

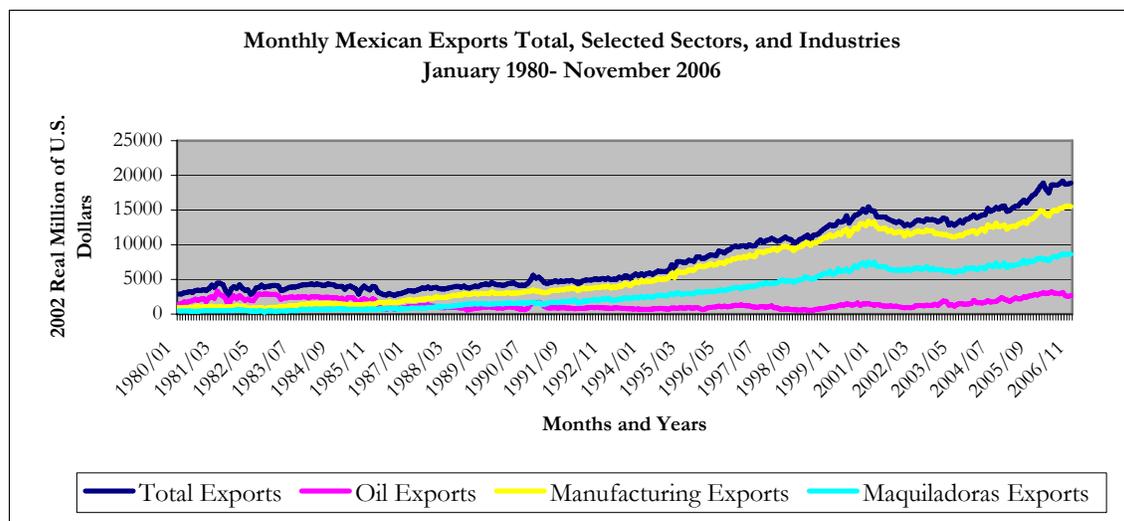
**Wages and Trade:  
The Mexican Experience**

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## Historical Background

Free trade has been extensively discussed and has created divided opinions about the possible benefits and costs of international trade on international and domestic socioeconomic conditions. While one group claims that free trade increases the variety of goods and lowers prices, another group claims that such achievements are at the expense of domestic producers and labor conditions from developing countries. This paper attempts to analyze the Mexican experience with international trade. It focuses on wages' response to trade liberalization and capital flows.

The Mexican experience with international trade is not recent; its experience can be divided in to three phases, which are: (1) liberalization of capital flows 1964 – 1983; (2) unilateral trade liberalization (1985-1993), and (3) regional liberalization (1994-present). Previous to explicit liberalization in 1983<sup>1</sup>, during the late 1960's, Mexico started the foreign own maquiladora assembly plants<sup>2</sup> program. This program was not implemented with further reduction in general tariff level; but it exposed the country to foreign direct investment and to produce for foreign market, particularly to the United States (U.S.). In reaction to the Mexican economy's poor performance under the import-substitution model<sup>3</sup> (Chiquiar/2002), in 1983 the government changed its strategy towards a more liberal policy and reduced barriers to capital flows (Robertson/2000).



Source: Dirección General de Contabilidad Nacional y Estadísticas Económicas. (2007)

The second phase of liberalization began with the dramatic reduction on tariffs after Mexico joined the General Agreement on Tariff and Trade (GATT) in 1986. Reductions on average tariffs went from 23.5 percent to 12.5 percent in less than 6 years (Robertson/2000). In addition to reduction on tariffs and non-tariff<sup>4</sup> barriers, in 1989<sup>5</sup> the Mexican government

<sup>1</sup> In 1983 the Mexican government reduced barriers on capital flows.

<sup>2</sup> The maquiladora program was a reaction to the end of the Bracero program in the United States. This program enables foreigner firms, mostly from the United States, to import raw inputs duty-free while Mexican workers did the assembly. The government only taxed final goods or value added.

<sup>3</sup> Mexico import-substitution policy was enforced for forty years. (Chiquiar/2002)

<sup>4</sup> During the period 1985-1990 the maximum tariff fell 100 percent to 20 percent and import license coverage fell from 92.2 percent to less than 20 percent of imports. (Hanson and Harrinson/1990)

proceeded with further liberalization and opened previously restricted sectors to foreign investment. After these reforms, manufacturing replaced petroleum as the largest export category in 1990 (Robertson/2000).

The Mexican regional liberalization phase began in 1994 when the North American Free Trade Agreement (NAFTA) between Canada, Mexico, and the U.S. was implemented after a negotiation process that lasted from 1990-1993. After NAFTA, Mexico finally obtained almost total free access to its most important market, the U.S. We are going to analyze the effect of free trade of Mexican wages from January 1990 to November 2006.

The described process developed three main effects over Mexican regional economic dynamics. First, it intensified the wage difference across sectors and regions (Chiquiar/2002). The difference in wages between the southern and northern Mexican



Source: Instituto Nacional de Estadísticas, Geografía e Información; Estadísticas de la Industria Maquiladora de Exportación (2007)

states increased. In the southern states, where the main production is agricultural, wages are lower in relation to northern states wages, where the main production is manufactured products. Second, reforms changed the optimal location choice of manufacturing firms (Chiquiar/2002). Before reforms started, most manufactured industries were located in the Mexico City area; but after the reforms, manufacturing firms began moving toward the northern states along the border with the U.S. Once liberalization occurred, Mexico experienced what I call a “power transferring process”. Under a liberalized market and limited or no-government intervention, entrepreneurs no longer relied on government protection to maximize profit. Instead, their maximization strategy was driven entirely or mostly by market forces, as the Mexican experience indicated. Third, reforms increased the gap between skilled and unskilled workers’ wages particularly in the northern Mexican states (Chiquiar/2002).

<sup>5</sup> This law is known as the Decree of May.

## Theory: The Heckscher-Ohlin Model<sup>6</sup>

The Heckscher-Ohlin model (H-O) presents how countries involved in international trade achieved comparative advantages based on factor endowment relative to each other, given certain conditions. The conditions that hold the model are the existence of (1) two production factors, labor (l) and capital (k). (2) These factors are homogeneous and perfectly mobile between industries and within each country, but not between countries. (3) Production functions for each good in both countries exhibit constant return to scale. The previous three conditions established that the technology level among nations is equal. (4) Perfect competition and efficient allocation of resources with no market distortions like unions, imperfect competition, taxes, or transportation costs that influence production or consumption decision. (5) The model is constrained to two countries with identical and homogenous preferences that differ in factor endowment, but produce the same two products. Each of these goods is characterized by their production function. (6) The good that requires more labor than capital in relation to the other good is called labor-intensive good and the other good is called capital-intensive good. Given the above conditions and based on the Heckscher-Ohlin Theorem, each country is supposed to export the good that intensively used its relative abundant factor.

The other theorem we are going to use is the Factor Price Equalization (FPE) Theorem. FPE states that after trade liberalization factors' (capital and labor) real returns in both countries will tend to converge until real returns in both countries are equal. This situation imply that the real wage level in the labor-abundant country will increase while real wage level in the capital abundant country will drop until both are equal. FPE manifest through changes on goods' demand due to comparative advantages. The increment on the demand for the labor-intensive goods that are produced in the labor-abundant country will motivates entrepreneurs in that country to produce more of those goods. The surge in demand for labor and capital that is used in for the production of labor-intensive products provokes an increase on factor real wage and rents. On the other hand, the capital-abundant country will increase its capital-intensive production inducing a general real rent appreciation of capital factors and labor that is used in the production of capital-intensive goods.

Based on this model and given that the U.S. possesses a larger endowment of capital than Mexico, the latter country would export labor-intensive goods. Those labor-intensive goods are supposed to be cheaper than labor-intensive goods produced in the U.S. After free trade, we expect Mexican export prices to rise due to increased on demand. This increase on price will last until Mexican exports prices equal U.S. labor-intensive goods prices. From the FPE theorem we expected a rise in real return for Mexican workers, converging with U.S. wages, since the price of labor intensive-goods increased.

## The Model and Mexico Experience

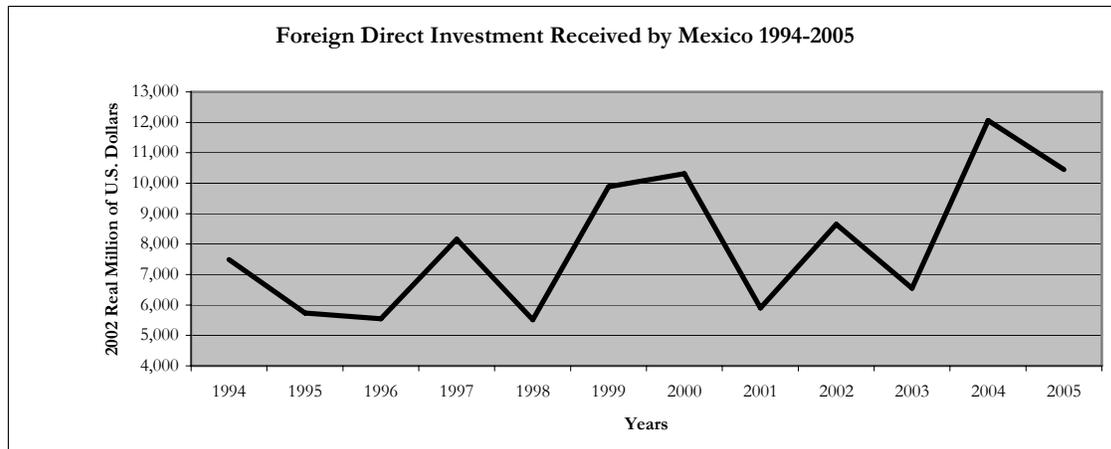
H-O model assumptions do not necessarily hold in the short run. First, the labor force is not homogenous in both countries as the model assumes. We can divide labor force in at least two categories, skilled and less-skilled workers. In the case of Mexico, less-skilled laborers are those workers who did not finish elementary school; the rest of the labor force

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<sup>6</sup> Descriptions for The Heckscher-Ohlin model and the Stolper-Samuelson Theorem were taken from James Markusen's book International Trade Theory and Evidence.

is considered skilled labor. In the U.S. skilled workers are those who at least finished high school. Robertson (2000) and Chiquiar (2002) tested for the remuneration and conditions of these two kinds of workers. Their conclusions were that after reforms, the less-skilled workers have benefited less from free trade. Apparently, protectionist measures, before reforms, tend to benefit more less-skilled workers than skilled workers (Robertson/2002). This situation results in a rise on real wages for skilled workers and a reduction to real wages from less-skilled worker.

