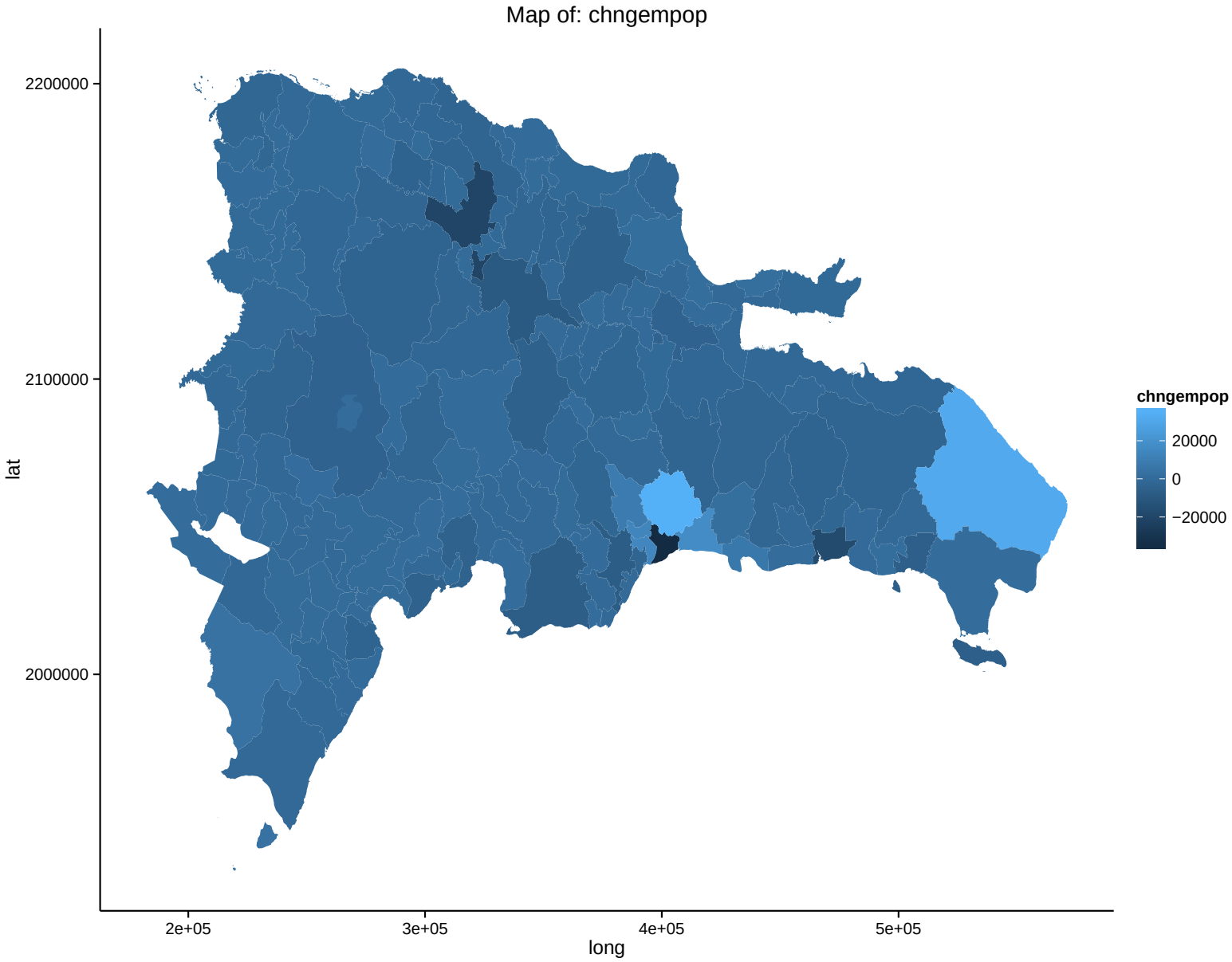


Figure 10.0.5
Source: ONE

Change in total population by municipality from 2002 to 2010

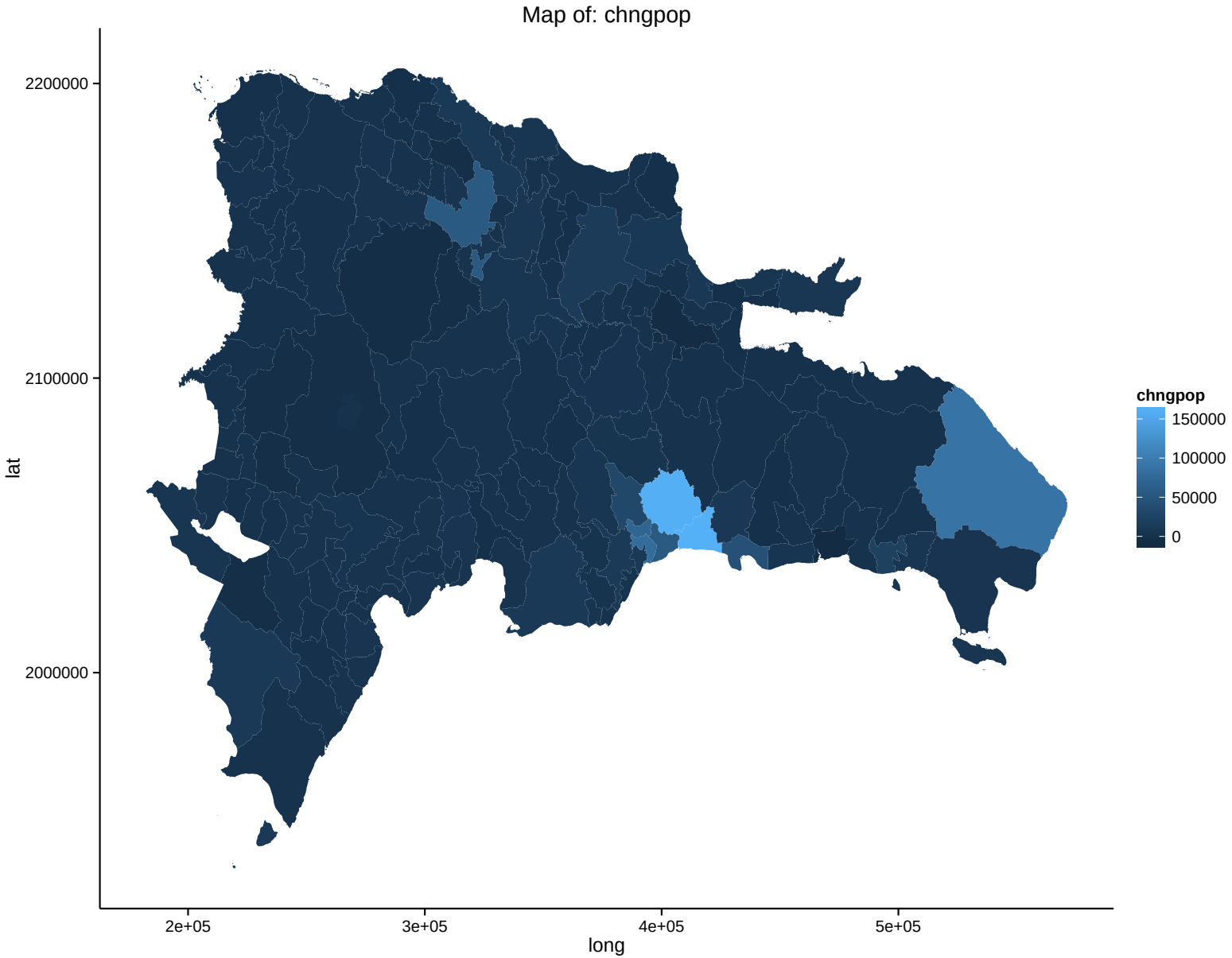


Figure 10.0.6
Source: ONE

