Inter-American Development Bank
Banco Interamericano de Desarrollo (BID)
Research department
Departamento de investigación
Working Paper #436

Does the Stolper-Samuelson Theorem Explain the Movement in Wages?: The Linkage Between Trade and Wages in Latin American Countries

By

Naoko Shinkai

Inter-American Development Bank

November 2000

Cataloging-in-Publication data provided by the
Inter-American Development Bank
Felipe Herrera Library

Shinkai, Naoko.
Does the Stolper-Samuelson Theorem explain the movement in wages? : the linkage between trade and wages in Latin American countries / by Naoko Shinkai.

p. cm. (Research Department Working papers series ; 436)
Includes bibliographical references.

1. Wages--Latin America. 2. Labor market--Latin America.. I. Inter-American Development Bank. Research Dept. II. Added title. III. Series.

331.21 S86--dc21

Inter-American Development Bank
1300 New York Avenue, N.W.
Washington, D.C. 20577

The Research Department (RES) publishes the *Latin American Economic Policies Newsletter*, as well as working papers and books, on diverse economic issues.

To obtain a complete list of RES publications, and read or download them please visit our web site: http://www.iadb.org/res/32.htm

ABSTRACT*

How does trade liberalization affect the wage gap between skilled workers and unskilled workers? The Heckscher-Ohlin (HO) trade model gives a prediction about the relation between wages and prices. However, its simple Stolper-Samuelson (SS) and Specific-Factors (SF) versions make opposite predictions about the correlation between prices and wages of certain types of workers (specific factors in industries) when they are not used intensively. The analysis in this paper provides evidence that may allow one to distinguish empirically between these two versions of the HO model, using wage data from household surveys in several Latin American countries—Bolivia, Mexico, and Venezuela. Two different specifications for the specific factor are examined: educated workers and experienced workers. In summary, the results favor SS, when educated workers are defined as the specific factor for these Latin American countries from the late 1980s to the mid 1990s.

* This paper was originally submitted as the second paper in partial fulfillment of the requirements for the degree of Doctor of Philosophy (Economics) at the University of Michigan in June, 1999. I thank Alan Deardorff for having given me many valuable comments. I also thank Eduardo Lora, Gustavo Márquez, Carmen Pagés, Suzanne Duryea, and Miguel Szekely for inspiring me. The views that are offered here do not correspond to the views of the Bank but are those of the author, to whom comments may be directed at NAOKOS@iadb.org.

1. Introduction

In the United States, starting from the 1980s, the gap between the wages of skilled workers with higher education and the wages of unskilled workers with less education has been growing. In Latin America, this trend of a widening gap is also likely to be encountered, especially in the countries that enacted trade liberalization, such as Mexico in the late 1980s. The question, then, is how does trade liberalization affect the wage gap? Should we blame trade for the growing wage gap? These questions lead to the question that is addressed in this paper: the link between trade and wages through the Stolper-Samuelson effect.

Based on the Stolper-Samuelson theorem in the Heckscher-Ohlin (H-O) model, the rising gap could be partially caused by a change in the relative prices of goods. This change is influenced by changes in prices in the world market. If a country is open to international trade, the price change in the domestic market is affected by the price change in the world market. Therefore, the rising gap can surely be related to trade openness through goods prices. Considering the fact that, in the United States and in Latin America, the ratio of the numbers of skilled workers to unskilled workers rises in the same period, the supply side is not likely to contribute to the rising wage gap between skilled workers and unskilled workers. The possible causes are instead on the demand side, such as technology and trade, as pointed out previously in the literature on the wage gap (Bound and Johnson, 1992; Katz and Murphy, 1992; Robbins, 1996; and Wood, 1997).

Moreover, the performance of the gap between the wages of skilled workers and the wages of unskilled workers is different by industry and country. In Mexico and Venezuela, this gap has closed between the 1980s and the 1990s in most traded industries, whereas in Bolivia the gap has widened (Graph 1). This raises the question of how these gaps are related to trade openness.

In this paper, wage data sets of different types of workers from household surveys in several Latin American countries are used to investigate the effects of international prices on wages. By decomposing wage changes over time into those that can be attributed to changes in various demographic variables and those that cannot, the otherwise unexplained wage changes can be correlated with international price changes in the industries of employment. The Stolper-Samuelson theorem predicts that changes in wages are related to the various price changes in

industries. Moreover, the unexplained wage changes are not the same in all industries. Some industries could have more significant drops in prices over the same period than others because of, for example, changes in trade policy.

The next interesting question would be in what direction the relative price would move the relative wage. This depends on the versions of the Stolper-Samuelson theorem (Deardorff and Stern, 1994). The Heckscher-Ohlin (H-O) trade model in its simple Stolper-Samuelson and Specific-Factors versions makes opposite predictions about this correlation for certain types of workers, who are considered as specific factors. The simple Stolper-Samuelson theorem in the 2 x 2 model concludes that the relative wages and also the real wages of skilled workers throughout the economy should rise when the prices of skilled worker-intensive industries increase, and the real wages of the opposite factor, unskilled workers, should drop. However, the Specific-Factor model predicts that the specific factor, say skilled workers, in a certain industry always gains when the price in that industry rises, even if this industry is unskilled worker-intensive.

The evidence that may allow one to distinguish empirically between these two versions of the H-O model using micro data sets from several Latin American countries will be provided below. In the next section, previous developments regarding the Stolper-Samuelson theorem are reviewed, followed by Section 3, which presents the model used in later estimation. Then, Section 4 explains estimation methods in detail, with four small subsections: data, estimation of labor types, the method of estimation, and additional estimation. Section 5 presents results. Finally, the conclusion summarizes the results, with prospects for future analysis and policy.

2. Previous Studies

This section reviews the theoretical development of the Stolper-Samuelson theorem, followed by some studies with empirical evidence revisited.

The Stolper-Samuelson theorem, which clarifies the relationship between factor prices and goods prices, has several versions (Deardorff, 1994): general version, restrictive version, essential version, strong version, and friends and enemies version. All of these versions assume that all factors are mobile across production sectors. This theorem originated in the 2 x 2 model with two factors and two sectors. In this model, the relative price of a certain factor, 1, increases when the goods price in the sector that uses this factor intensively rises relative to the goods

price in the other sector. However, as questioned later by Jones (1971) and developed by others including Mayer (1974) and Neary (1978), this result does not hold when at least one factor is not mobile across sectors. In the 3 x 2 model with three factors—two factors that are specific to each of two sectors and one mobile factor—it is shown that the relative factor price of the specific factor will increase when the relative price in its industry rises even if the industry uses other factors intensively. This is the major distinction between the Specific-Factors version and the original Stolper-Samuelson version.

The wages of skilled workers relative to those of unskilled workers have increased, especially starting from the early 1980s in the United States, and this phenomenon has been extensively analyzed. In the developing countries, the same trend seems to apply, although the empirical evidence ascertaining the cause is not ample.[1] Furthermore, the analyses that investigate the relation between relative wages and prices are few, both for developed countries and for developing countries.

There is an enormous volume of studies in the labor economics literature that explore the wage gaps among different types of workers separated by their education in order to find the cause of these gaps in the labor market and in the international market. The wages of skilled workers relative to the wages of unskilled workers are related to differences in technology, trade openness, and the change in supply of workers with different skills (Katz and Murphy, 1992; Bound and Johnson, 1992; and Murphy and Welch, 1992). However, these studies did not examine the Stolper-Samuelson effect directly, as pointed out in Deardorff and Hakura (1994).

In the trade literature, the Stolper-Samuelson effect has been investigated empirically in order to explain the difference in the wage gap across industries (Magee, 1980; Gaston and Trefler, 1994; Leamer, 1996; and Harrigan, 1998). Three simple tests of the Stolper-Samuelson theorem conducted in Magee (1980) use data on lobbyists for each of two factors, labor and capital. He calculates the probability of having lobbyists who support either protection or free trade for each factor and tests the Stolper-Samuelson theorem against the theory of Cairnes. In the theory of Cairnes, both factors are specific to their own sectors. The results favor the theory by Cairnes. Gaston and Trefler (1994) use the CPS (Current Population Survey) in 1983 and data on trade restrictions such as tariffs and nontariff barriers by industry, and examine how the

difference in trade protection is related to the difference in wages across industries. They find that tariffs tend to have large negative effects on wages, while nontariff barriers do not have significant effects. Leamer (1996) investigates the direct link between factor prices and commodity prices using industry data in the United States and NBER Productivity data. The data on prices are production prices in the domestic market. He finds that a net real increase in income of each factor due to the price change is from 1.35% to –7.24% depending on the factor—capital, production workers, and non-production workers—in the period of 1960-1990. Harrigan (1998) uses the time series data set of the CPS and the data on relative import prices of the three major import groups. He finds that relative factor prices are partly related to relative factor supplies and relative final commodity prices. He discovers a small but significant effect of oil import prices on wages of workers in three different skill categories, which varies from 3.5% to 4%. In addition, he concludes that increases in the import prices of other import groups have different effects on the wages of workers in different skill categories. For example, the price of Imports 1 (Food and Beverages, Industrial Supplies, and Services) increases the wages of workers without completed high school education and decreases the wages of workers who completed high school. The price of Imports 2 (Capital Goods, Consumer Goods, and Autos) has the completely opposite effect on the wages of these workers.

In this paper, the Stolper-Samuelson theorem is reexamined, using micro data sets, the household surveys of several Latin American countries. Moreover, the test between two versions —the original Stolper-Samuelson version and the Specific-Factors version of this theorem, which provide opposite predictions regarding the movement of wages caused by changes in commodity prices—is conducted using wages and international prices.[1]

3. Model

The Stolper-Samuelson theorem explains the relationship between the movements of goods prices and factor prices. However, two main streams of the same theorem give opposite predictions for the relation between goods and factor prices for some factor-industry pairs. This paper investigates which of these two versions is more applicable to the observed price

[1] There are some studies that analyze the relative wage of workers with different years of schooling in Latin America and some Southeast Asian countries (Robbins,1994 and 1996; and Wood,1997).

movements. In order to clarify the difference between these two versions of the Stolper-Samuelson theorem and to derive a testable formula later, in this section the models with two factors in a two-good world are analyzed. These two factors are more specifically, in this paper, different types of labor that are defined using the information provided in the household surveys in the next section.

The differences in characteristics between two factors are the key to distinguishing the two versions: the original Stolper-Samuelson and the Specific-Factors versions. The original Stolper-Samuelson theorem is built on the assumption of free mobility of factors across sectors. On the other hand, the Specific-Factors version, as its name implies, allows immobility of some factors. This paper deals with two factors in the two-good world.

First, the Specific-Factors version is considered. Then, the difference between the Specific-Factors version and the original Stolper-Samuelson version is described.