Technology level between Mexico and the U.S. is not equal; but after NAFTA, the process of reaching the same level of technology in Mexico was accelerated. This is one of the reasons why remuneration for workers has not been the same. After the reforms in 1986 and particularly after NAFTA, the level of foreign direct investment (FDI) increased significantly (Hanson/2003). These DFIs tend to introduce new technology into recipient markets. This structural change altered the demand for workers' skill level. However, the real remuneration for skilled and less-skilled workers has increased, but at different rates (Chiquiar/2002). At the same time, in a perfect competition market, wage equals efficiency (marginal product), holding constant all other variables. It is expected that after a positive change in the level of technology, skilled workers will be more efficient and better remunerated. At the same time, less-skilled workers work will be substituted by technology. This situation affects the supply and demand for less-skilled workers pushing the real wages downwards.



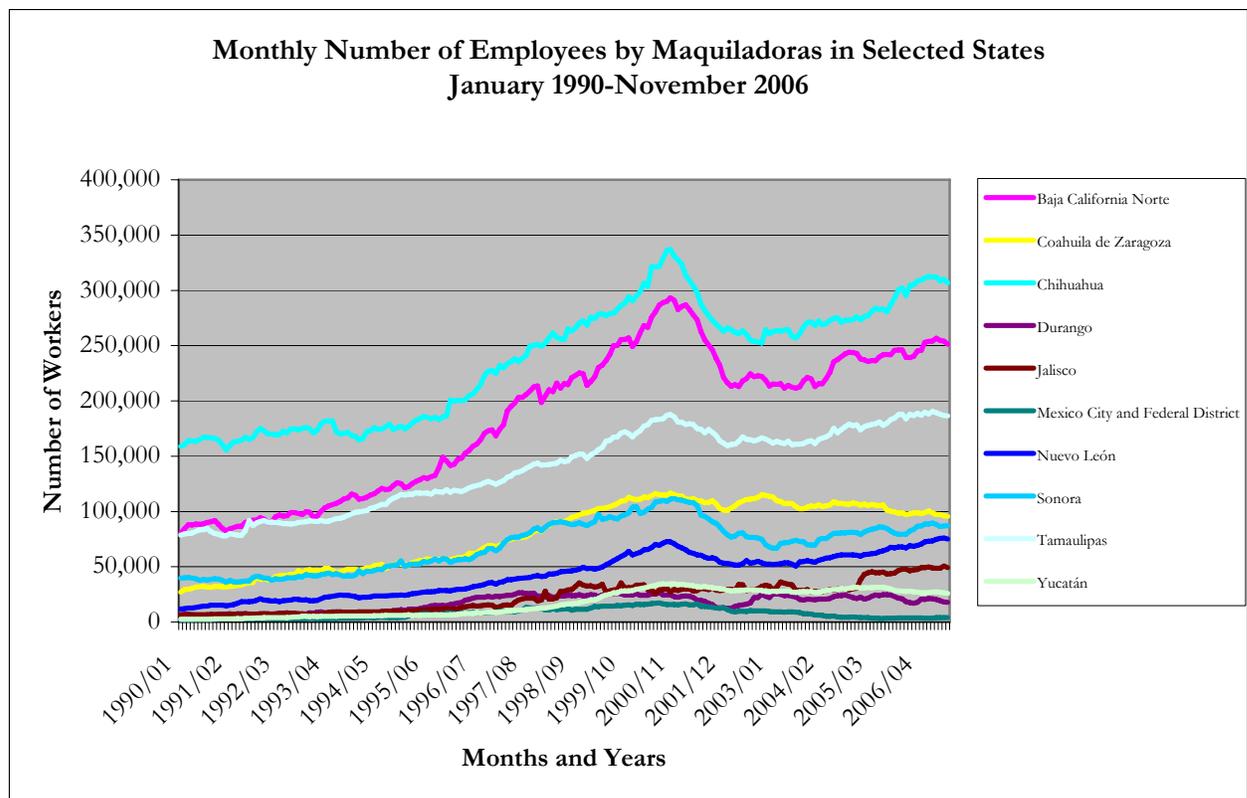
Source: Mexican Secretary of Economics, General Direction of Foreign Direct Investment. (2007)

In reality, all markets present distortions and Mexico is not the exception. The distortion we are going to focus on is geographic location. Since the maquiladora program began in the late 1960s, the Northern Border States<sup>7</sup> (NBS) have been recipients of significant DFI in relation to other Mexican states. In 1980, 46 percent of the manufacturing labor force was located in the Mexico City area and just 21 percent was located in NBS (Hanson/1997). The numbers changed in 1993 to 29 percent in the Mexico City area and while 30 percent was in NBS (Hanson/2003). By 1998 figures were different, only 23 percent of the manufacturing northern labor force was in the Mexico City area and 34 percent was in NBS (Chiquiar/2001). Two main reasons explain this pattern. First, NBS

<sup>7</sup> Mexican Northern Border States are Baja California Norte, Sonora, Chihuahua, Coahuila, Nuevo León and Tamaulipas.

has had a better endowment<sup>8</sup> than the rest of the country (Chiquiar/2002). This situation can be attributed to the region exposition and export production after the maquiladoras program. The second reason is that Mexico's main market is closer to NBS than other regions, that by being closer to the United States, transportation costs are expected to be lower.

Mexican wage level is expected to increase after free trade, but not to converge with U.S. wage level. While the impact of the U.S. economy in Mexico is significant, the opposite is not true. The difference in wages between Mexico and the U.S. is significant. On the other hand, wages performance within Mexico goes in accordance with S-S theorem. The NBS have experienced greater wage increases when compared to other regions (Chiquiar/2004). The level of exposure to international trade, or in particular to the U.S. market, is related to location, natural endowment, infrastructure, past regional policies and historically determined agglomeration of population (Chiquiar/2004).



Source: Instituto Nacional de Estadísticas, Geografía e Información; Estadísticas de la Industria Maquiladora de Exportación (2007)

Finally, the world economy is composed of multiple competitors, not only two. Hence, real wages and rents convergence between trading country is affected by global market forces that influence international equilibrium real wages and rents. The level of trading openness that each country exhibits intensifies this situation. The level of international trade in the U.S. economy force exported Mexican goods to compete with American products in addition to Chinese and Indian goods among other countries' goods.

<sup>8</sup> In this sentence endowment does not refer exclusively to production factors (labor and capital), but also to infrastructure, energy and waters supply, and communication availability.

The same occurs with exported American product in Mexico. This situation affects real wages and rents convergence between the U.S. and Mexico. Since the real wages in the U.S. may be significantly greater than international equilibrium but Mexican real wages may not be significantly less than world equilibrium, Mexican real wage increase may be less than expected in a world economy of only two competitors.

## Hypotheses and Models

- (1) Mexican real remunerations level is expected to increase after liberalization reforms. After trade liberalization, the demand for Mexican export will rise. This will result in increased Mexican exports prices and real remuneration to workers. However, the increase on real remunerations level is constraint by U.S. trade balance. As U.S. trade balance becomes greater in favor of Mexico, Mexican real wages will increase.
- (2) Wage gap between skilled and less-skilled workers is expected to increase after trade liberalization due to structural changes related to changes in technology.

The data used for this analysis is available on the website of the National Institute of Statistics, Geographic and Information (INEGI Spanish acronym) under Industrial Maquiladora Exports Statistics. The data represents monthly real remuneration<sup>9</sup> to maquiladora workers at the production and administrative level in selected Mexican states<sup>10</sup>. We are going to use administrative workers real wages as a proxy to skilled workers wages and technical production workers real wages as a proxy for less-skilled workers wages. Data represents wages from workers in maquiladora plants. In addition to data limits, we will choose to use remuneration from maquiladoras because their production is extremely related to the foreign market and in particular the U.S. market. For that reason, is our intuition that if international trade is going to affect workers' remuneration, wages and salaries from maquiladora plants are supposed to be the first recipient of such changes. Additionally, we used monthly data on U.S. trade balance with Mexico. The Foreign Trade Division, of the U.S. Census Bureau produces this data<sup>11</sup>.

### Hypothesis 1 Models

$$\begin{aligned} \text{Wages} = & \beta_0 + \beta_1\text{BC} + \beta_2\text{Coah} + \beta_3\text{Chi} + \beta_4\text{Dur} + \beta_5\text{Jal} + \beta_6\text{NL} + \beta_7\text{Son} + \beta_8\text{Tam} + \\ & \beta_9\text{Yuc} + \beta_{10}\text{NAFTA} + \beta_{11}\text{RUSMEBA} + \beta_{12}\text{BCNAFTA} + \beta_{13}\text{CoahNAFTA} + \\ & \beta_{14}\text{ChiNAFTA} + \beta_{15}\text{DurNAFTA} + \beta_{16}\text{JalNAFTA} + \beta_{17}\text{NLNAFTA} + \\ & \beta_{18}\text{SonNAFTA} + \beta_{19}\text{TamNAFTA} + \beta_{20}\text{YucNAFTA} + \beta_{21}\text{BalaceBC} + \\ & \beta_{22}\text{BalaceCOA} + \beta_{23}\text{BalaceCHI} + \beta_{24}\text{BalaceDUR} + \beta_{25}\text{BalaceJAL} + \\ & \beta_{26}\text{BalaceSON} + \beta_{27}\text{BalaceNL} + \beta_{28}\text{BalaceTAM} + \beta_{29}\text{BalaceYUC} + u \end{aligned}$$

<sup>9</sup> Figures are adjusted to Mexican constant price of 2002.

<sup>10</sup> Mexico is divided into 32 federal states. Due to data limitations, we are going to use data from 11 states.