Change in employment rate by municipality from 2002 to 2010

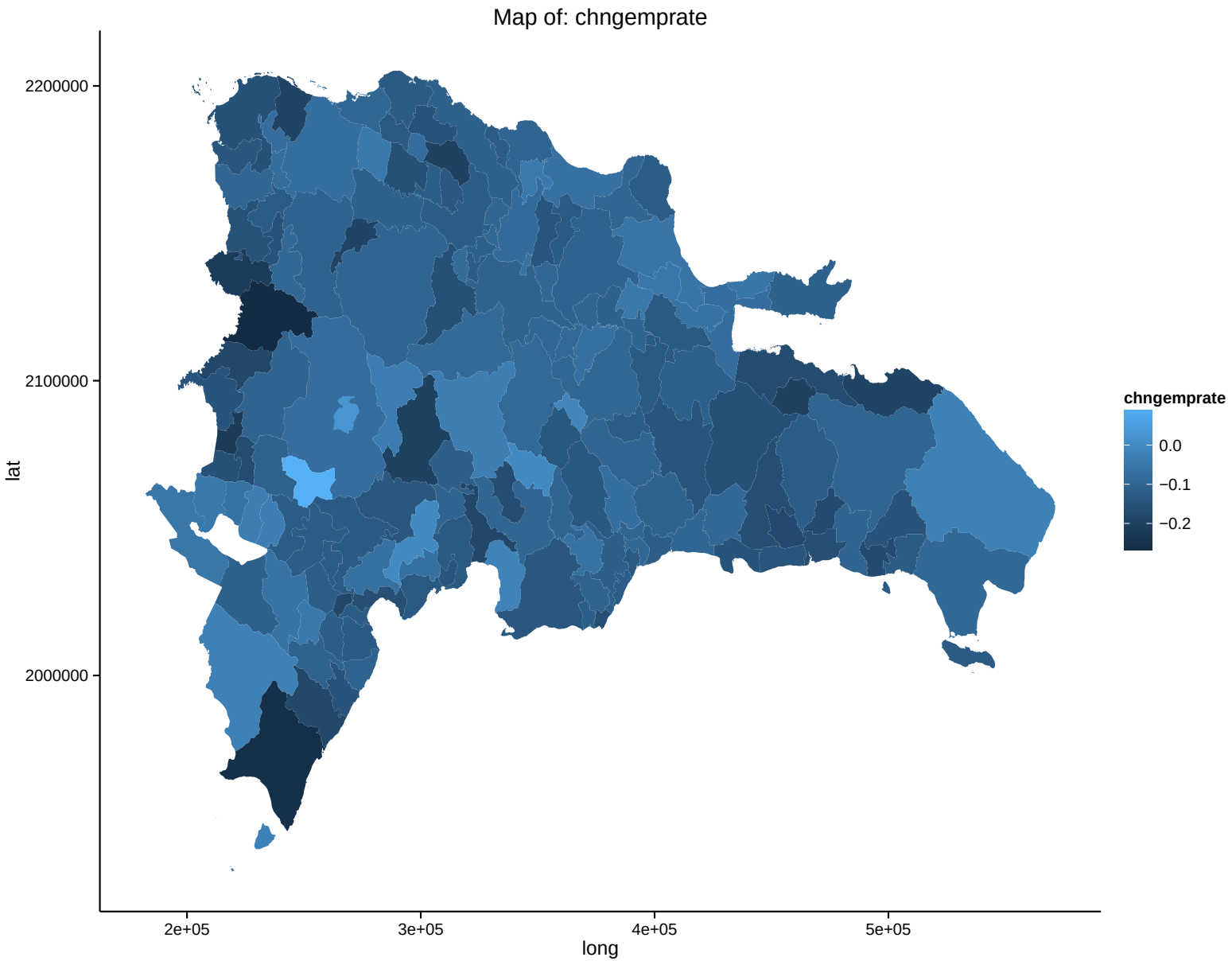


Figure 10.0.7
Source: ONE, Author's calculations

Municipality average tariff rate (weighted by share of industries) in 2002

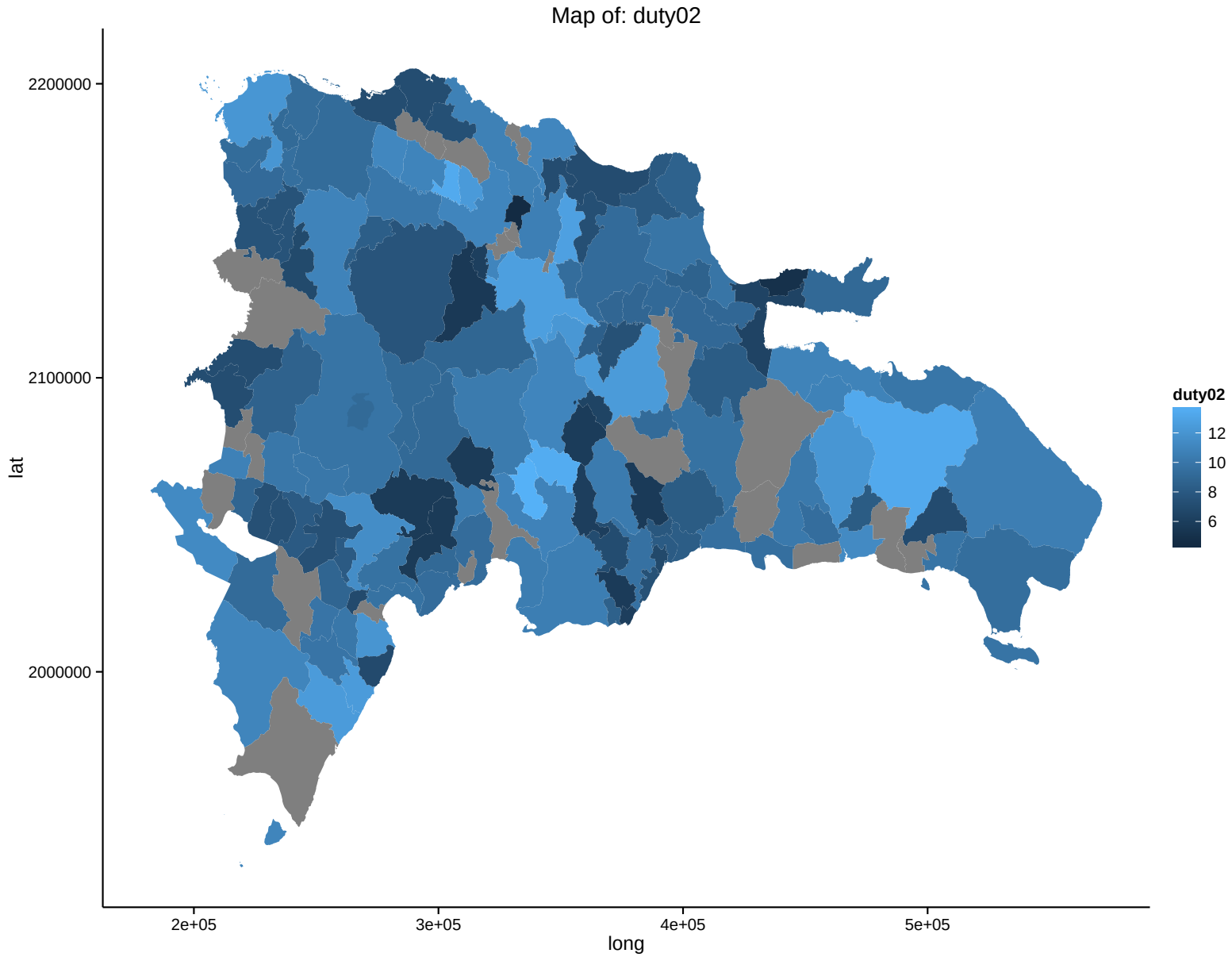


Figure 10.0.8

Source: Author's calculations. Note that grey municipalities have no corresponding survey data.