The Specific-Factors version is explained in a 3 x 2 model, following Jones (1971). There are three factors: one mobile factor and two specific factors which are not mobile across sectors. In the following analyses, two different types of workers are examined: skilled and unskilled workers. Both educated workers and experienced workers are examined as skilled workers. Skilled workers in this paper are defined as the specific factor and unskilled workers as the mobile factor. The reason for this specification is described in the next section. Therefore, *u* that stands for the unskilled and *s* that stands for the skilled are used to indicate the mobile factor and the specific factor respectively. There are two sectors: sectors 1 and 2. Then, there is a relation between commodity prices and factor prices as follows:

$$V_{s1}W_{s1} + V_{u1}W_u = P_1 \qquad (1)$$

$$V_{s2}W_{s2} + V_{u2}W_u = P_2 \qquad (2)$$

where a subscript *s* stands for a specific factor in each sector and a subscript *u* stands for a mobile factor. P is a commodity price, and V is factor usage per unit in each sector, and W is factor price. There is another relationship among endowments of factors that is required to derive the relationship between commodity prices and wages later on:

$$V_{s1}X_1 = I_{s1}$$
$$V_{s2}X_2 = I_{s2}$$

$$V_{u1}X_1 + V_{u2}X_2 = I_u$$

where X is output of each sector and I is endowment of each factor.

$$\frac{I_{s1}}{V_{s1}}V_{u1} + \frac{I_{s2}}{V_{s2}}V_{u2} = I_u \qquad (3)$$

Differentiating equations (1), (2) and equation (3) together yields the following relationship between changes in commodity prices and changes in factor prices:

$$E_{s1}\hat{W}_{s1} + E_{u1}\hat{W}_u = \hat{P}_1 \qquad (4)$$
$$E_{s2}\hat{W}_{s2} + E_{u2}\hat{W}_u = \hat{P}_2 \qquad (5)$$

$$H_{u1}\sigma_1\hat{W}_{s1} + H_{u2}\sigma_2\hat{W}_{s2} = (H_{u1}\sigma_1 + H_{u2}\sigma_2)\hat{W}_u \qquad (6)$$

where E is the factor share of each factor in each producing sector. H represents the fraction of the mobile factor that is used in each sector and σ is the elasticity of substitution between the mobile factor and the specific factor in each sector. Holding relative factor endowment constant, the effect of changes in commodity prices on changes in factor prices is, based on Jones (1971):

$$\hat{W}_{s1} = \frac{1}{E_{s1}}(1 - \frac{E_{u1}}{\Omega}\frac{H_{u1}\sigma_1}{E_{s1}})\hat{P}_1 - \frac{1}{\Omega}\frac{E_{u1}}{E_{s1}}\frac{H_{u2}\sigma_2}{E_{s2}}\hat{P}_2 \qquad (7)$$

$$\hat{W}_{s2} = \frac{1}{E_{s2}}(1 - \frac{E_{u2}}{\Omega}\frac{H_{u2}\sigma_2}{E_{s2}})\hat{P}_2 - \frac{1}{\Omega}\frac{E_{u2}}{E_{s2}}\frac{H_{u1}\sigma_1}{E_{s1}}\hat{P}_1 \qquad (8)$$

$$\hat{W}_u = \frac{1}{\Omega}(\frac{H_{u1}\sigma_1}{E_{s1}}\hat{P}_1 + \frac{H_{u2}\sigma_2}{E_{s2}}\hat{P}_2) \qquad (9)$$

where $\Omega = \frac{H_{u1}\sigma_1}{E_{s1}} + \frac{H_{u2}\sigma_2}{E_{s2}}$

Therefore, equation (7) predicts that an increase in the commodity price of good 1 raises the factor price of its specific factor. However, the factor price of the mobile factor does not increase as much as the price of commodity 1.

Furthermore, the changes in the relative wages of the specific factor in sector 1 become:

$$\hat{W}_{s1} - \hat{W}_u = \frac{1}{E_{s1}}\left(1 - \frac{1}{\Omega}\frac{H_{u1}\sigma_1}{E_{s1}}\right)\hat{P}_1 - \frac{1}{\Omega}\frac{1}{E_{s1}}\frac{H_{u2}\sigma_2}{E_{s2}}\hat{P}_2 \qquad (10)$$

A similar relationship holds for the changes in the relative factor prices of the specific factor in sector 2. Therefore, the changes in the factor prices of the specific factor relative to the changes in the factor prices of the mobile factor are positively correlated with the price changes of the commodity for which each specific factor is used.

Now the original Stolper-Samuelson version is described in the 2 x 2 model, following Jones (1965). As before, the relationship between the changes in commodity prices and the changes in factor prices is expressed as:

$$E_{s1}\hat{W}_s + E_{u1}\hat{W}_u = \hat{P}_1 \qquad (11)$$

$$E_{s2}\hat{W}_s + E_{u2}\hat{W}_u = \hat{P}_2 \qquad (12)$$

The difference is that here there is a single wage for skilled labor, which has been the specific factor before, in both industries. In this case, there are only two factors in the model, and they are both mobile across sectors and are identified by *s* and *u*. Solving this system, we get:

$$\hat{W}_s = \frac{1}{\Delta}(E_{u2}\hat{P}_1 - E_{u1}\hat{P}_2) \qquad (13)$$

$$\hat{W}_u = -\frac{1}{\Delta}(E_{s2}\hat{P}_1 - E_{s1}\hat{P}_2) \qquad (14)$$

where $\Delta = -E_{u1}E_{s2} + E_{u2}E_{s1}$

In order to determine the signs of these effects of commodity prices on factor prices, we need to know the relative factor intensities of the sectors. We assume throughout that commodity

1 uses factor *s* intensively. In that case, Δ is positive. Therefore, when the price of commodity 1 increases, the factor price of skilled labor, which was the specific factor in the other model, uses because it is used intensively in the production of commodity 1. On the other hand, an increase in price of commodity 2 decreases the factor price of skilled labor there, even though it was the specific factor in the other model.

Now we are ready to compare these two versions of the Stolper-Samuelson theorem and clarify the difference in the predictions. The following box is used in order to observe the different effects of the changes in commodity prices on the changes in wages:

Table 1: The Predictions by the Original Stolper-Samuelson Version (SS) and the Specific-Factors Version (SF)

	P1	P2
Ws	+ : SF	+ : SF
	+ : SS	– : SS
Wu	+ or – : SF	+ or – : SF
	– : SS	+ : SS

For example, the Specific-Factors version tells us that the changes in the factor prices of the specific factor are positively related to the changes in commodity prices (the upper row of Ws). However, the original Stolper-Samuelson version predicts that the price of a factor increases only when the price of the commodity that uses this factor intensively rises (the lower row of Ws). Both the lower row and upper right corner show the contradicting predictions in the signs of the changes in wages caused by changes in commodity prices. However, there is no definite relation between changes in commodity prices and changes in factor prices of the mobile factor in the Specific-Factors version. Therefore, the only clear difference between these two versions of the Stolper-Samuelson theorem is shown in the upper right corner. This phenomenon is empirically examined in the following by observing the sign of the elasticity of the factor price of the specific factor with respect to the commodity price of the mobilefactor-intensive industry. If this elasticity is positive, the Specific-Factors version is favored. If this elasticity is negative,

the original Stolper-Samuelson version should be used in order to explain the interactions between trade and wages.

4. Empirical Method

In order to distinguish empirically between the predictions of the original Stolper-Samuelson (SS) and Specific-Factors (SF) versions in the upper-right-hand cell in Table 1, we need the following: 1) data on wage changes for different types of labor; 2) international price changes for the industries in which those workers are employed; 3) some way to distinguish specific from non-specific factors; and 4) measures of the intensities of these factors by industry. Once we have all these, we can focus our attention on specific factors in industries where they are not the intensively-used factor, and then use regressions to determine whether wages and prices are related positively, as in the SF prediction, or negatively, as in the SS prediction. Our household survey data of several Latin American countries include comparable labor market and demographic variables for two years about ten years apart. These variables will be used to infer the portions of wage changes that are not simply the result of shifting demographics. The survey data also include the industry of employment, which can be matched to international prices or unit value data.

Central to this approach is the ability to distinguish specific from non-specific factors. Since we have data only on workers with various characteristics, we will base our analysis on the assumption that some workers are more industry-specific than others, depending either on their level of education or on their years of experience in the industry. Our assumption is that education provides skills that are specific to industries when skilled workers are considered as a specific factor. When experienced workers are defined as a specific factor, workers are presumed to acquire industry-specific skills with experience. These two alternative assumptions will therefore be used to divide workers into two labor categories, the specific factor and the mobile factor, with the former taken to be industry specific and less mobile. Once the factors are defined in this way, industries will be classified by their intensities of use of these factors using the employment ratio of these factors.

Data

The data consist of household surveys from Latin American countries at two points in time, one in the 1980s and the other in 1994 or 1995, depending on the country. The difference between these two points is about ten years on average. These data sets contain demographic and labor market characteristics for each individual. These characteristics include gender, age, location, hourly wages, which sector (*rama de actividad*) individuals work for, whether these individuals are self-employed or not, whether these individuals are part-time workers or not, years of schooling, and occupation (in one or two digits). All of the household surveys are collected by the Inter-American Development Bank for a larger project in which the author is involved.

The method used in this paper requires fine categories of industries, at least the 2 or 3 digit level, so that there are enough observations of industries to examine the correlations between changes in international prices and changes in wages. The household surveys that satisfy this condition are Chilean, Bolivian, Mexican, Peruvian, and Venezuelan. Considering the comparability across time and the availability of international prices with sufficient quality, Bolivia, Mexico, and Venezuela are analyzed in this paper.

The workers in the data set who are studied in this paper are dependent workers[2] between the ages of 15 and 65 who declared themselves as employed and reported positive labor income.[3] When workers reported excessively high years of schooling compared to their own age, they were excluded. These workers constitute at most 0.6% of workers in the sample. In the case of Venezuela, there are some people who have income flags of no response (around 0.61% in 1981 and around 3.6% in 1995 of all dependent workers between the ages of 15 and 65). They also are not included. Wage per worker is labor income per hour.[4]

[2] Dependent workers are those who work for other people's business establishments or companies and independent workers are those who basically own their own business and work all by themselves or with several employees.

[3] There are three distinctions for workers in the data set: dependent workers, independent workers (patrono o empleador y trabaja por cuenta propia), and self-employed (trabaja por cuenta propia). The "top-coded problem," that is, all income above a certain level is truncated to that level, is a main concern when the values of earnings are analyzed with the CPS. There is no top-coded problem for the countries that are examined in this paper.

[4] The hourly wage from principal jobs and that from all jobs are both examined. Almost 90-95% of the workers used for analysis have only one job and the choice of wage did not make much difference. Therefore, in the following analyses, the hourly wage of all jobs is used.

The data on commodity prices, or unit values which we observe as approximations to commodity prices.[5] All of the unit-value indexes are weighted by trade volume in order to take into account any change in the composition of goods.

The unit values are reported at the 4 or 5 digit SITC (Standard International Trade Classification) level and hourly wages are available at the 2 or 3 digit ISIC (International Standard Industrial Classification) level. The concordance between these two codes is constructed, basically following the method developed in Maskus (1991) and also utilizing the concordance published by OECD (Organization for Economic Cooperation and Development), which is made available by Jon Haveman.