<sup>11</sup> Trade Balance data is presented on millions of dollars. Trade balance figures were adjusted to constant prices of 2002 for regression analysis.

Where,

Wages is monthly real remuneration<sup>12</sup> for Mexican workers working in maquiladoras from January 1990 through November 2006.

NAFTA is a dummy variable to measure period after NAFTA implementation January 1994.

BC, Coah, Chi, Dur, Jal, NL, Son, Tam, and Yuc are dummy variables to monthly real remuneration in Baja California, Coahuila de Zaragoza, Chihuahua, Durango, Jalisco, Nuevo León, Sonora, Tamaulipas, and Yucatán respectively.

NAFTABC, NAFTACoa, NAFTACHi, NAFTADur, NAFTAJal, NAFTANL, NAFTASon, NAFTATam, NAFTAYuc are interaction dummy variables to measure wage changes by selected states after NAFTA implementation for Baja California, Coahuila de Zaragoza, Chihuahua, Durango, Jalisco, Nuevo León, Sonora, Tamaulipas, and Yucatán respectively.

BalaceBC, BalaceCOA, BalaceCHI, BalaceDUR, BalaceJAL, BalaceSON, BalaceNL, BalaceTAM, and BalaceYUC are interaction dummy variables to measure wage changes on selected states due to changes on the U.S. trade balance with Mexico for Baja California, Coahuila de Zaragoza, Chihuahua, Durango, Jalisco, Nuevo León, Sonora, Tamaulipas, and Yucatán respectively.

The base group of this model ( $\beta_0$ ) is wages from workers in Mexico City and the Federal District (DF) before NAFTA.

We will use the same model to measures de effect of NAFTA and the U.S. trade balance with Mexico on salaries<sup>13</sup> paid and benefits, other than wages and salaries, paid by employers. For these regressions we will only change the dependant variables the explanative variable swill represent the same.

$$\begin{aligned} \text{Salaries} = & \beta_0 + \beta_1\text{BC} + \beta_2\text{Coah} + \beta_3\text{Chi} + \beta_4\text{Dur} + \beta_5\text{Jal} + \beta_6\text{NL} + \beta_7\text{Son} + \beta_8\text{Tam} + \\ & \beta_9\text{Yuc} + \beta_{10}\text{NAFTA} + \beta_{11}\text{RUSMEBA} + \beta_{12}\text{BCNAFTA} + \beta_{13}\text{CoahNAFTA} + \\ & \beta_{14}\text{ChiNAFTA} + \beta_{15}\text{DurNAFTA} + \beta_{16}\text{JalNAFTA} + \beta_{17}\text{NLNAFTA} + \\ & \beta_{18}\text{SonNAFTA} + \beta_{19}\text{TamNAFTA} + \beta_{20}\text{YucNAFTA} + \beta_{21}\text{BalaceBC} + \\ & \beta_{22}\text{BalaceCOA} + \beta_{23}\text{BalaceCHI} + \beta_{24}\text{BalaceDUR} + \beta_{25}\text{BalaceJAL} + \\ & \beta_{26}\text{BalaceSON} + \beta_{27}\text{BalaceNL} + \beta_{28}\text{BalaceTAM} + \beta_{29}\text{BalaceYUC} + u \end{aligned}$$

$$\begin{aligned} \text{Benefits} = & \beta_0 + \beta_1\text{BC} + \beta_2\text{Coah} + \beta_3\text{Chi} + \beta_4\text{Dur} + \beta_5\text{Jal} + \beta_6\text{NL} + \beta_7\text{Son} + \beta_8\text{Tam} + \\ & \beta_9\text{Yuc} + \beta_{10}\text{NAFTA} + \beta_{11}\text{RUSMEBA} + \beta_{12}\text{BCNAFTA} + \beta_{13}\text{CoahNAFTA} + \\ & \beta_{14}\text{ChiNAFTA} + \beta_{15}\text{DurNAFTA} + \beta_{16}\text{JalNAFTA} + \beta_{17}\text{NLNAFTA} + \\ & \beta_{18}\text{SonNAFTA} + \beta_{19}\text{TamNAFTA} + \beta_{20}\text{YucNAFTA} + \beta_{21}\text{BalaceBC} + \\ & \beta_{22}\text{BalaceCOA} + \beta_{23}\text{BalaceCHI} + \beta_{24}\text{BalaceDUR} + \beta_{25}\text{BalaceJAL} + \\ & \beta_{26}\text{BalaceSON} + \beta_{27}\text{BalaceNL} + \beta_{28}\text{BalaceTAM} + \beta_{29}\text{BalaceYUC} + u \end{aligned}$$

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<sup>12</sup> Adjusted to Mexican pesos of 2002

<sup>13</sup> We refer to salaries to remuneration received by administrative worker. Remuneration to production workers is called wage.

## Hypothesis 2 Models

$$\begin{aligned} \text{Salaries/Wages Ratio} = & \beta_0 + \beta_1\text{BC} + \beta_2\text{Coah} + \beta_3\text{Chi} + \beta_4\text{Dur} + \beta_5\text{Jal} + \beta_6\text{NL} + \beta_7\text{Son} \\ & + \beta_8\text{Tam} + \beta_9\text{Yuc} + \beta_{10}\text{NAFTA} + \beta_{11}\text{RUSMEBA} + \\ & \beta_{12}\text{BCNAFTA} + \beta_{13}\text{CoahNAFTA} + \beta_{14}\text{ChiNAFTA} + \\ & \beta_{15}\text{DurNAFTA} + \beta_{16}\text{JalNAFTA} + \beta_{17}\text{NLNAFTA} + \\ & \beta_{18}\text{SonNAFTA} + \beta_{19}\text{TamNAFTA} + \beta_{20}\text{YucNAFTA} \\ & \beta_{21}\text{BalaceBC} + \beta_{22}\text{BalaceCOA} + \beta_{23}\text{BalaceCHI} + \\ & \beta_{24}\text{BalaceDUR} + \beta_{25}\text{BalaceJAL} + \beta_{26}\text{BalaceSON} + \\ & \beta_{27}\text{BalaceNL} + \beta_{28}\text{BalaceTAM} + \beta_{29}\text{BalaceYUC} + u \end{aligned}$$

Where,

Salaries-Wage Ratio is the ratio of real remuneration<sup>14</sup> for administrative workers to real remuneration<sup>15</sup> to production workers working in maquiladoras from January 1990 through November 2006.

NAFTA is a dummy variable to measure the period after NAFTA implementation in January 1994.

BC, Coah, Chi, Dur, Jal, NL, Son, Tam, and Yuc are dummy variables to identify monthly salaries-wages<sup>16</sup> ratio in Baja California, Coahuila, Chihuahua, Durango, Jalisco, Nuevo León, Sonora, Tamaulipas, and Yucatán, respectively.

NAFTABC, NAFTACoa, NAFTAChi, NAFTADur, NAFTAJal, NAFTANL, NAFTASon, NAFTATam, NAFTAYuc are interaction dummy variables to identify monthly salaries-wages<sup>17</sup> ratio for Baja California, Coahuila de Zaragoza, Chihuahua, Durango, Jalisco, Nuevo León, Sonora, Tamaulipas, and Yucatán, respectively, after NAFTA implementation in January 1994.

BalaceBC, BalaceCOA, BalaceCHI, BalaceDUR, BalaceJAL, BalaceSON, BalaceNL, BalaceTAM, and BalaceYUC are interaction dummy variables to measure wage changes on salaries-wages ratio due to changes on the U.S. trade balance with Mexico for Baja California, Coahuila de Zaragoza, Chihuahua, Durango, Jalisco, Nuevo León, Sonora, Tamaulipas, and Yucatán, respectively.

The base group of this model ( $\beta_0$ ) represents the monthly salaries-wages<sup>18</sup> ratio in Mexico City and the DF before NAFTA.

## Regression Results

The first regression explained 76.11 percent of the sample variation. Before NAFTA and accounting for the impact of US trade balance with Mexico<sup>19</sup>, monthly wages in Mexico

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<sup>14</sup> Adjusted to Mexican pesos of 2002.

<sup>15</sup> Adjusted to Mexican pesos of 2002.

<sup>16</sup> Adjusted to Mexican pesos of 2002.

<sup>17</sup> Adjusted to Mexican pesos of 2002.

<sup>18</sup> Adjusted to Mexican pesos of 2002.

City and DF were expected to be \$5,983<sup>20</sup> pesos, holding all other variables constant. Based on the regression, after NAFTA, monthly average real wages in Mexico City and DF were expected to increase by \$473<sup>21</sup> pesos, holding all other variables constant. The regression

**Table 1. Regression Results for Model 1**

Independent Variables	Dependent Variable Monthly Wages to Production Workers	Estimates and Standard Errors
Intercept		5,983.249(125.103)***
<b>Binary for Baja California Norte*</b>		2,686.414(176.923)***
<b>Binary for Coahuila de Zaragoza*</b>		-442.401(176.923)**
<b>Binary for Chihuahua*</b>		506.77(176.923)***
Binary for Durango		-1,541.89(176.923)***
Binary for Jalisco		3,314.271(176.923)***
<b>Binary for Nuevo León*</b>		833.522(176.923)***
<b>Binary for Sonora*</b>		1,336.187(176.923)***
<b>Binary for Tamaulipas*</b>		2,492.664(176.923)***
Binary for Yucatán		2.503(176.923)
Binary for NAFTA (After January 1994 = 1)		472.541(197.834)**
U.S. Trade Balance with Mexico		-0.347(0.053)***
<b>Interaction NAFTA * Baja California Norte*</b>		-984.174(279.78)***
<b>Interaction NAFTA * Coahuila de Zaragoza*</b>		-861.011(279.78)***
<b>Interaction NAFTA* Chihuahua*</b>		-180.357(279.78)
Interaction NAFTA * Durango		-439.361(279.78)
Interaction NAFTA * Jalisco		-2,402.062(279.78)***
<b>Interaction NAFTA * Sonora*</b>		-975.405(279.78)***
<b>Interaction NAFTA * Nuevo León*</b>		-949.87(279.78)***
<b>Interaction NAFTA * Tamaulipas*</b>		-1,471.476(279.78)***
Interaction NAFTA * Yucatán		-2,406.155(279.78)***
<b>Interaction U.S. Trade Balance with Mexico * Baja California Norte</b>		0.068(0.075)
<b>Interaction U.S. Trade Balance with Mexico * Coahuila de Zaragoza</b>		0.053(0.075)
<b>Interaction U.S. Trade Balance with Mexico * Chihuahua</b>		0.195(0.07514)***
Interaction U.S. Trade Balance with Mexico * Durango		0.257(0.075)***
Interaction U.S. Trade Balance with Mexico * Jalisco		0.332(0.075)***
<b>Interaction U.S. Trade Balance with Mexico * Sonora</b>		0.34(0.075)***
<b>Interaction U.S. Trade Balance with Mexico * Nuevo León</b>		-0.342(0.075)***
<b>Interaction U.S. Trade Balance with Mexico * Tamaulipas</b>		-0.247(0.075)***
Interaction U.S. Trade Balance with Mexico * Yucatán		0.298(0.075)***
Adjusted R <sup>2</sup> = 0.7530	N = 2029	DF = 29

**States in bold share border with the United States.**

\* if significant at 90% \*\* if significant at 95% \*\*\* if significant at 99%

predicts that monthly average real wages will decrease \$0.35 pesos for every million increment on the U.S. trade balance with Mexico. All parameters for NBS are significant<sup>22</sup>.