Municipality average tariff rate (weighted by share of industries) in 2013

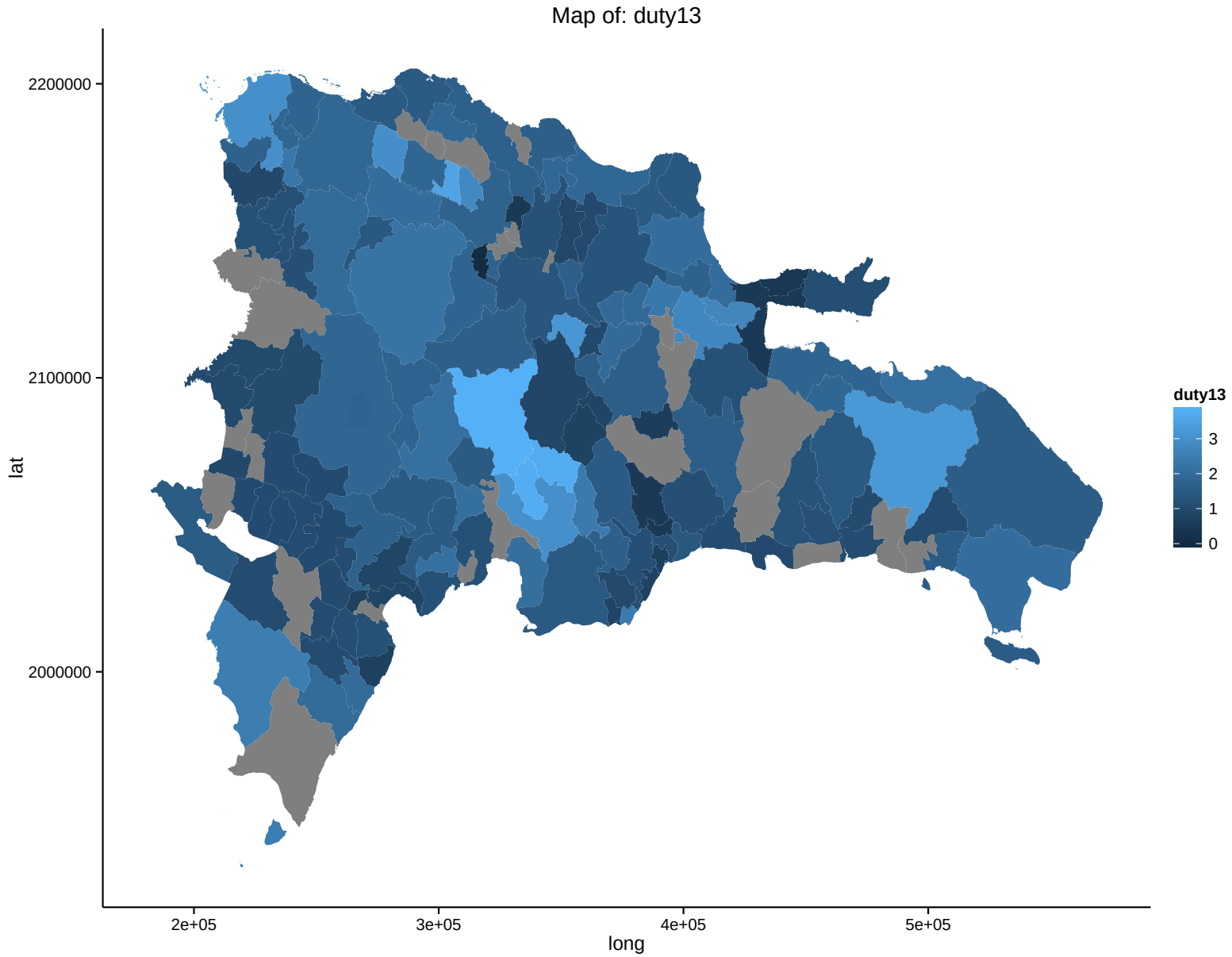


Figure 10.0.9

Source: Author's calculations. Note that grey municipalities have no corresponding survey data.