The disaggregated unit values (hereafter referred to as international prices, export prices, and import prices) are aggregated so that they would match the categories of wages. For Bolivia and Mexico, where wages are available only at the 2 digit ISIC level, the export and import prices at the 3 digit ISIC level are averaged using either export or import share within the 2 digit ISIC industries as weights. Therefore, at the 2 digit level, because of this aggregation, both import and export prices are observed. Additionally, within industries, the composition of products at the 3 digit level changes over time. The trade shares that are used in this paper as weights are those in the base year 1990. Export share is used for export prices and import share is used for import prices. Products whose international prices are observed only in one year are added only for that year, using these weights. All export prices and import prices are Laspyres indexes that use the quantity traded in the base year 1990. All prices are valued in the 1990 U.S. dollars.

All industries are divided into three groups: export industries, import industries, and industries that have both exports and imports. An index, equal to the difference between exports and imports divided by the sum of exports and imports, is used to determine the trade category into which each industry falls. Specifically, if the value of this index is greater than or equal to 0.5, an industry is classified as an export industry and if it is smaller than or equal to –0.5, this industry is categorized as an import industry. Industries with a value between –0.5 and 0.5 are

[5] All commodity prices come from the United Nations' *International Trade Statistics Yearbook*, and the method of calculating the unit value index is taken from Shiells (1991). Shiells constructed the import unit-value indexes for categories that would coincide with those used to produce the BLS (Bureau of Labor Statistics) import-price

defined as having two-way trade. For an industry with two-way trade, if export surpasses import, then export prices minus import prices, both weighted, are used as international prices.[6] Export prices should influence the international prices of this two-way trade industry more than import prices when exports dominate imports. However, using only export prices may not capture the effect from import prices. Therefore, as net export prices, weighted export prices after import prices are subtracted are used. If the opposite is true, then import prices minus export prices as net import prices are used. In other cases, only either the import price or the export price is used depending on the trade category.

The producer price index is used to adjust for inflation and the consumer price index is used to deflate wages.

Estimation of Labor Types

As stated previously, in order to distinguish empirically between the SS and the SF predictions of the correlation between wage changes and price changes, we need to specify who are the specific factors within each industry. The specific factor is the factor that is not mobile across industries. According to human-capital theory, workers who are paid highly in their current jobs are in general less likely to change jobs (Parsons,1977 and Flinn, 1986). Workers who are paid poorly and can find better-paying jobs elsewhere tend to change their jobs easily, because the cost of changing jobs is offset by the gain from changing jobs.

All workers are paid differently according to their various characteristics, such as age, gender, years of schooling, years of experience, region, and so on. Among these characteristics, the difference in wages of workers is mostly explained by two factors: the difference in years of schooling and the difference in years of experience. Workers are paid more when they are more educated and/or they have more experience. Therefore, when workers have more education and/or have more experience, they tend to stay on their jobs. There is some evidence for this prediction.

---

indexes. Hethen compared the import-demand elasticity estimates based on these two indexes. He concluded that the results obtained from using these two different indexes are similar.

[6] If, within an industry, both exports and imports (different products in narrowly defined industries, for example) are observed, it is possible that this indicates that there is a change in the composition of products. In this case, there could be some substitution between export goods and import goods. Then, changes in net export prices are more accurate figures that represent international prices in this two-way trade industry.

The more experience workers have, the less likely they are to change jobs, because the cost of changing jobs becomes higher and also the quality of matching characteristics between employers and employees becomes higher (Jovanovic, 1979; Flinn, 1986; and Topel and Ward, 1992). The skill that a firm demands of workers tends to match with the skill that experienced workers have.

In the case of educated workers, they are assumed to acquire some industry-specific skills at school before they enter the labor market. These skills are highly valued in certain industries but not in others. For example, business-school students are of value in financially related industries but of no value or less value in the agricultural industry.

In the following analyses, all workers are divided into two categories, the specific factor and the mobile factor, based on the two standards: years of schooling and years of experience.

In the 1980s in the Latin American countries, wages were almost double for workers (urban males between the ages of 18 and 65) who have completed primary school, when they are compared with those who did not finish primary school, according to studies based on the household surveys.[7] However, the fact that the size of the difference in wages is one and a half times higher when workers complete primary school is found only in the 1990s. On the other hand, in both periods, wages are one and a half times higher for workers who completed high school compared to the ones who did not. The value of completed high school education is very steady both in the 1980s and in the 1990s. Therefore, for this study all workers are divided into two categories according to whether they completed high school or not.

When years of experience is used in order to divide workers into the specific factor and the mobile factor, whether workers have 25 years of experience or not is used. The percentage of workers with less than one year of job tenure is less than 20% when workers have more than 20 years of experience in Venezuela, where both years of experience and job tenure are available (Table A.1). Based on this fact, we assume that most of the workers with around 25 years of experience or more would have more than one year of experience in their current jobs and are less likely to be mobile. Therefore, experienced workers with more than 25 years of experience accumulated the skills that are specific to the industry through experience.

[7] Inter-American Development Bank (1999).

The measurement of factor intensity of each industry is also required in order to make a distinction between the SS and SF versions. The SS in the 2 x 2 model is based on the assumption:

$$\frac{V_{s1}}{V_{u1}} > \frac{V_{s2}}{V_{u2}} \quad (15)$$

where V is factor usage per unit in each sector. Equation (15) means that good 1 is skilled worker-intensive. The above relationship can be written as:

$$\frac{V_{s1}Q_1}{V_{s2}Q_2} = \frac{L_{s1}}{L_{s2}} > \frac{V_{u1}Q_1}{V_{u2}Q_2} = \frac{L_{u1}}{L_{u2}} \text{ and } \frac{L_{s1}}{L_{u1}} > \frac{L_{s2}}{L_{u2}} \quad (16)$$

where Q is the amount of production of each good and L is the total amount of each factor that is used for production. In the following analyses, all industries are ordered according to the ratio of skilled workers to unskilled workers. The average ratio is used in order to divide industries into skilled worker-intensive industries and unskilled worker-intensive industries.

The Method of Estimation

There are several ways to estimate the relationship between changes in wages and changes in international prices. In this paper, the method that has been utilized to study wage differences across industries is chosen to study this relationship. In summary, in this method, individual wages are regressed on all the characteristics of workers and the characteristics of industries such as international prices.

There are two ways to proceed with this approach: a one-step procedure and a two-step procedure. The one-step procedure, in which wages are regressed on both workers' characteristics and industry characteristics such as prices, is problematic because of the following reasons. First, the standard errors from the one-step estimation for the variables at the industry level are exaggerated since there are some components in the error terms that are shared by workers in the same industry. Second, and more importantly, including industry-level variables could cause a bias. For example, when the average firm size in an industry instead of the firm size for each worker is incorporated, multicollinearity among the right-hand side variables makes it more difficult to interpret the effects of the variables that are different only by

industry. Moreover, if the difference between the average firm size and the firm size for each worker that is left in the error term is correlated with other demographic variables, it will cause a bias toward the coefficients of demographic characteristics. Therefore, the two-step procedure is preferable and more efficient (Dickens and Katz, 1987 and Gaston and Trefler, 1994).

In addition to this advantage, the two-step procedure with the industry dummies is necessary in order to capture the changes in wage premiums across industries over time.

In the following description, skilled workers are used as the specific factor and unskilled workers are used as the mobile factor.

The two-step procedure is illustrated below. Workers are paid according to their skills. Some of the skills are explained by the characteristics of workers and other skills are considered as industry-specific:

$$W_{ij} = W_{p_j} W_D \quad (17)$$

$$W_D = f(X_i) \quad (18)$$

where W_D is a part of the individual wage which can be explained by the characteristics of workers and is a function of X which is a set of demographic characteristics of workers, such as gender, region, experience, and years of schooling. W_{ij} is the wage of individual i in industry j. W_{pj} is a part of the individual wage which can not be explained by workers' characteristics, and it is industry-specific.

The first stage of the two-step procedure is to regress individual wages on the worker's demographic characteristics and a dummy variable for industries (industry dummies) in order to separate W_{pj} from W_D. Note that only skilled workers are used in the regression for the purpose of obtaining wage premiums for skilled workers.

$$\ln W_{ij} = \alpha + \beta_j D_j + \beta_X X_{ij} + \varepsilon_{ij} \quad (19)$$

The coefficients of industry dummies, β_j, are wage premiums on industries for skilled workers. Then, the second stage is to regress wage premiums on the special characteristics of industries which are international prices:

$$\beta_j = \ln W_{pj}$$

$$\ln W_{pj} = \delta + \beta_p \ln P_j + \eta_j \quad (20)$$

Based on equations (7), (8), and (13), the following relation between changes in wage premiums and changes in commodity prices is derived:

$$d \ln W_{pj} = \lambda + \beta_{dp} d \ln P_j + \sigma_j \quad (21)$$

where W_{pj} is a wage premium on industry j and σ_j is a component of the changes in wage premiums which is not explained by international prices. A constant term λ captures the change in the average wage premiums of skilled workers. For example, the increase or decrease in the demand of skilled workers in industries, such as the increase in the demand of skilled workers in these industries as technology becomes more advanced over time, is considered to be captured by λ. The difference in wage premiums that is not explained by the changes in prices by industry is left in the error term. This can be yielded from the difference in the speed of adoption of technology by industry since this difference adds variety to the demand of skilled workers.

Estimation with Prices

In this section, an estimation equation that includes factor intensities of all traded industries is derived based on SS. As explained later, this estimation equation emphasizes the validity of SS, while allowing the price effects on wages to vary by industry.

If industry 1 is the unskilled-intensive industry, the coefficient on $\hat{P}_1$, $\frac{E_{u2}}{\Delta}$ in equation (13), should be negative. This coefficient can be reformulated as follows:

$$\frac{E_{u2}}{\Delta} = \frac{E_{u2}}{-E_{u1}E_{s2} + E_{u2}E_{s1}}$$

$$= -\frac{\frac{E_{u2}}{E_{s1}E_{s2}}}{\frac{W_u}{W_s}\left(\frac{L_{u2}}{L_{s2}} - \frac{L_{u1}}{L_{s1}}\right)^2}\left(\frac{L_{u1}}{L_{s1}} - \frac{L_{u2}}{L_{s2}}\right) \quad (22)$$

where L_{uj} is the unskilled and L_{sj} is the skilled labor used in industry j.

Therefore, if the difference in the factor intensities between the unskilled worker-intensive industry and the skilled worker-intensive industry is large, the absolute value of the negative effect of the changes in prices on the changes in wages is also large. The estimation equation with this difference in the factor intensities between the unskilled worker-intensive industry and the skilled worker-intensive industry can be written as follows:

$$d\ln W^{p}{}_{j} = \lambda + \beta_{Lp}\left(\frac{L_{u1}}{L_{s1}} - \left(\frac{\bar{L_{u2}}}{L_{s2}}\right)\right) d\ln P_{j} + \sigma_{j} \quad (23)$$

where $\frac{\bar{L_{u2}}}{L_{s2}}$ is the average factor ratio of all skilled worker-intensive industries.