<sup>19</sup> The average value of the real value of U.S trade balance with Mexico from January 1990 until December 1993 (\$191.54 millions of dollars) was used to calculate predicted values before NAFTA. The average value of the real value of U.S trade balance with Mexico from January 1994 until November 2006 (\$-2371.98 millions of dollars) was used to calculate predicted values after NAFTA.

<sup>20</sup> Wages in Mexico City and DF = 5,983.25 -0.35(US trade balance with Mexico before NAFTA) US trade balance with Mexico before NAFTA= 191.54 millions of 2002 dollars.

<sup>21</sup> All wages are measured in Mexican pesos adjusted to 2002 Mexican prices.

<sup>22</sup> For this paper parameter are considered significant if reject the null hypothesis at 90 percent confidence level.

Monthly average real wages in Baja California, Chihuahua, Nuevo León, Sonora, and Tamaulipas before NAFTA and the effect of the trade balance were expected to be \$2,700<sup>23</sup>, \$543<sup>24</sup>, \$768<sup>25</sup>, \$1,401<sup>26</sup>, and \$2,445<sup>27</sup>, respectively, greater than in Mexico City and DF, holding all other variables constant. Although Coahuila de Zaragoza is a border state, its parameter indicated that, before NAFTA, wages were expected to be \$433<sup>28</sup> less than in the base group, holding all other variables constant. On the other hand, Durango was predicted to provide the lowest wages of the sample states, holding all other variables constant. Monthly average real wages in Jalisco are predicted to be the highest paid in the selected states. On averages monthly real wages in Jalisco were predicted to be \$3,377<sup>29</sup> more than in Mexico City and DF before NAFTA. Production workers in Yucatán are expected to earn \$60<sup>30</sup> pesos more than those working in Mexico City and DF before NAFTA enactment, holding all other variables constant.

Only 2 interaction-dummy variables to measure NAFTA effect on Mexican states wages are not significant, Chihuahua and Durango. After NAFTA, wages in Tamaulipas, Baja California Norte, Nuevo León, and Jalisco were \$1,614<sup>31</sup>, \$1,536<sup>32</sup>, \$690<sup>33</sup>, and \$129<sup>34</sup>

<sup>23</sup> Predicted wages in Baja California Norte before NAFTA = 5,983.25 + 2,686.41(Baja California Norte) - 0.35(US trade balance with Mexico) + 0.07(US trade balance with Mexico effect on Baja California Norte Wages) Baja California Norte = 1; Expected US trade balance with Mexico before NAFTA 191.54 million of 2002 real US dollars.

<sup>24</sup> Predicted wages in Chihuahua before NAFTA = 5,983.25 + 506.77(Chihuahua) - 0.35(US trade balance with Mexico before NAFTA) + 0.19(US trade balance with Mexico effect on Chihuahua) Chihuahua = 1; Expected US trade balance with Mexico before NAFTA 191.54 million of 2002 real US dollars.

<sup>25</sup> Predicted wages in Nuevo León before NAFTA = 5,983.25 + 833.52(Nuevo León) - 0.35(US trade balance with Mexico) - 0.34(US trade balance with Mexico effect on Nuevo León) Nuevo León = 1; Expected US trade balance with Mexico before NAFTA 191.54 million of 2002 real US dollars.

<sup>26</sup> Predicted wages in Sonora before NAFTA = 5,983.25 + 1,336.19(Sonora) - 0.35(US trade balance with Mexico effect on) + 0.34(US trade balance with Mexico effect on Sonora) Sonora = 1; Expected US trade balance with Mexico before NAFTA 191.54 million of 2002 real US dollars.

<sup>27</sup> Predicted wages in Tamaulipas before NAFTA = 5,983.25 + 2,492.66(Tamaulipas) - 0.35(US trade balance with Mexico) - 0.25(US trade balance with Mexico effect on Tamaulipas) Tamaulipas = 1; Expected US trade balance with Mexico before NAFTA 191.54 million of 2002 real US dollars.

<sup>28</sup> Predicted wages in Coahuila de Zaragoza before NAFTA = 5,983.25 - 442.40(Coahuila de Zaragoza) - 0.35(US trade balance with Mexico) + 0.05(US trade balance with Mexico effect on Coahuila de Zaragoza); Coahuila de Zaragoza = 1; Expected US trade balance with Mexico before NAFTA 191.54 million of 2002 real US dollars.

<sup>29</sup> Predicted wages in Jalisco before NAFTA = 5,983.25 + 3,314.27(Jalisco) - 0.35(US trade balance with Mexico) + 0.33(US trade balance with Mexico effect on Jalisco); Jalisco = 1; Expected US trade balance with Mexico before NAFTA 191.54 million of 2002 real US dollars.

<sup>30</sup> Predicted wages in Yucatán before NAFTA = 5,983.25 + 2.50(Yucatán) - 0.35(US trade balance with Mexico effect on) + 0.30(US trade balance with Mexico effect on Yucatán); Yucatán = 1; Expected US trade balance with Mexico before NAFTA 191.54 million of 2002 real US dollars.

<sup>31</sup> Predicted wages in Tamaulipas after NAFTA = 5,983.25 + 2,492.66(Tamaulipas) + 472.54(NAFTA) - 0.35(US trade balance with Mexico) - 1471.476(NAFTA effect on Tamaulipas) - 0.25(US trade balance with Mexico effect on Tamaulipas); Tamaulipas = 1, NAFTA = 1, Expected US trade balance with Mexico after NAFTA -\$2,371.98 million of 2002 real US dollars.

<sup>32</sup> Predicted wages in Baja California Norte after NAFTA = 5,983.25 + 2,686.41(Baja California Norte) + 472.54(NAFTA) - 0.35(US trade balance with Mexico) - 984.17(NAFTA effect on Baja California Norte) + 0.07(US trade balance with Mexico effect on Baja California Norte); Baja California Norte = 1, NAFTA = 1, Expected US trade balance with Mexico after NAFTA -\$2,371.98 million of 2002 real US dollars.

<sup>33</sup> Predicted wages in Nuevo León after NAFTA = 5,983.25 + 833.52(Nuevo León) + 472.54(NAFTA) - 0.35(US trade balance with Mexico) - 949.87(NAFTA effect on Nuevo León) - 0.34(-US trade balance with Mexico effect on Nuevo León); Nuevo León = 1, NAFTA = 1, Expected US trade balance with Mexico after NAFTA -\$2,371.98 million of 2002 real US dollars.

pesos, respectively, greater than in Mexico City and the DF, holding all other variables constant. On the other hand, wages in Chihuahua, Sonora, Yucatan, Coahuila de Zaragoza, and Durango are expected to be \$124<sup>35</sup>, \$446<sup>36</sup>, \$3,115<sup>37</sup>, \$1,422<sup>38</sup>, and \$2,598<sup>39</sup> pesos, respectively, less than in Mexico City and DF, holding all other variables constant.

All interaction variables to measure the effect of U.S. trade balance with Mexico were significant but those that interact with Baja California and Coahuila de Zaragoza. The model predicts that an increment of \$1 million dollars in U.S. trade balance with Mexico increase wages in Chihuahua, Durango, Yucatan, and Sonora by \$0.26, \$0.30, \$0.33, and \$0.34 pesos, respectively, holding all other variables constant. However, a similar change in U.S. trade balance with Mexico decreases monthly average wages in Nuevo Leon and Tamaulipas by \$0.34 and \$0.25 pesos, holding all other variables constant.

The second model explained 75.30 percent of the sample variation. Monthly salaries, before NAFTA enactment, in Mexico City and DF are expected to be \$10,968, holding all other variables constant. Based on the regression, after NAFTA, monthly average real salaries are expected to decrease by \$1,833<sup>40</sup>. The regression predicts that salaries for administrative workers will decrease \$1.47 pesos for every million increment on the U.S. trade balance with Mexico. With the exception of the parameter to measure Tamaulipas salaries, all others parameters for NBS are significant<sup>41</sup>. Predicted monthly salaries<sup>42</sup> in Jalisco, Tamaulipas, Nuevo León, and Chihuahua, before NAFTA, were \$4,828 4,434, \$2,647, and \$1,346 pesos, respectively, greater than in Mexico City and DF, holding all variables constant in each test. Expected salaries for the remaining Northern Border States Sonora, Baja California Norte, and Coahuila de Zaragoza, before NAFTA, are \$526, 1,005, and \$1,544 pesos, respectively, less than in the base group, holding all other variables

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<sup>34</sup> Predicted wages in Jalisco after NAFTA = 5,983.25 + 3,314.27(Jalisco) + 472.54(NAFTA) - 0.35(US trade balance with Mexico) - 2,402.06(NAFTA effect on Jalisco) + 0.33(US trade balance with Mexico effect on Jalisco); Jalisco = 1, NAFTA = 1, Expected US trade balance with Mexico -\$2,371.98 million of 2002 real US dollars.