Average change in tariff rate faced by a municipality from 2002 to 2013

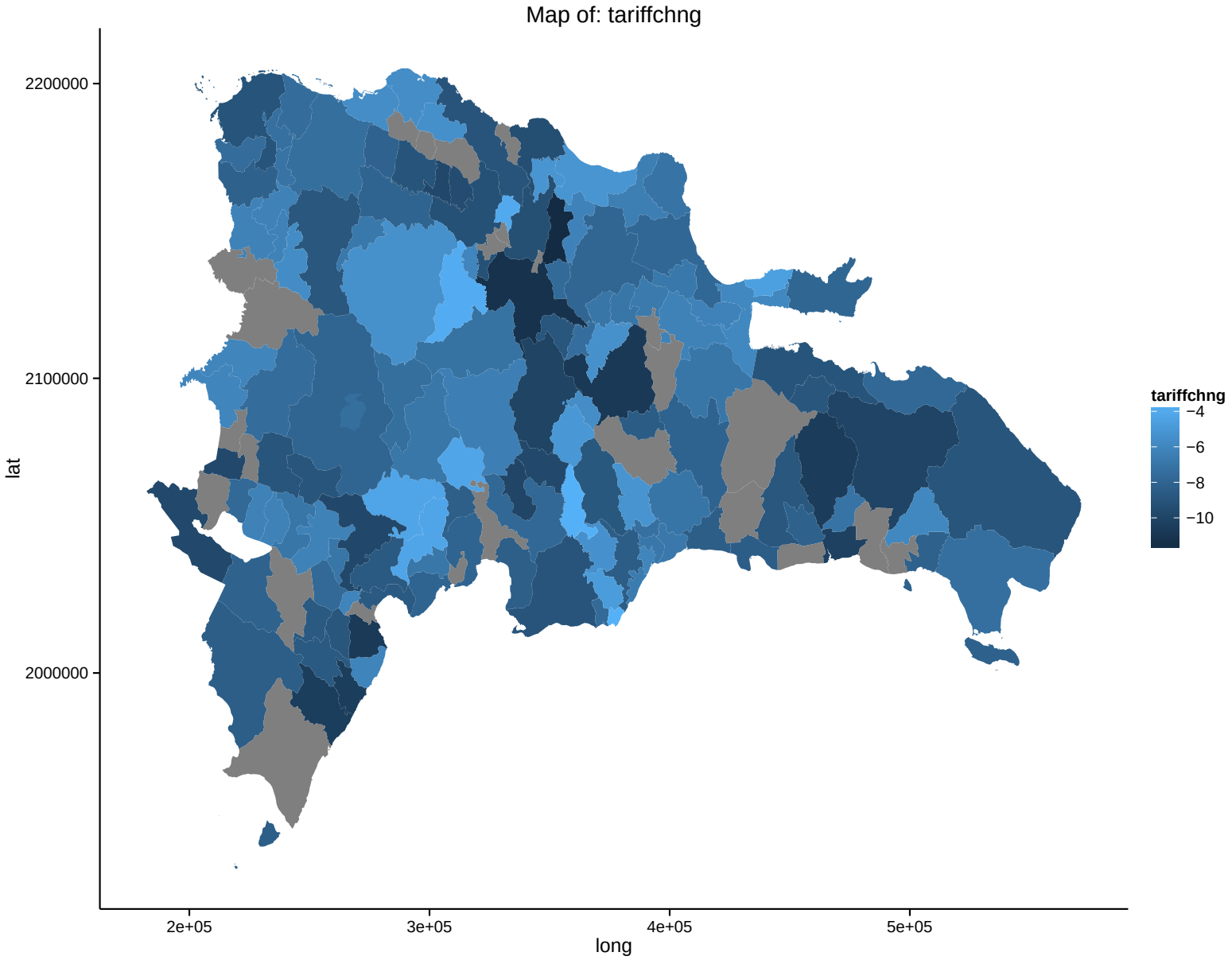


Figure 10.0.10

Source: Author's calculations. Note that grey municipalities have no corresponding survey data.

Chapter 11

Data Appendix

Estimated CAFTA-DR tariffs computed using the following scheme:

Cat.	Number of Goods	Phase Out Scheme
A	4326	Good is now duty free (0% tariff rate).
B	381	Good will be reduced to duty free in 5 equal annual stages, duty free by 2012.
C	692	Good will be reduced to duty free in 10 equal annual stages, duty free by 2017.
D	121	Good will be reduced to duty free in 15 equal annual stages, duty free by 2022.
G	903	Good remains duty free.
M	313	2007-2008 reduced by 2% of base rate. 2009-2013 reduced by 8% of base rate. 2014-2016 reduced by 16% percent of base rate. Duty free by 2017.
N	22	Good will have tariff rate reduced in 12 equal annual stages, duty free by 2019.
SP	48	Special exemption, usually means good has a non-tariff barrier such as a quota.
V	2	Good will remain at base rate until 2017. From 2017-2022 reduced by 8% of base rate, 2022-2026 reduced by 12 percent of base rate. Duty free by 2027.
W	2	Good will have tariff rate reduced in 4 equal annual stages, duty free by 2011.
X	21	Good will have tariff rate reduced in 4 equal annual stages (first year is exempt), duty free by 2012.
Y	2	Good will have duties reduced by 15 percent of base rate for first five years (2007-2012), 5% for next four years after that (2012-2016), duty free by 2017.

Figure 11.0.1

Source: Office of the United States Trade Representative, CAFTA-DR Annex 3.3

Conversion Table for DHS occupations to ISIC 2 digit code

Occupation	ISIC 2 digit
peones de la industria manufacturera	15,16,17,18,19,20,21,22,23,24,25 26,27,28,29,30,31,32,33,34,35,36,37
conductores de vehículos de motor	60
personal de enfermería y partería de nivel superior	85
profesionales de nivel medio de servicios de administración	74
médicos y profesionales afines (excepto el personal de enfermería y partería)	85,86
vendedores y demostradores de tiendas y almacenes	52
maestros de nivel superior de la enseñanza primaria y preescolar	80
vendedores de quioscos y de puestos de mercado	52
personal doméstico y afines, limpiadores, lavanderos y planchadores	90
profesionales en ciencias biológicas y otras disciplinas relativas a los seres o	73
otros directores de departamentos	74
oficiales y operarios de la construcción (obra gruesa) y afines	45
peones de la minería y la construcción	10,11,12,13,14
agricultores y trabajadores calificados de cultivos para el mercado	1
secretarios y operadores de máquinas de oficina	74
conserjes, lavadores de ventanas y afines	90
mecánicos y ajustadores de máquinas	50
mecánicos y ajustadores de equipos eléctricos y electrónicos	40
mensajeros, porteadores, porteros y afines	53,93
otros profesionales de la enseñanza	80
otros trabajadores de servicios personales a particulares	93
oficiales y operarios del tratamiento de la madera, ebanistas y afines	20,36
peones del transporte	63
personal de los servicios de protección y seguridad	75
productores y trabajadores agropecuarios calificados	1
técnicos en programación y control informáticos	72
profesionales de nivel medio en operaciones financieras y comerciales	65
oficiales y operarios de los textiles y de la confección y afines	17,18
oficiales y operarios de la construcción (trabajos de acabado) y afines	45
cajeros, taquilleros y afines	65
maestros de nivel medio de la enseñanza primaria	80
trabajadores de los cuidados personales y afines	93
don't know	99
peones agropecuarios, forestales, pesqueros y afines	01,05
operadores de equipos ópticos y electrónicos	72,33
vendedores ambulantes y afines	52
gerentes de empresa	74
personal de intendencia y de restauración	55
empleados encargados del registro de materiales y de transportes	60,63
herreros, herramentistas y afines	28,29
miembros del poder ejecutivo y de los cuerpos legislativos	75
directores de departamentos de producción y operaciones	74
técnicos en ciencias físicas y químicas y en ingeniería	74,24
operadores de instalaciones de vidriería, cerámica y afines	26
fuerzas armadas	75
pescadores, cazadores y tramperos	1,5
arquitectos, ingenieros y afines	74
empleados de servicios de información a la clientela	64,72
pintores, limpiadores de fachadas y afines	45,91
moldeadores, soldadores, chapistas, caldereros	28,29,3
otros operadores de máquinas y montadores	15,16,17,18,19,20,21,22,23,24,25,26 27,28,29,30,31,32,33,34,35,36,37