The above relationship is for the unskilled worker-intensive industries. A similar relationship between the changes in wages and the changes in prices multiplied by the difference in the factor intensities can also be shown for the skilled worker-intensive industry. The coefficient on $\hat{P}_2$ in equation (13) is:

$$-\frac{E_{u1}}{\Delta} = -\frac{E_{u1}}{-E_{u1}E_{s2} + E_{u2}E_{s1}}$$

$$= -\frac{\frac{E_{u1}}{E_{s1}E_{s2}}}{\frac{W_u}{W_s}\left(\frac{L_{u2}}{L_{s2}} - \frac{L_{u1}}{L_{s1}}\right)^2}\left(\frac{L_{u2}}{L_{s2}} - \frac{L_{u1}}{L_{s1}}\right) \quad (24)$$

The estimation equation for the skilled worker-intensive industry becomes:

$$d\ln W^{p}{}_{j} = \lambda + \beta_{Lp}\left(\frac{L_{u2}}{L_{s2}} - \left(\frac{\bar{L_{u1}}}{L_{s1}}\right)\right) d\ln P_{j} + \sigma_{j} \quad (25)$$

where $\frac{\bar{L_{u1}}}{L_{s1}}$ is the average of the factor ratio of all unskilled worker-intensive industries.

In this equation, the coefficient of the changes in prices multiplied by the difference in the factor intensities is expected to be negative also, as in the above estimation equation (23).

In sum, according to equations (22) and (24), the estimation equation for all industries can be expressed as:

$$d\ln W^{p}{}_{j} = \lambda + \beta\ E_{uo}(\frac{L_{uj}}{L_{sj}} - (\frac{\bar{L_{uo}}}{L_{so}}))d\ln P_{j} + \sigma_{j}$$

where $\frac{\bar{L_{uo}}}{L_{so}}$ is the average of the factor intensities of all skilled worker-intensive industries and *o* stand for the skilled worker-intensive industries when industry *j* is an unskilled worker-intensive industry, and vice versa.

Before proceeding, E_{u1} and E_{u2} are considered. These are factor shares of unskilled workers in the unskilled worker-intensive industry and in the skilled worker-intensive industry. In order to observe the actual shares, data on production by industry in the national accounts are used. These are publicly available in *Anuario Estadístico Los Estados Unidos Mexicanos*. E_{u1}, which is the factor share of unskilled workers in the unskilled worker-intensive industry (for Mexico, industries: 31, 32, 33, and 36), is 11.72%, which is the average of two years. E_{u2}, which is the factor share of unskilled workers in the skilled worker-intensive industry (for Mexico, industries: 34, 35, 37, and 38), is 12.59%. The difference between factor shares is 0.87 and less than one. In other countries, the actual factor shares are not available. Therefore, when the further estimation is conducted, the following estimating equation is used, assuming the factor share of unskilled workers to be similar in both the unskilled worker-intensive industry and the skilled worker-intensive-industry.

$$d\ln W^{p}{}_{j} = \lambda + \beta_{Lp}(\frac{L_{uj}}{L_{sj}} - (\frac{\bar{L_{uo}}}{L_{so}}))d\ln P_{j} + \sigma_{j} \quad (26)$$

Next, an estimation equation is considered in order to make a distinction between the SS and the SF. As an alternative to equation (21), which uses absolute wages, the following discussion will focus on relative wages.

According to equations (7) and (9) for the specific factor model, the changes in the relative wages of skilled workers are expressed as in the following for the unskilled worker-intensive industry, industry 1:

$$\hat{W}_{s1} - \hat{W}_{u1} = \frac{1}{E_{s1}}\hat{P}_1 - \frac{1}{\Omega}\frac{H_{u1}\sigma_1}{E_{s1}}\frac{1}{E_{s1}}\hat{P}_1 - - \frac{1}{\Omega}\frac{H_{u2}\sigma_2}{E_{s2}}\frac{1}{E_{s2}}\hat{P}_2$$

$$= \frac{1}{E_{s1}}(1 - \frac{1}{\Omega}\frac{H_{u1}\sigma_1}{E_{s1}})(\hat{P}_1 - \hat{P}_2) \qquad (27)$$

In industry 2, the above relationship between the changes in wages and the changes in prices holds by switching subscripts from 1 to 2. The terms in front of the changes in the relative prices are positive in both cases.

Second, the estimation equation that has a combination of the deviations in factor ratios and the changes in the relative prices is derived based on the SS.

$$\hat{W}_s - \hat{W}_u = \frac{1}{E_{s1} - E_{s2}}(\hat{P}_1 - \hat{P}_2)$$

$$= \frac{(1 + \frac{W_u L_{u1}}{W_s L_{s1}})(1 + \frac{W_u L_{u2}}{W_s L_{s2}})}{\frac{W_u}{W_s}(\frac{L_{u2}}{L_{s2}} - \frac{L_{u1}}{L_{s1}})^2}(\frac{L_{u2}}{L_{s2}} - \frac{L_{u1}}{L_{s1}})(\hat{P}_1 - \hat{P}_2) \qquad (28)$$

Industry 1 is unskilled worker-intensive. Therefore, the changes in the relative wages between skilled workers and unskilled workers are negatively related to the changes in the relative prices. The negativity of the term in front of the changes in the relative prices is opposite to the prediction based on the SF.

The estimation equation becomes:

$$d(\ln W^s{}_j - \ln W^u{}_j) = \lambda + \beta_{dp} d(\ln P_j - \ln P_o) + \sigma_j \qquad (29)$$

where *o* stands for the average of skilled worker-intensive industries and *j* represents an unskilled worker-intensive industry.

The average price in the skilled worker-intensive industry is represented by P_o. If the coefficient on the changes in the relative prices is found to be negative, the SS is favored. A further analysis will be done in this case in order to observe the cause of the negativity more clearly by using all industries when the coefficient in equation (29) is negative. The equation

achieving this purpose is derived from equation (28):

$$d(\ln W^{s}{}_{j} - \ln W_{j}{}^{u}) = \lambda + \beta_{dLp}(\frac{L_{uj}}{L_{sj}} - (\frac{\bar{L}_{uo}}{L_{so}}))d(\ln P_{j} - \ln P_{o}) + \sigma_{j} \quad (30)$$

This estimation equation enables us to calculate the plausible size of the effect of the changes in the relative prices on the changes in the relative wages that could be different by industry because of the divergence of factor intensities. Equations (29) and (30) are estimated and results are examined in the next section.

If the error term, σ_j, and the right hand side variable, $d(\ln P_j - \ln P_o)$, is correlated in equation (29), the coefficient is biased. Technological change that is only applicable for the skilled workers is absorbed by a constant term when it is the same in all industries. However, if there is a difference in technological change across industries, this difference is left in the error term. In this case, it is possible that the skilled workers in some industries utilize more advanced technology than the skilled workers in the others. Then, the change in the relative price in industry *j* is positively correlated with the deviation of technological change. Therefore, a difference in technology adoption by industry that correlates both with price changes and with change in wage premiums would cause an upward bias in the coefficient of the change in the relative price. In order to obtain unbiased coefficients, instrumental variables can be used. The instruments should be correlated with the changes in the relative prices but not with technological change affecting skilled workers. There are several candidates for instruments that satisfy these criteria: exchange rates, international prices, producer prices, and costs of production of main trade partners of the country under analysis. In this paper, the changes in the real producer prices in matching industries in the United States are used to instrument the changes in the relative prices. The choice of country is reasonable, considering the United States dominates almost half of the entire trade (either by exports or by imports) of the Latin American countries analyzed here and is their major trade partner. There could be a correlation between technological change and production cost in the U.S. if the same technologies change both in the U.S. and in the developing countries, or if there is technology diffusion. However, technologies seem likely to differ sufficiently by levels of development. Therefore, this link appears weak.

5. Results

The test to distinguish two different versions—SS and SF—and further estimations are conducted in the following order: First, the two versions are sorted by examining the sign of the effects of prices on wages based on equation (29). Second, if the price effect is negative and the result validates SS, the further estimation which allows variation in the strength of price effects based on the variation in the factor intensities is investigated.

Overall, the effects of changes in international prices of unskilled worker-intensive goods on wages of skilled workers in those industries are negative when the wages of educated workers are used as dependent variables in the regressions. However, the coefficients are either smaller or positive when experienced workers are taken to be the specific factor. Therefore, SS is likely to explain the relationship between the wages of educated workers and international prices in Bolivia and Mexico. On the other hand, when the wages of experienced workers are examined, the chance of SS being true is probable, but not definite. In Venezuela, the effect of changes in international prices is positive in this case.

The ambiguity of the price effect in Bolivia and Mexico occurs when the wages of experienced workers are examined, partially because the variation in factor intensities by this measure is rather small across industries. As discussed below, there could be some industries that have factor intensities close to the mean factor intensity with a positive price effect on wages. At the same time, the industries with factor intensities far from the mean could have the opposite and thus negative price effect on wages.

The results are presented in the following order in the next subsections: first, the results from the regression of the changes in the relative wages of skilled workers on the changes in the relative international prices as in equation (29) are provided; then, the results from the estimation examining the effect of relative international prices combined with the differences in factor intensities on the relative wages based on equation (30) follow; finally, the results using instrumental variables are presented.

First, the case in which educated workers are defined as skilled workers, therefore, as the specific factor, is considered in order to sort out two versions.

Educated and Uneducated Workers

First, the result based on equation (29) from regressing changes in relative wages of educated workers to the less-educated, on changes in relative prices is examined to differentiate SS from SF by the sign of coefficients.

The results from the first-stage regression for equation (29) are reported in Table A.2. The wages of skilled workers used in the second-stage regression are the wage premiums that are obtained in the first-stage regression. This regression uses only the unskilled-intensive industries.

First, the wage gaps between educated workers and uneducated workers are observed by industry (Graph 1). The actual measures of the relative wage premiums by industry are presented in Table A.3. The relative returns to educated workers increase or decrease over time and the pattern of changes varies by industry. In most traded industries in Mexico and Venezuela, the gaps between the wages of educated workers and the wages of uneducated workers have narrowed for the period of 1980s-1995. On the other hand, in Bolivia, in all traded industries, the gaps have widened between 1986 and 1995.

This effect, using the changes in the relative prices, is rather large in the case of Bolivia. For example, when the commodity prices in the uneducated worker-intensive industries rise relative to the ones in the skilled worker-intensive industries, the wages of educated workers in the uneducated worker-intensive industries relative to those of uneducated workers drop by around 29 percent of the price change in Bolivia and by around 2 percent in Mexico. Now also, in Venezuela the coefficient is small but negative. The relative price increase brings about a 0.7 percent increase in the relative wages of educated workers.