<sup>35</sup> Predicted wages in Chihuahua after NAFTA = 5,983.25 + 506.77(Chihuahua) + 472.54(NAFTA) - 0.35(US trade balance with Mexico effect on Jalisco) - 180.36(1) + 0.19(-2371.98); Chihuahua = 1, NAFTA = 1, Expected US trade balance with Mexico -\$2,371.98 million of 2002 real US dollars.

<sup>36</sup> Predicted wages in Sonora after NAFTA = 5,983.25 + 1,336.19(Sonora) + 472.54(NAFTA) - 0.35(US trade balance with Mexico) - 975.41(NAFTA effect on Sonora) + 0.34(US trade balance with Mexico effect on Sonora); = 1, NAFTA = 1, Expected US trade balance with Mexico -\$2,371.98 million of 2002 real US dollars.

<sup>37</sup> Predicted wages in Yucatán after NAFTA = 5,983.25 + 2.50(Yucatán) + 472.54(NAFTA) - 0.35(US trade balance with Mexico) - 2406.155(NAFTA effect on Yucatán) + 0.30(US trade balance with Mexico effect on Yucatán); Yucatán = 1, NAFTA = 1, Expected US trade balance with Mexico -\$2,371.98 million of 2002 real US dollars.

<sup>38</sup> Predicted wages in Durango after NAFTA = 5,983.25 - 1,541.89(Durango) + 472.54(NAFTA) - 0.35(US trade balance with Mexico) - 439.36(NAFTA effect on Durango) + 0.26(US trade balance with Mexico effect on Durango); Durango = 1, NAFTA = 1, Expected US trade balance with Mexico -\$2,371.98 million of 2002 real US dollars.

<sup>39</sup> Predicted wages in Coahuila de Zaragoza = 5,983.25 - 442.40(Coahuila de Zaragoza) + 472.54(NAFTA) - 0.35(US trade balance with Mexico) - 861.01(NAFTA effect on Coahuila) + 0.05(US trade balance with Mexico effect on Coahuila); = 1, NAFTA = 1, Expected US trade balance with Mexico -\$2,371.98 million of 2002 real US dollars.

<sup>40</sup> All salaries are measured in Mexican pesos adjusted to 2002 Mexican prices.

<sup>41</sup> For this paper parameter are considered significant if reject the null hypothesis at 90 percent confidence level.

<sup>42</sup> The calculation of predicted monthly average real salaries before and after NAFTA was done using average trade balance between U.S. and Mexico for the period before (\$191.54 million of 2002 US dollars) and after (-\$2371.98 million of 2002 US dollars) NAFTA.

constant. Administrative workers in Yucatán were expected to receive the lowest salaries in this sample, holding all other variables constant. Before NAFTA, administrative workers in Jalisco were expected to earn the highest salaries in this sample, holding all other variables constant. In Durango administrative workers were expected to earn \$3,190 pesos less than by working in Mexico City and DF, holding all other variables constant.

**Table 2. Regression Results for Model 2**

Independent Variables	Dependent Variable Monthly Remuneration to Administrative Workers	Estimates and Standard Errors
Intercept		11,249(268.064)***
<b>Binary for Baja California Norte*</b>		-1,125.297(379.1)***
<b>Binary for Coahuila de Zaragoza*</b>		-1,584.507(379.1)***
<b>Binary for Chihuahua*</b>		1,343.789(379.1)***
Binary for Durango		-3,371.603(379.1)***
Binary for Jalisco		4,317.209(379.1)***
<b>Binary for Nuevo León*</b>		2,680.212(379.1)***
<b>Binary for Sonora*</b>		-637.575(379.1) *
<b>Binary for Tamaulipas*</b>		222.663(379.1)
Binary for Yucatán		-4,438.094(379.1)***
Binary for NAFTA (After January 1994 = 1)		-1,833.005(423.907)***
U.S. Trade Balance with Mexico		-1.467(0.114)***
<b>Interaction NAFTA * Baja California Norte*</b>		2,783.568(599.495)***
<b>Interaction NAFTA * Coahuila de Zaragoza*</b>		1,046.367(599.495)*
<b>Interaction NAFTA * Chihuahua*</b>		1,550.313(599.495)***
Interaction NAFTA * Durango		-334.515(599.495)
Interaction NAFTA * Jalisco		3,551.415(599.495)***
<b>Interaction NAFTA * Sonora*</b>		2,834.85(599.495)***
<b>Interaction NAFTA * Nuevo León*</b>		-989.115(599.495)*
<b>Interaction NAFTA * Tamaulipas*</b>		774.235(599.495)
Interaction NAFTA * Yucatán		711.893(599.495)
<b>Interaction U.S. Trade Balance with Mexico * Baja California Norte</b>		0.631(0.161)***
<b>Interaction U.S. Trade Balance with Mexico * Coahuila de Zaragoza</b>		0.212(0.161)
<b>Interaction U.S. Trade Balance with Mexico * Chihuahua</b>		0.012(0.161)
Interaction U.S. Trade Balance with Mexico * Durango		0.948(0.161)***
Interaction U.S. Trade Balance with Mexico * Jalisco		2.664(0.161)***
<b>Interaction U.S. Trade Balance with Mexico * Sonora</b>		0.581(0.161)***
<b>Interaction U.S. Trade Balance with Mexico * Nuevo León</b>		-0.173(0.161)
<b>Interaction U.S. Trade Balance with Mexico * Tamaulipas</b>		0.612(0.161)***
Interaction U.S. Trade Balance with Mexico * Yucatán		1.199(0.161)***
Adjusted R <sup>2</sup> = 0.7530	N = 2029	DF = 29

**States in bold share border with the United States.**

\* if significant at 90% \*\* if significant at 95% \*\*\* if significant at 99%

Three interaction-dummy variables to measure NAFTA effect on Mexican states' salaries are not significant, Durango, Tamaulipas, and Yucatan. After NAFTA, salaries in Chihuahua, Nuevo León, Jalisco, Sonora, and Baja California Norte were predicted to be \$2,923, \$2,101, \$1,549, \$818, and \$168 pesos, respectively, greater than in Mexico City and the DF, holding all other variables constant. On the other hand, salaries in Tamaulipas, Coahuila de Zaragoza, Durango, and Yucatán were expected to be \$454, \$1,042, \$5,955, and \$6,571 pesos, respectively, less than in Mexico City and DF, holding all other variables constant.

All but three interaction variables to measure the effect of U.S. trade balance with Mexico on Mexican salaries are significant. The parameter for Coahuila de Zaragoza, Chihuahua, and Nuevo León are not significant. The model predicted that an increment of \$1 million dollars in U.S. trade balance with Mexico increase salaries in Jalisco, Yucatán, Durango, Baja California del Norte, Tamaulipas, Sonora, Coahuila de Zaragoza, and Chihuahua by \$2.66, \$1.20, \$0.95, \$0.63, \$0.61, \$0.58, \$0.21, and \$0.01 pesos, respectively, holding all other variables constant. However, a similar change in U.S. trade balance with Mexico decreases monthly average salaries in Nuevo Leon by \$0.17 pesos, holding all other variables constant.

The third model explained 73.86 percent of the sample variation. Monthly benefits paid by employers, before NAFTA enactment, in Mexico City and the DF were expected to be \$870 pesos, holding all other variables constant. Based on the regression, after NAFTA, monthly average benefits paid by employers were expected to decrease by \$0.42<sup>43</sup>. The regression predicts that benefits paid by employers will decrease \$1.47 pesos for every million dollars increment on the U.S. trade balance with Mexico. All parameters to measure geographic location impact on benefits paid before NAFTA are significant<sup>44</sup>. Predicted monthly benefits<sup>45</sup> paid in Tamaulipas, Chihuahua, Jalisco, Nuevo León, Baja California, Coahuila de Zaragoza, and Sonora were \$1,313, \$1,229, \$832, \$590, \$585, \$478, and \$364 pesos, respectively, greater than in Mexico City and DF, holding all variable constant in each test. On the other hand, benefits paid in Yucatán and Durango were \$286 and \$325 pesos, respectively, less than benefits paid in Mexico City and DF.

Parameters for Baja California Norte, Chihuahua, Jalisco, and Yucatan that measure NAFTA effect on benefits paid by employers were not significant. After NAFTA, benefits paid on Northern Border States increased in relation to those paid on the based group city. Benefits paid on Chihuahua, Tamaulipas, Baja California, Nuevo León, Sonora, and Coahuila de Zaragoza were \$1,023, \$644, \$404, \$267, \$146, and \$144, respectively, greater than those paid in Mexico City and the Federal District. However, benefits paid on NBS were lower after NAFTA than those paid before the agreement was enacted. Benefits paid on Chihuahua, Tamaulipas, Baja California, Nuevo León, Sonora, and Coahuila de Zaragoza were 14.6, 35.3, 19.4, 29.1, 25.9 and 32.3 percent, respectively, lower than benefits paid before January 1994. Benefits paid by employers on Jalisco were \$545 pesos lower than in Mexico City and DF. Benefits paid on Durango and Yucatán were predicted to be \$310 and \$438 less than on the base group. Yucatán's fall on benefits payments was the greatest of the sample states. Benefits paid in this state fall by 43.4 percent after NAFTA.

Parameters to measure the effect of U.S. trade balance with Mexico on benefits paid for Sonora and Yucatán are not significant. The rest of the parameters are significant. The model predicts that an increment of \$1 million dollars in U.S. trade balance with Mexico increased monthly benefits paid by employers on Baja California, Coahuila de Zaragoza, Chihuahua, Jalisco, Sonora, Tamaulipas, and Yucatán by \$0.062, \$0.060, \$0.62, \$0.12, \$0.016, \$0.141, and \$0.014 pesos, respectively. A similar change on U.S. trade balance with Mexico

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<sup>43</sup> All benefits paid by employers are measured in Mexican pesos adjusted to 2002 Mexican prices.

<sup>44</sup> For this paper parameter are considered significant if reject the null hypothesis at 90 percent confidence level.