Figure 11.0.2

Occupation	ISIC 2 digit
operadores de máquinas para fabricar productos textiles y artículos de piel y cu	17,19
personal directivo de la administración pública	75
personal al servicio directo de los pasajeros	60
jefes de pequeñas poblaciones	75
inspectores de obras, seguridad y salud y control de calidad	74
profesionales de nivel medio de actividades artísticas, espectáculos y deportes	92
profesores de universidades y otros establecimientos de la enseñanza superior	80
operadores de instalaciones de procesamiento de la madera y de la fabricación de	20,21
oficiales y operarios del procesamiento de alimentos y afines	15,16
criadores y trabajadores pecuarios calificados de la cría de animales para el me	1
archiveros, bibliotecarios, documentalistas y afines	92
otros oficinistas	74
alfareros, operarios de cristalerías y afines	52
profesionales del derecho	75
operadores de maquinaria agrícola móvil y de otras máquinas móviles	1
sacerdotes de distintas religiones	91
recolectores de basura y afines	90
operadores de máquinas para fabricar productos de caucho y de material plástico	25
limpiabotas y otros trabajadores callejeros	52,93
astrólogos, adivinadores y afines	93
operadores de máquinas para fabricar productos químicos	24
operadores de máquinas para elaborar alimentos y productos afines	15
especialistas en ciencias sociales y humanas	73
oficiales y operarios de las pieles, cuero y calzado	18,19
operadores de máquinas de imprenta, encuadernación y fabricación de productos de	21,22
profesionales de nivel medio de la medicina moderna y la salud (excepto el perso	85
operadores de máquinas para trabajar metales y productos minerales	26,27,28
otros maestros e instructores de nivel medio	80
profesores de la enseñanza secundaria	80
maestros de nivel medio de la enseñanza preescolar	80
empleados de bibliotecas y servicios de correos y afines	92
especialistas en organización y administación de empresas y afines	74
oficiales y operarios de las artes gráficas y afines	92
operadores de instalaciones mineras y de extracción y procesamiento de minerales	10,11,12,13,14
operadores de instalaciones de producción de energía y afines	40
trabajadores y asistentes sociales de nivel medio	85
personal de enfermería y partería de nivel medio	85
físicos, químicos y afines	74,24
trabajadores forestales calificados y afines	2
other	99
agentes de las administraciones públicas de aduanas, impuestos y afines	75
escritores, artistas creativos y ejecutantes	92
montadores	29,30,31,32,33,34,35,36
directores generales y gerentes generales de empresa	74
agentes comerciales y corredores	70
mecánicos de precisión en metales y materiales similares	26,27,28
profesionales de la informática	72
técnicos de nivel medio en ciencias biológicas, agronomía, zootecnia y afines	1
auxiliares laicos de los cultos	91
marineros de cubierta y afines	61
dirigentes y administradores de organizaciones especializadas	74
técnicos en navegación marítima y aeronáutica	61,62
auxiliares contables y financieros	74
modelos de modas, arte y publicidad	92
maestros e instructores de nivel superior de la enseñanza especial	80

Figure 11.0.2

Average hours worked per week for a given economic activity in 2002

BANCO CENTRAL DE LA REPUBLICA DOMINICANA
DEPARTAMENTO DE CUENTAS NACIONALES Y ESTADISTICAS ECONOMICAS

DIVISION DE ENCUESTAS

Población Ocupada Perceptora de Ingresos y Horas Trabajadas a la Semana por Deciles de Ingresos según Rama de Actividad Económica, año 2002