For the countries with negative price effects in these estimations, a further estimation is considered. This additional estimation incorporates the difference in factor intensities across industries. Therefore, this enables us to capture different sizes in the effect of the changes in prices on the changes in wages produced by the divergence in factor intensities.

The further estimation involving relative factor intensities is applied to all three countries. In equation (30), the deviations of factor intensities are incorporated as part of the regressor in the estimations for the effect of relative prices on relative wages. The results from this estimation are shown in Table 3. The coefficients become smaller relative to those reported in Table 2. The large deviations of factor intensities of educated workers across industries make the coefficients

smaller by being a part of the denominator of the coefficients. The price effect in Mexico is significant at the 15 percent level.

Graph 3 shows these effects of the changes in the relative international prices on the changes in the relative wages of educated workers by industry, when these price effects are allowed to differ across industries because of the variation in factor intensities. The educated workers in the educated worker-intensive industries with large deviations of factor intensities from the mean gain the most from the increases in the relative prices in those industries.

For example, in Bolivia, when relative international prices are doubled, this price increase in each industry brings about a 10 percent decrease in the relative wages of educated workers in the uneducated worker-intensive industries, such as the wood and wood products industry (33), and the same commodity price change causes a 9.4 percent increase in the relative wages of educated workers in the educated worker-intensive industries, such as the paper and paper products industry (34).

In Mexico, in the uneducated worker-intensive industries, such as the wood and wood products industry (33), a one hundred percent increase in relative international prices results in about a 5.4 percent reduction in the relative wages of educated workers in this industry. The same amount of increase in the relative international price brings about a 35.7 percent reduction in the relative wages of educated workers in the agricultural industry (11). On the other hand, in the educated worker-intensive industries such as the mining industry (20), a one hundred percent increase in the relative international prices yields about a 3.2 percent increase in wages of educated workers in these industries. Therefore, the effect of international prices on wages could be large depending on the factor intensities of industries in question.

In the following subsection, the results from estimations using experienced workers as the specific factor are examined.

Experienced and Inexperienced Workers

When experienced workers are categorized as the specific factor, the effect of the changes in international relative prices is negative in Bolivia and Mexico as presented in Table 2. First, the wage gaps are examined by industry.

As shown in Graph 2, the wage gaps between experienced workers and inexperienced workers in almost all traded industries have widened over time in Venezuela. In Bolivia and

Mexico, the wage gaps between experienced workers and inexperienced workers in most traded industries have been narrowed (Table A.4).

The result from the estimation based on equation (29) using experienced workers is indeterminate. As reported in Table 2, changes in the relative prices in inexperienced worker-intensive industries do not affect the changes in relative wages of experienced workers as much as they affect the changes in relative wages of skilled workers in the unskilled worker-intensive industries in the case of Bolivia.

On the other hand, in Venezuela, the effect of changes in relative international prices on changes in the relative wages of experienced workers comes out positive. This positive coefficient in Venezuela could be explained by the number of industries that are analyzed. Even if the effect of prices may be consistent with SS and negative when only the most extreme less experienced worker-intensive industries are used, including all relatively less experienced worker-intensive industries could result in the positive price effect. The fact that the price effect that is captured by the coefficient is the average price effect in all less experienced worker-intensive industries should not be forgotten.

When the relative prices in the inexperienced worker-intensive industries double, the wages of experienced workers decrease by 9.4 percentage points in Bolivia and by 2 percentage points in Mexico, and increase by 1.5 percentage points in Venezuela. All these price effects are insignificant.

As in the previous case, the further estimations are considered for countries with negative price effects. Both Bolivia and Mexico are examined. In the case with experienced workers as the specific factor, only Mexico has a negative price effect (Table 3); as a result, this is the only country that is used to examine further the size of the price effect by industry.

The difference in factor intensities of experienced workers across industries is not as large as the difference in factor intensities of skilled workers, and sometimes the deviations of factor intensities are less than one. Therefore, this deviation that becomes part of the denominator of the coefficients makes the absolute size of the coefficient larger than in the estimation without the deviations in factor intensities. The price effect is negative only in Mexico, and it is significant at the 10 percent level (Table 3).

The results from the regression described in equation (30) are reported in Table 3. The coefficients of the changes in the relative international prices combined with deviations in factor

intensities are small but negative and significant at the 10 percent level. Factor intensities of experienced workers do not vary across industries, as stated previously, and the deviations of those from the mean of the opposite industries are smaller than one. Consequently, the absolute value of coefficient becomes larger than that in the regression without factor intensities as part of the regressor.

The price effects in Mexico by industry are shown in Graph 4. For example, when the relative price increase in the inexperienced worker-intensive industry, such as the fabricated metal products, machinery and equipment industry (38), the relative wages of experienced workers decrease by 6.9 percent of the price change. On the other hand, when the relative price in an experienced worker-intensive industry, such as the agricultural (11) or the non-metallic mineral products industry (36), increases, the relative wages of experienced workers increase by 4.5 percentage points.

Instrumental Variables

Finally, the results using instrumental variables are presented in Table 4.[8]. Instrumental variables are used in the regression of the changes in the wages of skilled workers on the changes in international prices and also in the regression using the changes in the relative international prices as regressor. The method of two-stage least squares overcomes the problem of possible positive correlation between the divergence in technology used by skilled workers across industries and the difference in international prices in each industry. If instrumental variables are correlated with international prices but not with technology differences, the corrected coefficients of international prices should be smaller than the ones without correction as discussed in the section on estimation. The results show that the coefficients of international prices actually are larger in Mexico and Venezuela and smaller in Bolivia, compared to those in the regression without instrumental variables. Although the R^2 in the first-stage regression is small, these changes in the coefficients imply that the actual effect of the changes in international prices on the changes in the wages of skilled workers could be large in the case of Bolivia.

[8] Standard errors are corrected using the White method of estimating variance.

6. Conclusion

The opposite predictions for the relation between wages and prices represented by two versions of the Stolper-Samuelson theorem—the original Stolper-Samuelson (SS) and the Specific-Factors (SF) versions—are investigated using household surveys of three Latin American countries, Bolivia, Mexico, and Venezuela. First, a sign test is performed in order to separate SS from SF. Then, when the SS is favored, an additional estimation is conducted in order to relate price effects to factor intensities by industry. There is some difficulty caused by the rather small number of traded industries with observed changes in international prices. The results are, however, robust for Bolivia and Mexico when the wage gap between skilled workers and unskilled workers is considered using education as a measure of skill. When the relative prices in the uneducated worker-intensive industries increase, the relative wages of educated workers in those industries drop, in one case significantly. Therefore, SS is favored.

For example, the relative wages of educated workers in the uneducated worker-intensive industries decrease by 8.4 percent of the price change in Bolivia and by 9.5 percent in Mexico on average as the relative prices increase. In contrast, in the educated worker-intensive industries, the relative wages of educated workers increase by 6.9 percent in Bolivia and by 3.0 percent in Mexico on average when the relative prices increase. All of these price effects are smaller than what is predicted by the magnification effect in the 2 x 2 model, which indicates that they should be greater than one. Although all traded industries are divided into two sectors, more than two industries are used in the analyses. It is possible that some opposite price effect based on SF is also captured and that price effect weakens the price effect from SS.

When workers are divided into experienced workers and inexperienced workers, the effect of the changes in international prices is small and not definite. This is partly because there is not much variation among factor intensities across industries when workers are grouped according to their years of experience as shown in Table A.6. In Venezuela, the price effect is positive in both cases; in one case using the changes in prices and the other using the changes in the relative prices, and this outcome is opposite from what is predicted by SS. This positivity could be caused by the immobility of experienced workers in this country as assumed in SF.

BIBLIOGRAPHY

Borjas, G. J. and Ramey, V. A. 1995. "Foreign Competition, Market Power, and Wage Inequality." *Quarterly Journal of Economics*. 110 (4): 1075-1110.

Bound, J. and Johnson, G. 1992. "Changes in the Structure of Wages in the 1980's: An Evaluation of Alternative Explanations." *American Economic Review*. 82 (3): 371-392.

Chipman, J. S. 1969. "Factor Price Equalization and the Stolper-Samuelson Theorem." *International Economic Review*. 1 (3): 399-413.

Davis, S. J. 1992. "Cross-Country Patterns of Change in Relative Wages." In: O.J. Blanchard and S. Fischer, editors. *NBER Macroeconomics Annual 1992*. Cambridge, United States: MIT Press.

Deardorff, A. V. 1998. "Technology, Trade, and Increasing Inequality: Does the Cause Matter for the Cure?" Discussion Paper No. 428. Ann Arbor, United States: University of Michigan.

---. 1994. "Overview of the Stolper-Samuelson Theorem." In: A.V. Deardorff and R.M. Stern editors. *The Stolper-Samuelson Theorem A Golden Jubilee*. Ann Arbor, United States: University of Michigan Press.

Deardorff, A.V. and Hakura, D.S. 1994. "Trade and Wages—What are the Questions?" In: J.N. Bhagwati and M.H. Kosters, editors. *Trade and Wages: Leveling Wages Down?* Washington, DC, United States: AEI Press.

Deardorff, A.V. and Stern, R. M., 1994. *The Stolper-Samuelson Theorem A Golden Jubilee*. Ann Arbor, United States: University of Michigan Press.

Dickens, W. T. and Katz, F. L. 1987. "Inter-Industry Wage Differences and Industry Characteristics." In: K. Lang and J.S. Leonard, editors. *Unemployment and the Structure of Labor Markets*. New York, United States and Oxford, United Kingdom: Blackwell.

Edwards, S. and Lederman, D. 1998. "The Political Economy of Unilateral Trade Liberalization: The Case of Chile." NBER Working Paper 6510. Cambridge, United States: National Bureau of Economic Research.

Ethier, W. 1974. “Some of the Theorems of International Trade with Many Goods and Factors.” *Journal of International Economics*. 4 (2): 199-206.

Feenstra, R. C. and Hanson, G. H. 1997. “Foreign Direct Investment and Relative Wages: Evidence from Mexico’s Maquiladoras.” *Journal of International Economics*. 42 (3-4): 371-393.

Feenstra, R. C. and Shiells, C. R. 1997. “Bias in U.S. Import Prices and Demand.” In: T. F. Bresnahan and R. J. Gordon editors. *The Economics of New Goods.* NBER Studies in Income and Wealth 58. Chicago, United States and London, United Kingdom: University of Chicago Press.

Flinn, C. J. 1986. “Wages and Job Mobility of Young Workers.*”* *Journal of Political Economy*. 94 (3): S88-S110.

Gaston, N. and Trefler, D. 1994. “Protection, Trade, and Wages: Evidence From U.S. Manufacturing.” *Industrial and Labor Relations Review*. 47 (4): 574-593.

Grossman, G. M. 1982. “The Employment and Wage Effects of Import Competition in the United States.” NBER Working Paper 1041. Cambridge, United States: National Bureau of Economic Research.

Hakura, D. S. 1997. “The Impact of Trade Prices on Employment and Wages in the United States.” IMF Working Paper 116. Washington, DC, United States: International Monetary Fund.