<sup>45</sup> The calculation of predicted monthly average real benefits paid before and after NAFTA was done using average trade balance between U.S. and Mexico for the period before (\$191.54 million of 2002 US dollars) and after (-\$2371.98 million of 2002 US dollars) NAFTA.

decreases monthly average salaries on Durango and Nuevo Leon by \$0.089 and \$0.067 pesos, holding all other variables constant.

**Table 3. Regression Results for Model 3**

Independent Variables	Dependent Variable Monthly Benefits Paid by Employers	Estimates and Standard Errors
Intercept		862.337(41.967)***
<b>Binary for Baja California Norte*</b>		573.227(59.351)***
<b>Binary for Coahuila de Zaragoza*</b>		466.744(59.351)***
<b>Binary for Chihuahua*</b>		1217.594(59.35084)***
Binary for Durango		-308.156(59.351)***
Binary for Jalisco		808.857(59.351)***
<b>Binary for Nuevo León*</b>		603.356(59.351)***
<b>Binary for Sonora*</b>		361.106(59.351)***
<b>Binary for Tamaulipas*</b>		1285.644(59.351)***
Binary for Yucatán		-289.069(59.351)***
Binary for NAFTA (After January 1994 = 1)		-0.419(66.366)
U.S. Trade Balance with Mexico		0.039(0.018)**
<b>Interaction NAFTA * Baja California Norte*</b>		-21.063(93.855)
<b>Interaction NAFTA * Coahuila de Zaragoza*</b>		-179.112(93.855)*
<b>Interaction NAFTA* Chihuahua*</b>		-47.465(93.855)
Interaction NAFTA * Durango		-213.361(93.855)**
Interaction NAFTA * Jalisco		22.122(93.855)
<b>Interaction NAFTA * Sonora*</b>		-177.922(93.855)*
<b>Interaction NAFTA * Nuevo León*</b>		-176.563(93.855)*
<b>Interaction NAFTA * Tamaulipas*</b>		-307.011(93.855)***
Interaction NAFTA * Yucatán		-116.239(93.855)
<b>Interaction U.S. Trade Balance with Mexico * Baja California Norte</b>		0.063(0.025)**
<b>Interaction U.S. Trade Balance with Mexico * Coahuila de Zaragoza</b>		0.061(0.025)**
<b>Interaction U.S. Trade Balance with Mexico * Chihuahua</b>		0.062(0.025)**
Interaction U.S. Trade Balance with Mexico * Durango		-0.089(0.025)***
Interaction U.S. Trade Balance with Mexico * Jalisco		0.12(0.025)***
<b>Interaction U.S. Trade Balance with Mexico * Sonora</b>		0.016(0.025)
<b>Interaction U.S. Trade Balance with Mexico * Nuevo León</b>		-0.067(0.025)***
<b>Interaction U.S. Trade Balance with Mexico * Tamaulipas</b>		0.141(0.025)***
Interaction U.S. Trade Balance with Mexico * Yucatán		0.014(0.02521)
Adjusted R <sup>2</sup> = 0.7386	N = 2029	DF = 29
<b>States in bold share border with the United States.</b>		

\* if significant at 90% \*\* if significant at 95% \*\*\* if significant at 99%

The fourth model attempts to measure the difference between salaries and wages. The regression explained 60 percent of the sample variation. Before January 1994, administrative workers in Mexico City and DF are expected to earn almost the double earning of production workers, holding all other variables constant. After NAFTA, administrative workers earning in Mexico City and DF were predicted to decrease by 9.7 percent in relation to production workers in the same location, holding all other variables constant. Salaries/Wages ratio in Mexico City and the Federal District are expected to decrease 0.00012 for every million increment on U.S. trade balance with Mexico, holding all other variables constant. The parameter to measure the effect of geographic location on the ratio for Chihuahua and Nuevo León are not significant. With the exception of the predicted value for Nuevo León, the predicted parameters for the remaining Northern

Border States were lower than Mexico City and DF's ratio. Salaries/Wages ratio on Baja California Norte, Tamaulipas, Sonora, Coahuila de Zaragoza, and Chihuahua were 0.829, 0.631, 0.558, 0.265, and 0.078, respectively, less than in Mexico City and DF, holding all other variables constant. Yucatán holds the greatest predicted difference with the regression base group, holding all other variables constant. Salaries in Yucatán are predicted to be 113.8 percent greater than wages, holding all other variables constant. The greatest predicted ratio belongs to Nuevo León. Administrative workers are predicted to earn 209.3 percent more than production worker before NAFTA, holding all other variables constant.

**Table 4. Regression Results for Model 4**

Independent Variables	Dependent Variable Salaries/Wages Ratio	Estimates and Standard Errors
Intercept		2.01(0.042)***
<b>Binary for Baja California Norte*</b>		-0.843(0.059)***
<b>Binary for Coahuila de Zaragoza*</b>		-0.267(0.059)***
<b>Binary for Chihuahua*</b>		-0.071(0.059)
Binary for Durango		-0.215(0.059)***
Binary for Jalisco		-0.326(0.059)***
<b>Binary for Nuevo León*</b>		0.048(0.059)
<b>Binary for Sonora*</b>		-0.556(0.059)***
<b>Binary for Tamaulipas*</b>		-0.653(0.059)***
Binary for Yucatán		-0.865(0.059)***
Binary for NAFTA (After January 1994 = 1)		-0.498(0.066)***
U.S. Trade Balance with Mexico		-0.00012(0.000018)***
<b>Interaction NAFTA * Baja California Norte*</b>		0.704(0.093)***
<b>Interaction NAFTA * Coahuila de Zaragoza*</b>		0.508(0.093)***
<b>Interaction NAFTA* Chihuahua*</b>		0.385(0.093)***
Interaction NAFTA * Durango		-0.029(0.093)
Interaction NAFTA * Jalisco		1.249(0.093)***
<b>Interaction NAFTA * Sonora*</b>		0.751(0.093)***
<b>Interaction NAFTA * Nuevo León*</b>		0.217(0.093)**
<b>Interaction NAFTA * Tamaulipas*</b>		0.536(0.093)***
Interaction NAFTA * Yucatán		0.804(0.093)***
<b>Interaction U.S. Trade Balance with Mexico * Baja California Norte</b>		0.00007(0.00002)***
<b>Interaction U.S. Trade Balance with Mexico * Coahuila de Zaragoza</b>		0.000008(0.00002)
<b>Interaction U.S. Trade Balance with Mexico * Chihuahua</b>		-0.00004(0.00002)
Interaction U.S. Trade Balance with Mexico * Durango		0.00003(0.00002)
Interaction U.S. Trade Balance with Mexico * Jalisco		0.0003(0.00002)***
<b>Interaction U.S. Trade Balance with Mexico * Sonora</b>		-0.00001(0.00002)
<b>Interaction U.S. Trade Balance with Mexico * Nuevo León</b>		0.00008(0.00002)***
<b>Interaction U.S. Trade Balance with Mexico * Tamaulipas</b>		0.0001(0.00002)***
Interaction U.S. Trade Balance with Mexico * Yucatán		0.00008(0.00002)***
Adjusted R <sup>2</sup> = 0.5427	N = 2029	DF = 29
<b>States in bold share border with the United States.</b>		

\* if significant at 90% \*\* if significant at 95% \*\*\* if significant at 99%

All interaction-dummy to measure NAFTA effect on salaries/wages ratio by states were significant, with the exception of Durango's parameters. After NAFTA, salaries/wages ratio on Chihuahua, Coahuila de Zaragoza, Sonora, Jalisco, and Nuevo León were 0.408, 0.222, 0.218, 0.213, and 0.085, respectively. On the other hand, the ratio for Yucatán, Baja California Norte, Durango, and Tamaulipas were 0.261, 0.0312, 0.322, and 0.392,

respectively, lower than in Mexico City and DF. After NAFTA, earnings situation for administrative workers improve the most for those working in Sonora, where salaries increased by 40.8 percent in relation to wages. This prediction contrasts with the situation in Durango where administrative earning fall 17.2 percent in relation to wages after NAFTA.

Parameters to measure the effect of U.S. trade balance with Mexico on salaries/wages ratio in Chihuahua, Coahuila de Zaragoza, Durango, and Sonora were not significant. The rest of the parameters are significant. The model predicts that an increment of \$1 million dollars in U.S. trade balance with Mexico increase salaries/wages ratio in Baja California, Coahuila de Zaragoza, Durango, Jalisco, Nuevo León, Tamaulipas, and Yucatán by 0.00007, 0.000008, 0.00003, 0.0003, 0.00008, 0.00012, and 0.00008, respectively. U.S. trade balance with Mexico effect on Sonora and Chihuahua's ratio is negative. This means that administrative workers in Sonora and Chihuahua benefits negative U.S. trade balance with Mexico.

## Conclusions

The statistical analysis of the data indicated that real remunerations in Mexico increased after NAFTA. However this increment is asymmetric. The asymmetry depends on workers function and maquiladora location. Administrative workers experienced an increment of almost 10 percent in salaries after NAFTA, while production workers have only experienced a 1 percent increment on their monthly average wages<sup>46</sup>. Wages and salaries increase in Northern Border States (NBS) are significantly higher than those received in Non-border States. Before NAFTA, wages and salaries<sup>47</sup> NBS increased 6.2 and 15.1 percent, respectively. The opposite occurs for production and administrative workers in Non-border States where wages and salaries decrease 8.0 and 1.7 percent, respectively. These results are consistent with change on profit maximization strategy where optimal location for production change from states closer to the Mexican capital and government structure towards their most important trade partner in the north. Benefits, other than wages and salaries, paid by employers present a different trend than wages and salaries received by workers. Benefits paid by employers decreased 25<sup>48</sup> percent after NAFTA. The decrease was greater for NBS (26.0 percent) than to Non-border States (22.4 percent).

These results are consistent with the Heckscher-Ohlin theorem, the Factor Price Equalization Theorem, and the Stolper Samuelson Theorem. Mexican production of labor-intensive products increased after NAFTA. In general, workers real remuneration increased after NAFTA. However real remuneration for workers that benefit from the protective Mexican policy experienced a decrease on their real remuneration after the policy change.