Rama de Actividad Económica	Perceptores de Ingresos	Deciles									
		1	2	3	4	5	6	7	8	9	10
Población Ocupada	**3,029,681**	**302,968**	**302,968**	**302,968**	**302,968**	**302,968**	**302,968**	**302,968**	**302,968**	**302,968**	**302,974**
Agricultura y Ganadería	470,904	117,591	74,717	67,670	50,521	37,945	37,337	28,599	17,719	21,068	17,739
Explotación de Minas y Canteras	7,079	0	179	423	476	233	1,016	794	1,073	1,374	1,512
Industrias Manufactureras	434,876	16,550	34,653	58,936	58,252	55,673	48,252	43,102	46,110	36,711	36,640
Electricidad, Gas y Agua	24,289	281	421	1,393	3,155	2,524	4,335	4,345	3,146	2,108	2,583
Construcción	181,992	2,687	5,646	8,731	11,805	22,546	23,613	30,324	31,558	21,808	23,278
Comercio al por Mayor y Menor	628,953	57,536	68,558	53,524	63,888	64,079	63,943	64,695	60,539	58,920	73,274
Hoteles, Bares y Restaurantes	165,803	14,183	19,221	14,851	18,224	17,174	19,776	17,219	13,661	18,242	13,256
Transporte y Comunicaciones	229,431	8,541	15,513	20,491	19,367	23,110	26,518	36,017	29,138	29,218	21,520
Intermediación Financiera y Seguros	61,942	915	2,453	1,925	802	4,767	7,848	8,536	10,455	12,069	12,174
Administración Pública y Defensa	156,771	3,578	8,616	12,604	17,715	18,213	18,764	16,493	19,698	21,649	19,443
Otros Servicios	667,644	81,108	72,994	62,423	58,765	56,706	51,569	52,846	69,874	79,804	81,558
Horas Trabajadas	**41.85**	**44.16**	**45.20**	**43.60**	**43.58**	**42.63**	**41.29**	**41.38**	**40.00**	**39.28**	**37.37**
Agricultura y Ganadería	38.38	41.38	40.71	39.40	38.22	37.26	35.41	34.26	31.45	33.28	34.59
Explotación de Minas y Canteras	44.51	0.00	36.00	21.51	51.90	20.00	33.31	56.16	48.01	40.94	38.19
Industrias Manufactureras	44.20	40.68	45.88	46.09	45.85	43.65	42.45	44.03	44.22	44.35	41.72
Electricidad, Gas y Agua	44.14	36.00	29.00	47.32	42.78	44.98	44.96	44.11	42.71	41.43	40.20
Construcción	43.13	25.07	44.83	47.29	45.62	45.71	44.35	43.47	42.31	39.22	39.82
Comercio al por Mayor y Menor	44.54	46.04	47.56	47.71	46.81	46.21	45.40	43.06	42.91	41.23	39.17
Hoteles, Bares y Restaurantes	41.51	48.75	45.63	43.04	42.82	42.67	41.93	36.92	34.34	40.77	36.59
Transporte y Comunicaciones	47.61	50.24	50.44	50.82	48.28	49.15	47.51	50.01	45.82	46.38	39.92
Intermediación Financiera y Seguros	40.52	37.08	32.02	36.83	49.53	44.17	41.87	41.00	39.58	40.06	40.24
Administración Pública y Defensa	41.53	43.19	53.60	48.21	45.74	42.13	40.70	39.65	38.19	37.44	37.58
Otros Servicios	38.11	46.28	45.28	38.64	40.21	37.13	34.52	35.43	34.70	34.67	32.81

ESTIMACIONES AJUSTADAS EN BASE A LOS RESULTADOS DEL CENSO NACIONAL DE POBLACION Y VIVIENDA REALIZADO EN OCTUBRE DEL 2002

Figure 11.0.3

Source: Central Bank of the Dominican Republic

Average hours worked per week for a given economic activity in 2013

BANCO CENTRAL DE LA REPUBLICA DOMINICANA
DEPARTAMENTO DE CUENTAS NACIONALES Y ESTADISTICAS ECONOMICAS
DIVISION DE ENCUESTAS

Población Ocupada Perceptora de Ingresos y Horas Trabajadas a la Semana por Deciles de Ingresos según Rama de Actividad Económica, año 2013