Hanson, G. H. and Harrison, A. 1995. “Trade, Technology, and Wage Inequality.” NBER Working Paper 5110. Cambridge, United States: National Bureau of Economic Research.

Inter-American Development Bank. 1999. *Economic and Social Progress in Latin America, 1998-1999 Report.* Washington, DC, United States: Inter-American Development Bank.

Johnson, G. and Stafford, F. 1999. “The Labor Market Implications of International Trade.” In: O. C. Ashenfelter and D. Card, editors. *Handbook of Labor Economics*. Vol. 3B. New York, United States and Oxford, United Kingdom: North-Holland.

Jones, R.W. and Scheinkman, J. A. 1977. “The Relative of the Two-Sector Production Model in Trade Theory.” *Journal of Political Economy*. 85 (5): 900-935.

Jones, R.W. 1971. “A Three-Factor Model in Theory, Trade, and History.” In: J. N. Bhagwati, R.W. Jones, R.A. Mundell, and J. Venek, editors. *Trade, Balance of Payments and Growth.* New York, United States and Oxford, United Kingdom: North-Holland.

Jones, R.W. 1965. “The Structure of Simple General Equilibrium.” *Journal of Political Economy*. 73: 557-572.

Jovanovic, B. 1979. “Job Matching and the Theory of Turnover.” *Journal of Political Economy*. 87 (5, Part 1): 972-990.

Katz, L.F. and Murphy, K.M. 1992. “Changes in Relative Wages, 1963-1987: Supply and Demand Factors.” *Quarterly Journal of Economics*. 107 (1): 35-78.

Lawrence, R.Z. and Slaughter, M.J. 1993. “International Trade and American Wages in the 1980s: Giant Sucking Sound or Small Hiccup?” Brookings Papers on Economic Activity, Microeconomics. Washington, DC, United States: Brookings Institution.

Leamer, E. 1996. “In Search of Stolper-Samuelson Effects on U.S. Wages.” NBER Working Paper 5427. Cambridge, United States: National Bureau of Economic Research.

---. 1994. “Trade, Wages and Revolving Door Ideas.” NBER Working Paper 4716. Cambridge, United States: National Bureau of Economic Research.

Magee, S.P. 1980. “Three Simple Test of the Stolper-Samuelson Theorem.” In: A.V. Deardorff and R.M. Stern, editors. *The Stolper-Samuelson Theorem A Golden Jubilee*. Ann Arbor, United States: University of Michigan Press.

Maskus, K.E. 1991. “Comparing International Trade Data and Product and National Characteristics Data for the Analysis of Trade Models.” In: P. Hooper and D.J. Richardson, editors. *International Economic Transactions Issues in Measurement and Empirical Research.* Chicago, United States: University of Chicago Press.

Mayer, W. 1974. “Short-Run and Long-Run Equilibrium for a Small Open Economy.” *Journal of Political Economy*. 82 (5): 955-967.

Murphy, K.M. and Welch, F. 1992. “The Structure of Wages.” *Quarterly Journal of Economics*. 107 (1): 285-326.

Parsons, D.O. 1977. “Models of Labor Market Turnover: A Theoretical and Empirical Survey.” In: R.G. Ehrenberg, editor. *Research in Labor Economics*. Vol.1. New York, United States and Oxford, United Kingdom: JAI Press.

Revenga, A.L. 1992. “Exporting Jobs?: The Impact of Import Competition on Employment and Wages in U.S. Manufacturing.” *Quarterly Journal of Economics*. 107 (1): 255-284.

Robbins, D.J. 1996. “Evidence on Trade and Wages in the Developing World.” Technical Paper No. 119. Paris, France: OECD Development Center.

---. 1994. “Worsening Relative Wage Dispersion in Chile During Trade Liberalization, and Its Causes: Is Supply At Fault?” Development Discussion Paper No.484. Cambridge, United States: Harvard Institute for International Development.

Shiells, C.R. 1991. “Errors in Import-Demand Estimates Based Upon Unit Value Indexes.” *The Review of Economic Statistics*. 73 (2): 378-382.

Stolper, W.F. and Samuelson, P.A. 1941. “Protection and Real Wages.” *The Review of Economic Studies*. 9: 333-357.

Topel, R.H. and Ward, M.P. 1992. “Job Mobility and the Careers of Young Men.” *Quarterly Journal of Economics*. 107 (2): 439-479.

Wood, A. 1997. “Openness and Wage Inequality in Developing Countries: The Latin American Challenge to East Asian Conventional Wisdom.” *World Bank Economic Review*. 11 (1): 33-58.

Table 2
The Effects of the Changes in the Relative International Prices
on the Changes in the Relative Wages of Educated/Experienced Workers
Equation (29)

Uneducated-worker Intensive Industries

	Constant	The Changes in the Relative Prices	**The Sign of Price Effect**	Obs.	R-squared
Bolivia	0.811**	-0.286	-	4	0.419
(1986,1995)	(0.202)	(0.238)			
Mexico	-0.208**	-0.019	-	4	0.695
(1984,1989)	(0.060)	(0.009)			
Venezuela	-0.351***	-0.007	-	9	0.031
(1981,1995)	(0.072)	(0.014)			
Inexperienced-worker Intensive Industries					
Bolivia	0.366	-0.094	-	3	0.088
(1986,1995)	(0.359)	(0.304)			
Mexico	0.055	-0.020	-	5	0.298
(1984,1989)	(0.095)	(0.018)			
Venezuela	0.236	0.015	+	13	0.034
(1981,1995)	(0.153)	(0.024)			

Note: 1. The coefficients are significant at the 5 percent level (***).
They have (**) if they are significant at the 10 percent level and (*) at the 15 percent level.

Table 3
The Effects of the Changes in the Relative International Prices on
the Changes in the Relative Wages of Educated/Experienced Workers
Deviations of factor intensities are also used as explanatory variables
Equation (30)

All Traded Industries-the Relative Wages of Educated workers

	Constant	The Changes in the Relative Prices	Obs.	R-squared
Bolivia	0.564***	-0.060	8	0.016
(1986,1995)	(0.186)	(0.195)		
Mexico	-0.059	-0.004*	9	0.276
(1984,1989)	(0.122)	(0.002)		
Venezuela	-0.411*	0.00008	21	0.0002
(1981,1995)	(0.044)	(0.001)		
All Traded Industries-the Relative Wages of Experienced workers				
Bolivia	0.314*	0.069	8	0.187
(1986,1995)	(0.163)	(0.059)		
Mexico	-0.027	-0.030**	10	0.372
(1984,1989)	(0.045)	(0.014)		

Table 4
2SLS - with instrumental variables
The Effects of the Changes in the Relative International Prices
on the Changes in the Relative Wages of Educated/Experienced Work
Equation (29)

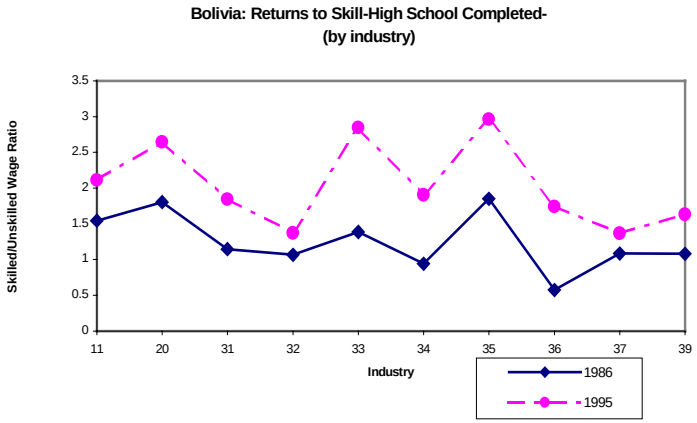
Uneducated-worker Intensive Industries

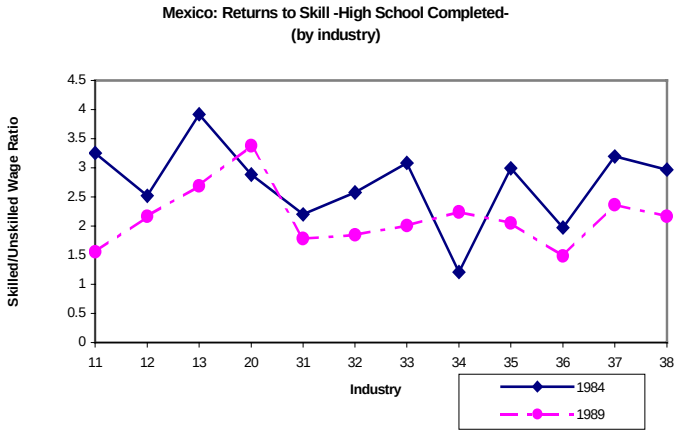
	Constant	The Changes in the Relative Prices	Obs.	First Stage R-squared
Bolivia	0.846**	-0.357	4	0.322
(1986,1995)	(0.269)	(0.429)		
Mexico	-0.262***	-0.010	4	0.365
(1984,1989)	(0.038)	(0.013)		
Venezuela	-0.389***	0.005	9	0.155
(1981,1995)	(0.094)	(0.037)		

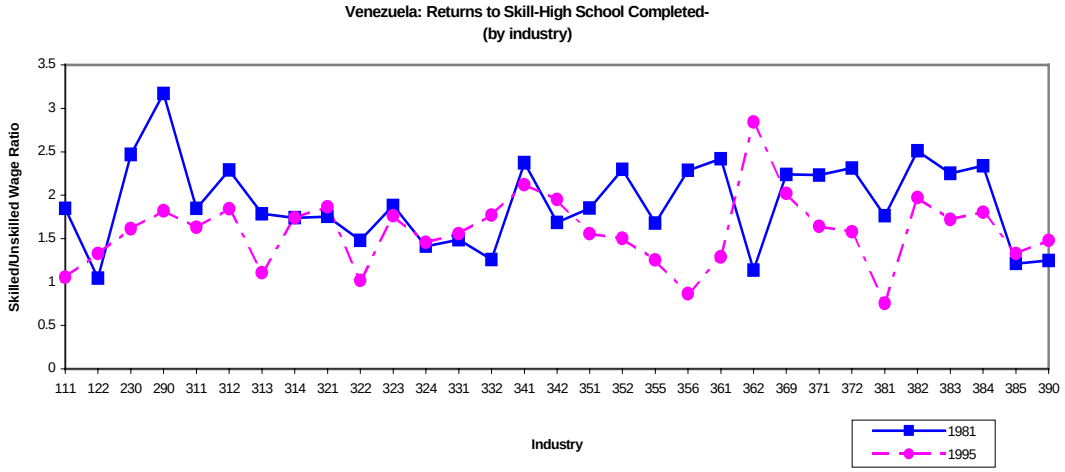
Inexperienced-worker Intensive Industries

Bolivia	0.369	-0.038	3	0.967
(1986,1995)	(0.365)	(0.314)		
Mexico	-0.076	0.022	5	0.201
(1984,1989)	(0.258)	(0.051)		
Venezuela	0.052	0.054	13	0.113
(1981,1995)	(0.304)	(0.066)		