Data analysis is consistent with the second hypothesis. After NAFTA, remuneration difference between production and administrative worker remuneration increased. Before NAFTA, administrative workers earned 1.629<sup>49</sup> pesos for every peso that production workers earned. After NAFTA, the difference was greater. Administrative workers were expected to earn 1.78 pesos for every peso a production worker earned. The relation was some how different for NBS and Non-border States. Before NAFTA administrative workers in NBS earned 1.611 pesos for every peso earn by a production workers. After

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<sup>46</sup> See attachments 1 and 3.

<sup>47</sup> See attachments 2 and 4.

<sup>48</sup> See attachments 5 and 6.

<sup>49</sup> See attachments 7 and 8.

NAFTA administrative workers increase their remuneration ratio by 13.7 percent in relation to production workers. On the other hand, salaries in Non-border States before NAFTA were 1.656 for every wage. After NAFTA salaries increase only 2.8 percent over wages. These predicted values are consistent with the hypothesis presented. That arising benefit from free trade in Mexico's case were asymmetric and benefiting the more skilled workers than less skilled workers.

Mexico's experience shows that benefits from international trade are possible but not instantly. Economic magnification takes time under perfect conditions and little bit more under not so perfect conditions. In addition, to keep fomenting DFI, Mexico needs to work on standardized nation wide education level, improved infrastructure in the southern states, and involvement of more national entrepreneurs into export production. These measures may provide Pareto-Efficient results derived from international trade.

## Bibliography

- Ariola, Jim. 2001. "Trade and Wages: A Regional Analysis of the Effect of Trade on Wages in Mexico". University of Houston. Unpublished manuscript.
- Chiquiar Cikurel, Daniel. 2002. Why Mexico's Regional Income Convergence broke Down? University of California, San Diego.
- Chiquiar, Daniel. 2001. Regional Implication of Mexico's Trade Liberalization. Mimeo, University of California, San Diego.
- Chiquiar, Daniel. 2004. Globalization, Regional Wages Differentials and the Stolper-Samuelson Theorem: Evidence from Mexico. Direccion General de Investigaciones Economicas. Banco de Mexico. Mexico.
- Hanson, G.H. and Harrison, A. 1999. Who Gains from Trade Reform? Some Remaining Puzzles. National Bureau of Economic Research paper 6915.
- Hanson, Gordon, H. 2003. What Has Happened to Wages in Mexico since NAFTA? Implication for Hemispheric Free Trade. University of California, San Diego and National Bureau of Economic Research.
- Horrocks, Julia. 2004. NAFTA in Mexico.
- Markusen, James; Melvin, James R.; Kaempfer, William H.; and Maskusen, Keith E. 1995. International Trade: Theory and Evidence. International ed. McGraw-Hill Inc. U.S.A
- Robertson, Raymond. 2000. Trade Inequality and Wage Inequality: Lessons from the Mexican Experience. The World Economy Vol. 23 Issue 6, pp 827.
- Robertson, Raymond. 2002. Did NAFTA Increase Labor Market Integration between the United States and Mexico? Department of Economics, Macalester College. St. Paul MN.
- Williamson, Jeffrey, G. 1996. Globalization, Convergence, and History. Journal of Economic History v56, issue 2, pp.277-306.
- Mexican Exports Statistics. Instituto Nacional de Estadísticas, Geografía e Información.  
<http://dgcnesyp.inegi.gob.mx/cgi-win/bdieintsi.exe/NIVA0500080570001002500200#ARBOL>
- Mexican Wages, Salaries and Benefits, Instituto Nacional de Estadísticas, Geografía e Información; Estadísticas de la Industria Maquiladora de Exportación  
<http://dgcnesyp.inegi.gob.mx/cgi-win/bdieintsi.exe/NIVJ1500020003000500100005#ARBOL>

Estadística de la Industria Maquiladora de Exportación. Instituto Nacional de Estadísticas, Geografía e Información. <http://dgcnesyp.inegi.gob.mx/cgi-win/bdieintsi.exe/NIVJ150002000300050005#ARBOL?c=1414>

Mexican Map. Instituto Nacional de Estadísticas, Geografía e Información. <http://galileo.inegi.gob.mx/website/mexico/viewer.htm?sistema=1&c=423&md=d&s=geo&pagant=1>

U.S. Census Bureau, Economic Directorate, Foreign Trade Division, Data on U.S. Trade Balance with Mexico 1990-2006. <http://www.census.gov/foreign-trade/balance/c2010.html>

## Attachments 1

### Expected Mexican Monthly Real Wages Before and After NAFTA

Selected Mexican States	Predicted Wages Before NAFTA (Mexican Pesos)	Predicted Wages After NAFTA (Mexican Pesos)	Absolute Changes After NAFTA (Mexican Pesos)	Percent Change After NAFTA (Percent)	Absolute Difference with Based Group Before NAFTA (Mexican Pesos)	Absolute Difference with Based Group After NAFTA (Mexican Pesos)
Baja California Norte	8,616.029	8,822.184	206.156	2.4	2,700	1,536
Coahuila de Zaragoza	5,483.388	5,863.974	380.586	6.9	-433	-1,422
Chihuahua	6,459.374	7,161.717	702.343	10.9	543	-124
Nuevo León	6,684.607	7,976.106	1,291.499	19.3	768	690
Sonora	7,317.525	6,840.290	-477.235	-6.5	1,401	-446
Tamaulipas	8,360.986	8,900.162	539.176	6.4	2,445	1,614
Yucatán	5,976.173	4,170.734	-1,805.439	-.30.2	60	-3,115
Durango	4,424.121	4,688.018	263.897	6.0	-1,492	-2,598
Jalisco	9,293.689	7,415.440	-1,878.250	-20.2	3,377	129
Mexico City and Distrito Federal	5,916.211	7,285.983	1,369.772	23.2	0	0
Predicted Total Wages	68, 532 < 69,125 Mexican wage level is predicted to increase after NAFTA, holding all other variables constant.					

## Attachments 2

### Expected Mexican Monthly Real Wages Before and After NAFTA For Northern Border States and Non-Border States

Selected Mexican States	Predicted Wages Before NAFTA (Mexican Pesos)	Predicted Wages After NAFTA (Mexican Pesos)	Absolute Changes After NAFTA (Mexican Pesos)	Percent Change After NAFTA (Percent)	Absolute Difference with Based Group Before NAFTA (Mexican Pesos)	Absolute Difference with Based Group After NAFTA (Mexican Pesos)
Baja California Norte	8,616.029	8,822.184	206.156	2.4	2,700	1,536
Coahuila de Zaragoza	5,483.388	5,863.974	380.586	6.9	-433	-1,422
Chihuahua	6,459.374	7,161.717	702.343	10.9	543	-124
Nuevo León	6,684.607	7,976.106	1,291.499	19.3	768	690
Sonora	7,317.525	6,840.290	-477.235	-6.5	1,401	-446
Tamaulipas	8,360.986	8,900.162	539.176	6.4	2,445	1,614
<b>Total Wages for Northern Border States</b>	<b>42,921.908</b>	<b>45,564.434</b>	<b>2,642.525</b>	<b>6.2</b>		
Yucatán	5,976.173	4,170.734	-1,805.439	-30.2	60	-3,115
Durango	4,424.121	4,688.018	263.897	6.0	-1,492	-2,598
Jalisco	9,293.689	7,415.440	-1,878.250	-20.2	3,377	129
Mexico City and Distrito Federal	5,916.211	7,285.983	1,369.772	23.2	0	0
<b>Predicted Total Wages Non-Border States</b>	<b>25,610.195</b>	<b>23,560.175</b>	<b>-2,050.020</b>	<b>-8.0</b>	<b>25,610.195</b>	

### Attachments 3

#### Expected Mexican Monthly Real Salaries Before and After NAFTA

Selected Mexican States	Predicted Salaries Before NAFTA (Mexican Pesos)	Predicted Salaries After NAFTA (Mexican Pesos)	Absolute Changes After NAFTA (Mexican Pesos)	Percent Change After NAFTA (Percent)	Absolute Difference with Based Group Before NAFTA (Mexican Pesos)	Absolute Difference with Based Group After NAFTA (Mexican Pesos)
Baja California Norte	9,963.432	13,059.020	3,095.589	31.1	-1,005	162
Coahuila de Zaragoza	9,424.058	11,854.685	2,430.627	25.8	-1,544	-1,042
Chihuahua	12,314.079	15,819.318	3,505.239	28.5	1,346	2,923
Nuevo León	13,615.078	14,997.234	1,382.156	10.2	2,647	2,101
Sonora	10,441.724	13,714.797	3,273.073	31.3	-526	818
Tamaulipas	15,402.333	12,442.289	-2,960.044	-19.2	4,434	-454
Yucatán	6,759.558	6,325.675	-433.883	-6.4	-4,208	-6,571
Durango	7,777.932	6,941.623	-836.309	-10.8	-3,190	-5,955
Jalisco	15,795.476	14,445.430	-1,350.046	-8.5	4,828	1,549
Mexico City and Distrito Federal	10,967.932	12,896.663	1,928.730	17.6	0	0
Predicted Total Salaries	<b>112,462 &lt; 122,497 Mexican salaries level is predicted to increase after NAFTA, holding all other variables constant.</b>					

## Attachment 4

### Expected Mexican Monthly Real Salaries Before and After NAFTA For Northern Border States and Non-Border States

Selected Mexican States	Predicted Salaries Before NAFTA (Mexican Pesos)	Predicted Salaries After NAFTA (Mexican Pesos)	Absolute Changes After NAFTA (Mexican Pesos)	Percent Change After NAFTA (Percent)	Absolute Difference with Based Group Before NAFTA (Mexican Pesos)	Absolute Difference with Based Group After NAFTA (Mexican Pesos)
Baja California Norte	9,963.432	13,059.020	3,095.589	31.1	-1,005	162
Coahuila de Zaragoza	9,424.058	11,854.685	2,430.627	25.8	-1,544	-1,042
Chihuahua	12,314.079	15,819.318	3,505.239	28.5	1,346	2,923
Nuevo León	13,615.078	14,997.234	1,382.156	10.2	2,647	2,101
Sonora	10,441.724	13,714.797	3,273.073	31.3	-526	818
Tamaulipas	15,402.333	12,442.289	-2,960.044	-19.2	4,434	-454
<b>Total Salaries for Northern Border States</b>	<b>71,160.704</b>	<b>81,887.343</b>	<b>10,726.639</b>	<b>15.1</b>		
Yucatán	6,759.558	6,325.675	-433.883	-6.4	-4,208	-6,571
Durango	7,777.932	6,941.623	-836.309	-10.8	-3,190	-5,955
Jalisco	15,795.476	14,445.430	-1,350.046	-8.5	4,828	1,549
Mexico City and Distrito Federal	10,967.932	12,896.663	1,928.730	17.6	0	0
<b>Total Salaries for Non-Border States</b>	<b>41,300.898</b>	<b>40,609.391</b>	<b>-691.508</b>	<b>-1.7</b>		