Rama de Actividad Económica	Perceptores de Ingresos	Deciles									
		1	2	3	4	5	6	7	8	9	10
Población Ocupada	**3,927,658**	**392,765**	**392,765**	**392,765**	**392,765**	**392,765**	**392,765**	**392,765**	**392,765**	**392,765**	**392,773**
Agricultura y Ganadería	547,196	106,774	72,638	70,521	73,839	59,696	50,062	39,501	30,244	26,686	17,235
Explotación de Minas y Canteras	12,561	645	923	356	178	1,268	813	3,517	1,692	787	2,382
Industrias Manufactureras	389,667	18,398	34,443	45,918	46,139	45,782	48,495	49,336	44,545	30,873	25,738
Electricidad, Gas y Agua	35,190	688	3,103	2,586	2,215	3,187	4,359	4,217	3,649	6,195	4,991
Construcción	224,832	6,854	8,768	12,796	13,995	26,231	31,750	31,375	46,357	29,124	17,582
Comercio al por Mayor y Menor	816,758	98,405	72,942	80,058	88,292	90,221	86,848	74,199	76,036	79,121	70,636
Hoteles, Bares y Restaurantes	235,051	26,701	24,564	25,344	24,647	26,928	20,613	23,628	21,303	18,637	22,686
Transporte y Comunicaciones	314,884	14,630	19,446	27,538	27,085	33,212	36,294	41,028	46,829	39,489	29,333
Intermediación Financiera y Seguros	105,233	2,880	1,551	3,679	5,155	4,891	10,686	10,790	15,777	17,204	32,620
Administración Pública y Defensa	194,720	4,494	21,093	16,043	13,618	16,726	21,791	22,217	20,212	24,963	33,563
Otros Servicios	1,051,566	112,296	133,294	107,926	97,602	84,623	81,054	92,957	86,121	119,686	136,007
Horas Trabajadas	**41.28**	**44.32**	**44.11**	**43.82**	**42.64**	**41.96**	**41.59**	**40.46**	**39.43**	**38.43**	**36.01**
Agricultura y Ganadería	39.62	43.26	42.48	41.07	39.53	38.92	37.05	37.02	35.19	34.32	31.30
Explotación de Minas y Canteras	44.95	51.33	46.41	45.60	40.16	44.34	44.11	40.56	49.41	49.05	45.48
Industrias Manufactureras	44.23	43.32	47.99	46.63	45.09	45.14	43.92	44.57	42.95	42.61	36.47
Electricidad, Gas y Agua	43.33	69.75	45.11	44.52	42.92	47.07	37.86	39.90	40.34	43.72	45.12
Construcción	41.97	47.43	44.65	43.56	43.74	43.70	44.33	43.56	39.64	38.33	38.42
Comercio al por Mayor y Menor	42.57	44.34	44.08	45.33	44.70	43.41	42.54	41.79	40.74	40.76	36.48
Hoteles, Bares y Restaurantes	42.03	41.54	44.48	44.45	44.59	44.87	43.23	40.80	36.24	38.87	39.35
Transporte y Comunicaciones	45.38	45.66	48.11	48.81	47.29	47.62	47.72	46.80	44.36	38.60	41.81
Intermediación Financiera y Seguros	41.30	39.54	44.23	43.96	45.45	44.23	44.81	44.01	44.07	40.96	36.71
Administración Pública y Defensa	40.70	62.82	46.91	46.94	42.80	41.07	40.10	38.71	37.79	37.69	35.51
Otros Servicios	38.49	44.95	42.83	41.43	39.86	36.96	37.88	34.79	35.23	36.08	33.62

Estimaciones ajustadas en base a los resultados de las proyecciones oficiales publicadas por ONAPLAN en 1999
Nota: A partir del año 2008 las muestras de viviendas son independientes lo que permite unir ambas bases en el año.
Cifras Rectificadas

Figure 11.0.4
Source: Central Bank of the Dominican Republic

References

Mary Amiti and Lisa Cameron. Trade Liberalization and the Wage Skill Premium: Evidence from Indonesia. *Journal of International Economics*, 87(2):277–287, 2012.

Mary Amiti and Donald Davis. Trade, Firms, and Wages: Theory and Evidence. *The Review of Economic Studies*, 79(1): 1–36, 2012.

William Brock and Stephen Magee. The Economics of Special Interest Politics: The Case of the Tariff. *The American Economic Review*, 68(2):246–250, 1978.

CESDEM and ICF International. Demographic and Health Surveys, Dominican Republic 2013. http://dhsprogram.com/, 2013.

Avinash Dixit and Joseph Stiglitz. Monopolistic Competition and Optimum Product Diversity. *The American Economic Review*, 67(3):297–308, 1977.

Dominican Today. US ambassador cautions free trade bills cannot be modified by Dominican congress.

Robert Feenstra and Gordon Hanson. *Global Production Sharing and Rising Inequality: A Survey of Trade and Wages*. Basil Blackwell, London, 2003.

Pinelopi Goldberg and Nina Pavcnik. Distributional Effects of Globalization in Developing Countries. *Journal of Economic Literature*, 45(1):39–82, 2007.

Gene Grossman and Elhanan Helpman. Protection for Sale. *The American Economic Review*, 84(4):833–850, 1994.

Sonia Guzmán de Hernández. *La Intrahistoria del DR-CAFTA*. Gonzalez Canahuate, 2006.

Thomas Holmes and James Schmitz. A Gain from Trade: From Unproductive to Productive Entrepreneurship. *Journal of Monetary Economics*, 47(2):417–446, 2001.

Thomas Holmes and John Stevens. An Alternative Theory of the Plant Size Distribution, with Geography and Intra- and International Trade. *Journal of Political Economy*, 122(2):369–421, 2014.

Brian Kovak. Regional Effects of Trade Reform: What is the Correct Measure of Liberalization? *The American Economic Review*, 103(5):1960–1976, 2013.

Giovanni Maggi and Andrés Rodríguez-Clare. A Political-Economy Theory of Trade Agreements. *The American Economic Review*, 97(4):1374–1406, 2007.

Minnesota Population Center. Integrated Public Use Microdata Series, International: Version 6.4. http://ipums.org, 2015.

Office of the United States Trade Representative. Dominican Republic-Central American Free Trade Agreement, Final Text. http://ustr.gov.

Oficina Nacional de Estadística, República Dominicana. Website. http://one.gob.do.

Joseph Pelzman and Gregory Schoepfle. The Impact of the Caribbean Basin Economic Recovery Act on Caribbean Nations' Exports and Development. *Economic Development and Cultural Change*, 36(4):753–796, 1988.

World Trade Organization. Country Profile - Dominican Republic. http://stat.wto.org, a.

World Trade Organization. Tariff Analysis Online Facility. Database. https://tao.wto.org, b.

Colophon

This thesis was typeset using LaTeX, originally developed by Leslie Lamport. The body text is set in 12 point Arno Pro, designed by Robert Slimbach and issued by Adobe in 2007. The formatting of this thesis is based upon a thesis template designed by Jordan Suchow, which is released under the permissive MIT (X11) license, and can be found online at github.com/suchow or from the original author at suchow@post.harvard.edu.