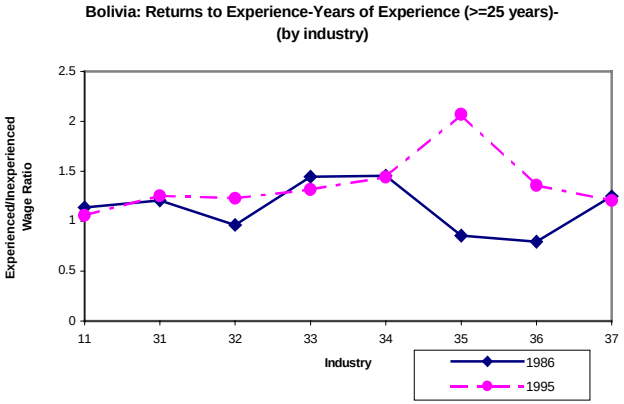
Graph 1


Bolivia: Returns to Skill-High School Completed-
(by industry)
Skilled/Unskilled Wage Ratio
3.5
3
2.5
2
1.5
1
0.5
0
11
20
31
32
33
34
35
36
37
39
Industry
1986
1995

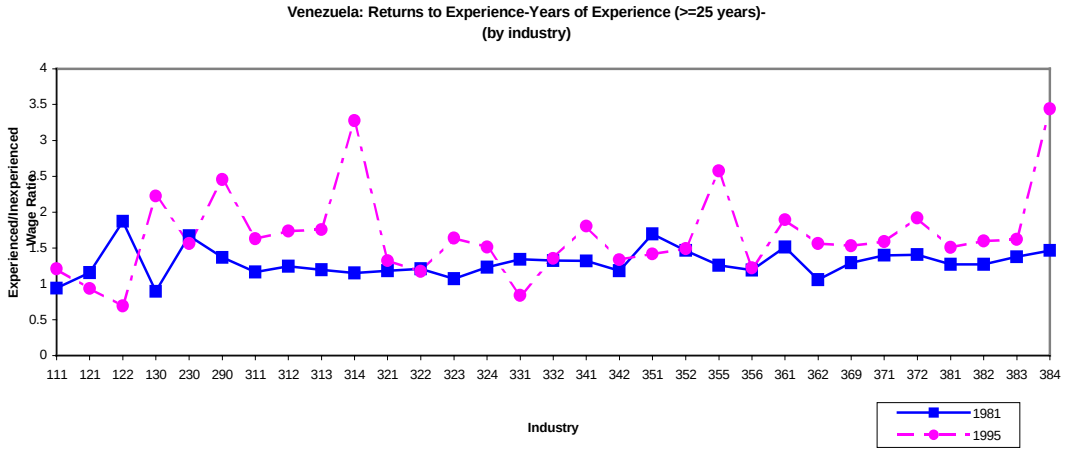

Mexico: Returns to Skill -High School Completed-
(by industry)
Skilled/Unskilled Wage Ratio
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
11
12
13
20
31
32
33
34
35
36
37
38
Industry
1984
1989


Venezuela: Returns to Skill-High School Completed-
(by industry)
Skilled/Unskilled Wage Ratio
3.5
3
2.5
2
1.5
1
0.5
0
111
122
230
290
311
312
313
314
321
322
323
324
331
332
341
342
351
352
355
356
361
362
369
371
372
381
382
383
384
385
390
Industry
1981
1995

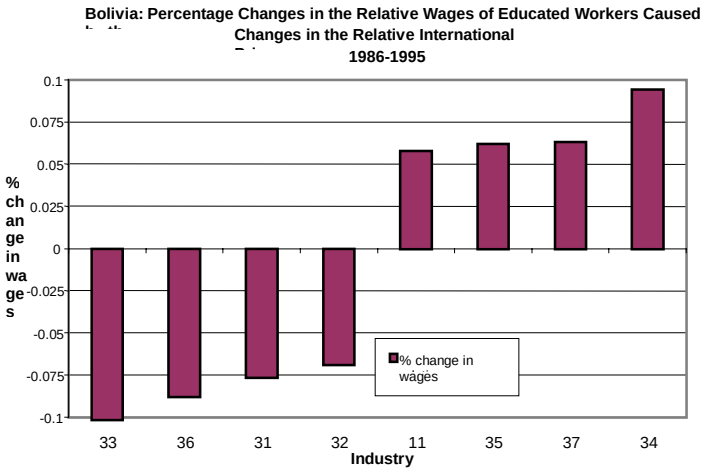
Graph 2

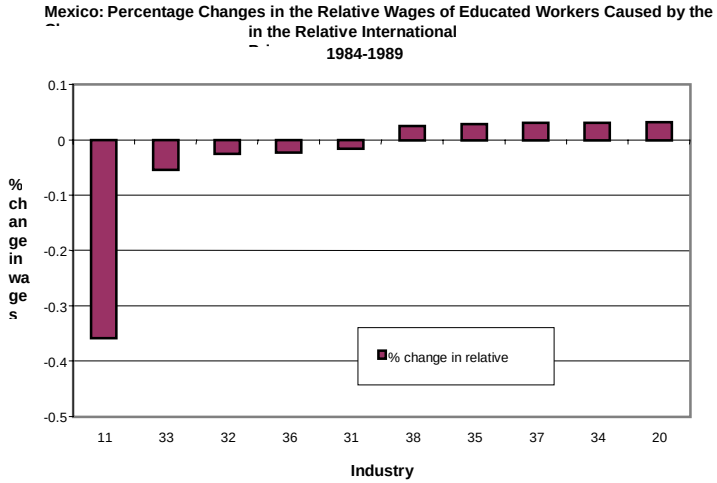

Bolivia: Returns to Experience-Years of Experience (>=25 years)-
(by industry)
Experienced/Inexperienced
Wage Ratio
2.5
2
1.5
1
0.5
0
11
31
32
33
34
35
36
37
Industry
1986
1995


Mexico: Returns to Experience -Years of Experience (>=25 years)-
(by industry)
Experienced/Inexperienced
Wage Ratio
3
2.5
2
1.5
1
0.5
0
11
12
20
31
32
33
34
35
36
37
38
Industry
1984
1989

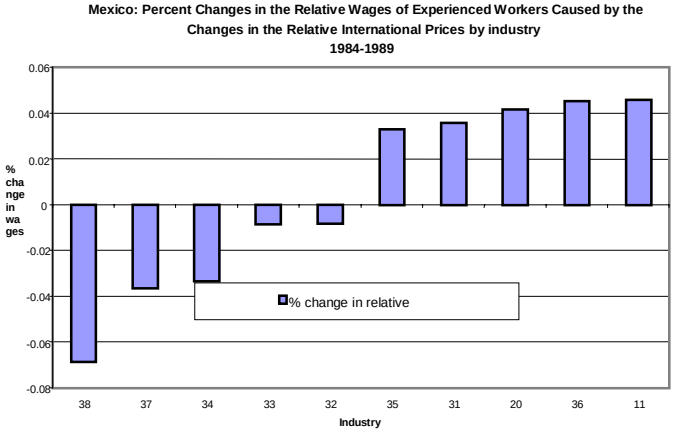

Venezuela: Returns to Experience-Years of Experience (>=25 years)-
(by industry)
Experienced/Inexperienced
Wage Ratio
4
3.5
3
2.5
2
1.5
1
0.5
0
111
121
122
130
230
290
311
312
313
314
321
322
323
324
331
332
341
342
351
352
355
356
361
362
369
371
372
381
382
383
384
Industry
1981
1995

Graph 3





Graph 4



APPENDIX

Table A.2 reports as an illustration for Mexico, the wages of skilled workers relative to those of unskilled workers and the wages of experienced workers relative to those of inexperienced workers obtained from the first-stage regression of the two-step procedure (equation (19)). A dummy variable for industries is interacted with a dummy variable for skilled workers. Other explanatory variables are not interacted with a dummy variable for skilled workers. This is based on the assumption that returns to characteristics of workers other than those to skilled or unskilled are the same for all workers. The results are consistent with conventional wisdom. Workers tend to have higher wages when they are male, live in urban areas, and have more experience. The gender effect on wage premiums is positive but insignificant in 1984. The return to years of experience decreases as years of experience increase. In the regression with experienced workers, when workers are males, live in urban areas, and have more education, they earn more. None of the experienced workers in the fishing industry (13) reported their wages, so there are no relative wages of skilled workers observed in 1984 for this industry.

The changes in the relative wages of skilled workers differ by industry. In Bolivia, in all industries, the relative returns to skilled workers rose (Table A.3). These relative returns are obtained by converting the coefficients of industry dummies that are interacted with a dummy variable for skilled workers to the relative premiums. However, the movements of the relative returns to experienced workers differ by industry (Table A.4). In the chemicals and chemical, petroleum, coal, rubber, and plastic products industry (35), the relative returns to experienced workers changed from 0.9 to 2.1 between 1986 and 1995, whereas, in the wood and wood products industry (33) and in the paper and paper products, printing, and publishing industry (34), these relative returns decreased a little bit.

In Mexico, the relative returns to skilled workers in the wood and wood products industry (33) dropped from 3.1 to 2.0 between 1984 and 1989. In the paper and paper products, printing, and publishing industry (34), however, the relative returns to skilled workers rose from 1.2 to 2.2 in the same period. When experienced workers and inexperienced workers are compared, the relative returns to experienced workers in the paper and paper products, printing, and publishing industry (34) increased from 1.5 to 1.8 between 1984 and 1989. In contrast, in the chemicals and

chemical, petroleum, coal, rubber, and plastic products industry (35), the relative returns to experienced workers sank from 2.1 to 1.8 during the same period.

In Venezuela, 10 out of 31 traded industries show increases in the relative returns to skilled workers. The largest increase is found in one of the non-metallic mineral products industries (362) and the relative returns to skilled workers changed from 1.1 to 2.8. The largest decrease is observed in one of the three-digit industries of the mining industry (290) and the relative returns to skilled workers dropped from 3.2 to 1.8. 26 out of 32 three-digit traded industries show an increase in the relative returns to experienced workers. In one of the three-digit industries of the food industry (314), the relative returns to experienced workers rose from 1.2 to 3.3. In the wood and wood products industry (331), the relative returns to experienced workers decreased from 1.3 to 0.8.

One thing to be noted regarding the second-stage regression in the two-step procedure is that the agricultural industries in Mexico and Venezuela are not used in the reported regression. These industries are huge outliers and have factor intensities of unskilled workers 40 times larger than the average in, for example, Mexico, as shown in Table A.5.

Tables A.5 and A.6 report the factor intensities which are measured by the ratio of the number of employed uneducated workers to educated workers and by the ratio of the number of employed inexperienced workers to experienced workers by industry. The variation in factor intensities of the uneducated to the educated across industries is fairly large. Factor intensities vary from 2.1 (the mining industry (20)) to 90.4 (the agricultural industry(11)) in Mexico and from 1.0 (the chemicals and chemical, petroleum, coal, rubber, and plastic products industry (351)) to 39.8 (the agricultural industry (111)) in Venezuela. This divergence in factor intensities contributes to the difference in the sizes of the effects of changes in relative prices on the changes in relative wages of, specifically, educated workers as shown in Graph 3.