## Attachments 5

### Expected Mexican Monthly Real Benefits Before and After NAFTA

Selected Mexican States	Predicted Benefits Before NAFTA (Mexican Pesos)	Predicted Benefits After NAFTA (Mexican Pesos)	Absolute Changes After NAFTA (Mexican Pesos)	Percent Change After NAFTA (Percent)	Absolute Difference with Based Group Before NAFTA (Mexican Pesos)	Absolute Difference with Based Group After NAFTA (Mexican Pesos)
Baja California Norte	1,455.103	1,172.115	-282.987	-19.4	585	404
Coahuila de Zaragoza	1,348.249	912.186	-436.063	-32.3	478	144
Chihuahua	2,099.313	1,792.026	-307.287	-14.6	1,229	1,023
Nuevo León	1,460.311	1,035.383	-424.927	-29.1	590	267
Sonora	1,233.978	914.642	-319.336	-25.9	364	146
Tamaulipas	2,182.520	1,412.836	-769.684	-35.3	1,313	644
Yucatán	583.458	330.420	-253.038	-43.4	-286	-438
Durango	544.646	458.477	-86.168	-15.8	-325	-310
Jalisco	1,701.791	1,313.997	-387.794	-22.8	832	545
Mexico City and Distrito Federal	869.874	768.580	-101.294	-11.6	0	0
Predicted Total Benefits	<p><b>13,479 &gt; 10,111</b> Benefits paid by employers are predicted to decrease after NAFTA, holding all other variables constant.</p>					

## Attachments 6

### Expected Mexican Monthly Real Benefits Before and After NAFTA For Northern Border States and Non-Border States

Selected Mexican States	Predicted Benefits Before NAFTA (Mexican Pesos)	Predicted Benefits After NAFTA (Mexican Pesos)	Absolute Changes After NAFTA (Mexican Pesos)	Percent Change After NAFTA (Percent)	Absolute Difference with Based Group Before NAFTA (Mexican Pesos)	Absolute Difference with Based Group After NAFTA (Mexican Pesos)
Baja California Norte	1,455.103	1,172.115	-282.987	-19.4	585	404
Coahuila de Zaragoza	1,348.249	912.186	-436.063	-32.3	478	144
Chihuahua	2,099.313	1,792.026	-307.287	-14.6	1,229	1,023
Nuevo León	1,460.311	1,035.383	-424.927	-29.1	590	267
Sonora	1,233.978	914.642	-319.336	-25.9	364	146
Tamaulipas	2,182.520	1,412.836	-769.684	-35.3	1,313	644
<b>Total Benefits for Northern Border States</b>	<b>9,779.473</b>	<b>7,239.189</b>	<b>-2,540.284</b>	<b>-26.0</b>		
Yucatán	583.458	330.420	-253.038	-43.4	-286	-438
Durango	544.646	458.477	-86.168	-15.8	-325	-310
Jalisco	1,701.791	1,313.997	-387.794	-22.8	832	545
Mexico City and Distrito Federal	869.874	768.580	-101.294	-11.6	0	0
<b>Total Benefits for Non-Border States</b>	<b>3,699.769</b>	<b>2,871.475</b>	<b>-828.294</b>	<b>-22.4</b>		

## Attachments 7

### Expected Mexican Monthly Salaries/Wages Ratio Before and After NAFTA

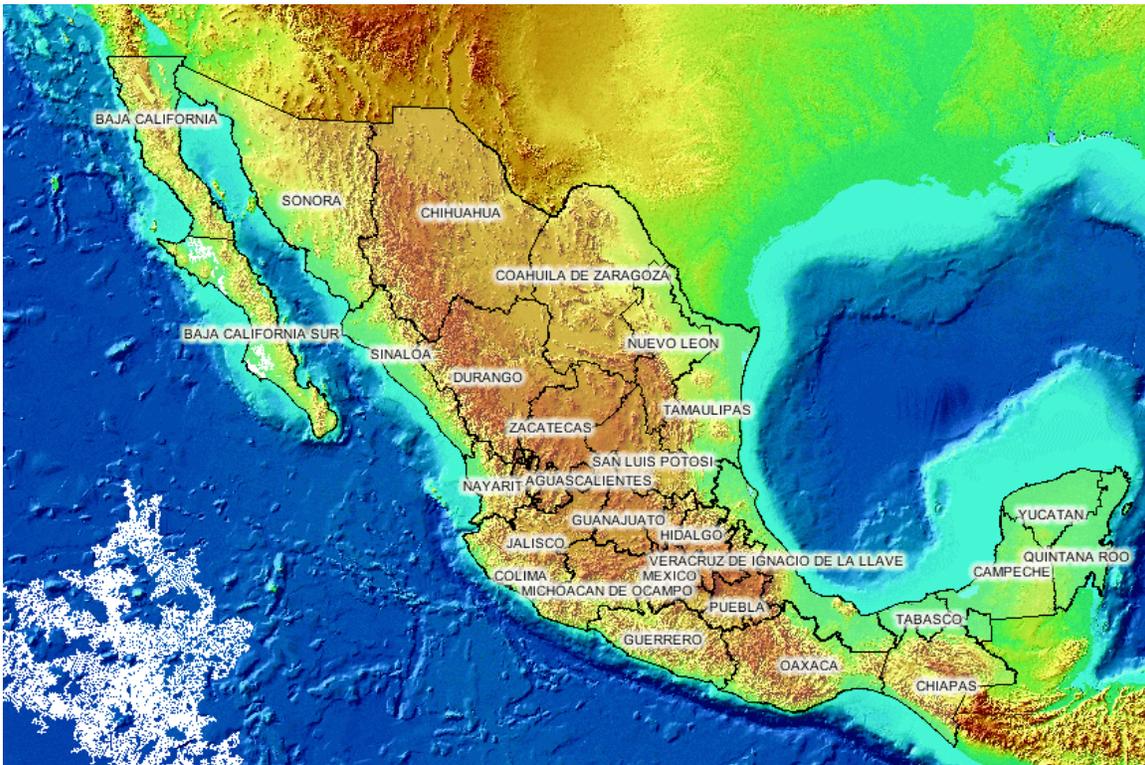
Selected Mexican States	Predicted Salaries/Wages Ratio Before NAFTA (Mexican Pesos)	Predicted Salaries/Wages Ratio After NAFTA (Mexican Pesos)	Absolute Changes After NAFTA (Mexican Pesos)	Percent Change After NAFTA (Percent)	Absolute Difference with Group Before NAFTA (Mexican Pesos)	Absolute Difference with Group After NAFTA (Mexican Pesos)
Baja California Norte	1.158	1.482	0.323	27.9	-0.829	-0.312
Coahuila de Zaragoza	1.722	2.016	0.294	17.1	-0.265	0.222
Chihuahua	1.909	2.202	0.293	15.4	-0.078	0.408
Nuevo León	2.093	1.879	-0.213	-10.2	0.106	0.085
Sonora	1.429	2.012	0.583	40.8	-0.558	0.218
Tamaulipas	1.356	1.402	0.046	3.4	-0.631	-0.392
Yucatán	1.138	1.533	0.394	34.6	-0.849	-0.261
Durango	1.778	1.472	-0.306	-17.2	-0.209	-0.322
Jalisco	1.718	2.007	0.288	16.8	-0.269	0.213
Mexico City and Distrito Federal	1.987	1.794	-0.193	-9.7	0.000	0.000
Predicted Average Salaries/wage ratio for all selected states	1.63	1.78	Difference between salaries and wages are expected to increase after NAFTA, holding all other variables constant.			

## Attachments 8

### Expected Mexican Monthly Salaries/Wages Ratio Before and After NAFTA

Selected Mexican States	Predicted Salaries/Wages Ratio Before NAFTA (Mexican Pesos)	Predicted Salaries/Wages Ratio After NAFTA (Mexican Pesos)	Absolute Changes After NAFTA (Mexican Pesos)	Percent Change After NAFTA (Percent)	Absolute Difference with Based Group Before NAFTA (Mexican Pesos)	Absolute Difference with Based Group After NAFTA (Mexican Pesos)
Baja California Norte	1.158	1.482	0.323	27.9	-0.829	-0.312
Coahuila de Zaragoza	1.722	2.016	0.294	17.1	-0.265	0.222
Chihuahua	1.909	2.202	0.293	15.4	-0.078	0.408
Nuevo León	2.093	1.879	-0.213	-10.2	0.106	0.085
Sonora	1.429	2.012	0.583	40.8	-0.558	0.218
Tamaulipas	1.356	1.402	0.046	3.4	-0.631	-0.392
Yucatán	1.138	1.533	0.394	34.6	-0.849	-0.261
Expected Average Salaries/Wages Ratio for Northern Border States	<b>1.611</b>	<b>1.832</b>	<b>0.221</b>	<b>13.7</b>		
Durango	1.778	1.472	-0.306	-17.2	-0.209	-0.322
Jalisco	1.718	2.007	0.288	16.8	-0.269	0.213
Mexico City and Distrito Federal	1.987	1.794	-0.193	-9.7	0.000	0.000
Expected Average Salaries/Wages Ratio for Non-Border States	<b>1.656</b>	<b>1.701</b>	<b>0.046</b>	<b>2.8</b>		

## Attachments 9 Mexico Map<sup>50</sup>



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<sup>50</sup> The map is from the National Institute of Statistics, Geography and Information.  
<http://galileo.inegi.gob.mx/website/mexico/viewer.htm?sistema=1&c=423&md=d&s=geo&pagant=1>