Table A.1
The Comparison of Job Tenure and Years of Experience
All Workers between the ages of 15-65 (Venezuela 1995)

years of experience	% of workers with less than one year of job tenure
0-4	0.15
5-9	0.30
10-14	0.28
15-19	0.23
20-24	0.19
25-29	0.16
30-34	0.14
35-39	0.13
40-44	0.09
45-49	0.07
50-54	0.07
55-59	0.06

Source: The Inter-American Development Bank, by author's calculation

Table A.2
The First Stage Regression
Dependent Variables - Hourly Wages in All Traded Industries

The specific factor is educated workers.

Mexico	1984		1989	
Variables	Coefficients	Standard Errors	Coefficients	Standard Errors
Sex	0.045	0.053	0.182***	0.030
Region	0.749***	0.040	0.747***	0.025
Industry 11	1.180***	0.372	0.443***	0.136
Industry 12	0.924	0.741	0.775	0.166
Industry 13	1.366	0.741	0.990***	0.376
Industry 20	1.060***	0.208	1.218***	0.094
Industry 31	0.789***	0.181	0.580***	0.078
Industry 32	0.947***	0.207	0.616***	0.082
Industry 33	1.125***	0.429	0.697***	0.165
Industry 34	0.193	0.249	0.806***	0.104
Industry 35	1.096***	0.172	0.720***	0.079
Industry 36	0.680***	0.304	0.396***	0.178
Industry 37	1.162***	0.177	0.861***	0.149
Industry 38	1.089***	0.135	0.775***	0.059
Industry 39	1.780***	0.741	0.954***	0.251
Experience	0.039***	0.005	0.039***	0.003
Experience squared	-0.0007***	0.0001	-0.0007***	0.0001
Unskilled	-1.353***	0.072	-1.517***	0.042
Number of obs.	1577		4269	
R-squared	0.316		0.318	

The specific factor is experienced workers.

Mexico	1984		1989	
Variables	Coefficients	Standard Errors	Coefficients	Standard Errors
Sex	0.136***	0.051	0.193***	0.030
Region	0.506***	0.043	0.514***	0.028
Industry 11	0.146***	0.057	0.217***	0.037
Industry 12	0.607***	0.228	0.160	0.369
Industry 13			0.489***	0.185
Industry 20	0.636***	0.217	0.882***	0.090
Industry 31	0.313***	0.094	0.347***	0.072
Industry 32	0.489***	0.103	0.491***	0.067
Industry 33	0.565***	0.163	0.305***	0.117
Industry 34	0.375	0.293	0.582***	0.120
Industry 35	0.757***	0.137	0.585***	0.088
Industry 36	0.594***	0.152	0.452***	0.123
Industry 37	0.563***	0.171	0.478***	0.198
Industry 38	0.525***	0.129	0.619***	0.074
Industry 39	0.522**	0.293	0.292	0.261
Years of schooling	0.089***	0.005	0.085***	0.003
Unskilled	-1.417***	0.063	-1.579***	0.038
Number of obs.	1571		4231	
R-squared	0.361		0.351	

Note: 1. Sex (0: female, 1: male), Region (0: rural, 1: urban), industry 11- 39 are dummy variables that are interacted with skilled workers.
2. In addition to the characteristics that are stated here, marital status and the firm size are included as part of characteristics of workers for Bolivia and Venezuela.
3. Unskilled is a dummy variable for unskilled workers.
4. Workers with negative experience are eliminated from the sample.

	Industry Description
11	Agriculture
12	Forestry and Logging
13	Fishing
20	Mining
31	Food Manufacturing
32	Textile, Apparel, and Leather products
33	Wood and Wood Products
34	Paper and Paper Products, Printing, and Publishing
35	Chemicals and Chemical, Petroleum, Coal, Rubber, and Plastic Products
36	Non-Metallic Mineral Products
37	Basic Metal
38	Fabricated Metal Products, Machinery and Equipment
39	Other Manufacturing

Table A.3
The Relative Returns to Educated Workers

Bolivia

Industry	1986	1995	Direction of changes
11	1.542	2.112	+
20	1.802	2.647	+
31	1.147	1.843	+
32	1.066	1.372	+
33	1.384	2.848	+
34	0.942	1.907	+
35	1.851	2.961	+
36	0.575	1.742	+
37	1.085	1.369	+
39	1.079	1.630	+

Mexico

Industry	1984	1989	Direction of changes
11	3.254	1.558	-
12	2.519	2.170	-
13	3.921	2.692	-
20	2.887	3.380	+
31	2.201	1.785	-
32	2.579	1.852	-
33	3.082	2.009	-
34	1.213	2.240	+
35	2.992	2.055	-
36	1.975	1.486	-
37	3.198	2.365	-
38	2.971	2.170	-
39	5.931	2.596	-

Venezuela

Industry	1981	1995	Direction of changes
111	1.846	1.056	-
122	1.046	1.330	+
230	2.471	1.613	-
290	3.172	1.820	-
311	1.847	1.630	-
312	2.291	1.844	-
313	1.785	1.106	-
314	1.739	1.740	+
321	1.756	1.865	+
322	1.480	1.018	-
323	1.882	1.763	-
324	1.412	1.457	+
331	1.488	1.558	+
332	1.261	1.771	+
341	2.372	2.122	-
342	1.687	1.951	+
351	1.852	1.558	-
352	2.296	1.505	-
355	1.679	1.254	-
356	2.286	0.865	-
361	2.420	1.292	-
362	1.136	2.842	+
369	2.241	2.021	-
371	2.232	1.642	-
372	2.313	1.580	-
381	1.765	0.755	-
382	2.510	1.972	-
383	2.253	1.723	-
384	2.338	1.805	-
385	1.214	1.327	+
390	1.249	1.479	+

Note: These are the results obtained from the first stage regression of the two-step procedure as described in Appendix and dependent variables are hourly wages in all traded industries. All relative returns are in absolute values.

Table A.4
The Relative Returns to Experienced Workers

Bolivia

Industry	1986	1995	Direction of changes
11	1.137	1.058	-
31	1.208	1.254	+
32	0.963	1.228	+
33	1.445	1.318	-
34	1.456	1.441	-
35	0.856	2.068	+
36	0.795	1.360	+
37	1.249	1.206	-

Mexico

Industry	1984	1989	Direction of changes
11	1.157	1.242	+
12	1.835	1.174	-
20	1.889	2.416	+
31	1.367	1.415	+
32	1.630	1.635	+
33	1.759	1.357	-
34	1.455	1.790	+
35	2.132	1.795	-
36	1.812	1.571	-
37	1.756	1.613	-
38	1.690	1.857	+
39	1.686	1.339	-

Venezuela

Industry	1981	1995	Direction of changes
111	0.940	1.210	+
121	1.158	0.938	-
122	1.871	0.691	-
130	0.897	2.227	+
230	1.667	1.561	-
290	1.367	2.456	+
311	1.168	1.629	+
312	1.243	1.735	+
313	1.195	1.758	+
314	1.151	3.276	+
321	1.184	1.324	+
322	1.209	1.173	-
323	1.071	1.638	+
324	1.231	1.514	+
331	1.341	0.840	-
332	1.327	1.355	+
341	1.318	1.804	+
342	1.185	1.339	+
351	1.697	1.416	-
352	1.466	1.493	+
355	1.259	2.574	+
356	1.190	1.225	+
361	1.514	1.892	+
362	1.059	1.562	+
369	1.294	1.530	+
371	1.402	1.587	+
372	1.407	1.919	+
381	1.272	1.509	+
382	1.272	1.598	+
383	1.379	1.619	+
384	1.465	3.440	+
390	0.855	1.730	+

Table A.5
Factor Intensities of All Traded Industries
Factor intensity=Uneducated workers/Educated workers

Bolivia (average of two years 1986, 1995)		
Industry	Factor Intensity	The Uneducated Intensive
11	1.464	
20	1.173	
31	2.475	*
32	2.349	*
33	2.892	*
34	0.866	
35	1.400	
36	2.667	*
37	1.375	
39	2.093	*

Mexico (average of two years 1984, 1989)		
Industry	Factor Intensity	The Uneducated Intensive
11	90.426	*
12	32.000	*
13	13.083	*
20	2.049	
31	6.741	*
32	9.051	*
33	16.190	*
34	2.271	
35	2.848	
36	8.556	*
37	2.289	
38	3.629	
39	5.806	

Venezuela (average of two years 1981, 1995)		
Industry	Factor Intensity	The Uneducated Intensive
111	39.807	*
112	5.500	*
122	3.250	
220	1.091	
230	3.121	
290	18.583	*
311	7.906	*
312	5.792	*
313	6.148	*
314	3.708	
321	5.390	*
322	9.644	*
323	7.200	*
324	23.850	*
331	14.253	*
332	9.935	*
341	5.536	*
342	2.855	
351	1.043	
352	2.496	
355	7.400	*
356	5.109	
361	5.964	*
362	7.357	*
369	12.681	*
371	1.630	
372	1.920	
381	5.380	*
382	3.688	
383	4.006	
384	3.900	
385	4.417	
390	4.654	

Note: Educated workers are defined as workers with higher education than high school complete and uneducated workers are defined as workers with less than high school complete education.

Table A.6
Factor Intensities of All Traded Industries
Factor intensity=Inexperienced workers/Experienced workers

Bolivia	(ave. of two years 1986, 1995)	
Industry	Factor Intensity	Inexperienced Intensive
11	1.464	
20	1.414	
31	2.374	
32	3.598	*
33	1.615	
34	4.167	*
35	2.600	*
36	2.290	
37	1.705	

Mexico	(ave. of two years 1984, 1989)	
Industry	Factor Intensity	Inexperienced Intensive
11	2.072	
12	3.830	*
13	1.798	
20	2.218	
31	2.406	
32	2.733	*
33	2.735	*
34	3.569	*
35	2.500	
36	2.091	
37	3.675	*
38	4.746	*
39	2.670	*

Venezuela	(ave. of two years 1981, 1995)	
Industry	Factor Intensity	Inexperienced Intensive
111	1.830	
112	1.077	
122	1.750	
220	1.790	
230	1.428	
290	1.083	
311	2.914	
312	2.140	
313	3.010	
314	6.316	*
321	1.979	
322	2.598	
323	2.657	
324	4.797	*
331	2.794	
332	3.940	*
341	3.168	
342	2.493	
351	3.315	*
352	3.750	*
355	4.292	*
356	3.387	*
361	3.524	*
362	3.544	*
369	1.711	
371	3.661	*
372	3.721	*
381	4.483	*
382	4.283	*
383	4.091	*
384	3.943	*
390	4.450	*

Note: Experienced workers are defined as workers with more than 25 years of experience and inexperienced workers are the others.