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Trade Liberalization, Technology, Relative Factor Supplies and the Relative Wage: Evidence from the South

By

Tahir Abdi

A thesis submitted to
The Faculty of Graduate Studies and Research
in partial fulfillment for
the degree of
Doctor of Philosophy

Department of Economics
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acceptance of the thesis,

**"Trade Liberalization, Technology, Relative Factor Supplies
and the Relative Wage: Evidence from the South"**

submitted by

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in partial fulfilment of the requirements
for the degree of Doctor of Philosophy

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ABSTRACT

There is much controversy about the role that trade liberalization, technological change and relative factor supplies have played in bringing about changes in the relative wage of the unskilled workers. Much of the empirical work on this issue has focused on the industrial countries and paid little attention to developing countries. To fill this gap, this study develops a special data set to examine the relative wage behavior of a large number of developing countries. An empirical model based on the theory is used to test different explanations of the relative wage change. As predicted by the technology explanation, the empirical analysis in the study finds a significant negative link between the relative wage of unskilled workers and the technology index. The analysis, however, does not find a significant role for factor supplies or trade liberalization in determining the relative wage.

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CHAPTER 1

INTRODUCTION

There continues to be considerable concern that expansion of trade with developing countries (hereafter South) is lowering the relative wage of unskilled labor in developed countries (hereafter North). The issue of income divergence in the North is highlighted by the experience of the U.S., where a marked decline in the relative wage was observed during the 1980's and the 1990's. The striking feature of this decline was that it occurred during the period when the U.S. was following trade liberalization policies and expanding its imports from the South. Many other developed countries were also liberalizing their trade with the South. Thus a similar fear of a decline in the relative wage has been expressed in these northern countries.

The causal relationship between international trade and the relative wage dispersion is normally explained in terms of the well-known Heckcher-Ohlin-Samuelson theory (hereafter HOS) with two factors (skilled and unskilled labor). In this model, Stolper-Samuelson theorem can be used to show that trade liberalization would lower the relative wage of unskilled labor in the skill-rich North¹.

A number of studies, for example, Murphy and Welch (1991), Katz and Murphy (1992), Borjas, Freeman and Katz (1992), Batra (1993), Wood (1994, 1995), Sachs and

¹ North is relatively more skill abundant than the South. Thus in the presence of trade restrictions, the price of the skill-intensive good relative to the unskilled-intensive good is lower in the North. Trade liberalization in the North will bring an increase in the real return of the skilled labor through a decrease (increase) in the relative price of the

Schatz (1994) and Leamer (1994, 1995, and 1996) provided empirical evidence in support of this HOS interpretation. They argued that the trade had been a contributing factor to the rising income differentials in the U.S. and other countries in the North.

These findings, based mainly on the Factor Content approach, were criticized by Bhagwati (1991, 1994), Dehejia and Bhagwati (1994) and Lawrence and Slaughter (1993). They argued that the Stolper-Samuelson theorem works through an intermediating step, a change in relative prices of goods. If relative prices of goods had not changed in the required direction, then it is inappropriate to link international trade with the relative wage². They suggested Hicks-neutral technological improvement in the skilled-labor-intensive sector as an alternative explanation. Such technological change would shift the unit value isoquant of the sector downwards and require a decline in the relative wage of unskilled labor at initial product prices³.

To date the phenomenon of a decline in the unskilled-skilled wage ratio in the North is well documented, but it is not yet clear whether trade liberalization or technological change has actually caused this divergence. One problem with resolving this issue is that these two types of changes affect relative factor prices in the same direction. Trade liberalization, for example, would decrease relative factor prices in the North via a decrease in the skilled-unskilled labor ratio in both sectors. Similarly, a technological improvement in skill intensive sector also leads to a decline in the skilled-

unskilled (skill) intensive good.

² As a matter of fact, Bhagwati (1991) found a slight increase in the prices of the unskilled intensive goods. Lawrence and Slaughter (1993) further confirmed these results.

³ Lawrence and Slaughter (1993) captured the impact of this variable by finding a higher Total Factor Productivity (TFP) growth in the skilled labor-intensive sector. Bhagwati and Dehejia (1994) explained the role of technology in terms of kaleidoscopic comparative advantage hypothesis: a term that usually refers to the frequent switch of

unskilled workers ratio in both sectors, thus causing a decrease in the relative wage. It is thus difficult to discriminate between these two explanations of a decrease in the relative wage in the North⁴. However, the relative wage would respond differently to the above-mentioned changes in the South. For example, trade liberalization would cause the relative wage to increase, while the sectoral technological improvement would decrease the relative wage⁵.

It is interesting to note that most of the empirical work has focused on the North and little attention has been given to the other side of the picture. One exception is Robbins (1996) who examines the behavior of relative wages in developing countries but does not explicitly address one aspect of the above issue -- the influence and implications of technological change. His study does, however, examine one other explanation -- the possible effects of changes in the relative supply of unskilled labor⁶. This thesis follows Robbins (1996) in focusing on the developing countries but extends it in several directions. First, it develops a data set on the unskilled-skilled wage ratio for a large number of developing countries. Second, it explores the role of technological change as an additional factor to explain changes in the relative wage. Finally, it uses data for a broader set of countries to re-examine Robbins' hypothesis that changes in the relative wage in the South were mainly due to changes in the relative factor supplies.

comparative advantage status from the production of one good to the other.

⁴ Lawrence and Slaughter (1993) found a higher growth rate of Total Factor Productivity for the skilled labor-intensive sector for the U.S., but at the same time they found the skilled-unskilled labor ratio increasing for both the sectors.

⁵ It is normally believed that the technological changes are global. If in the North the technological improvement occurs in the skill-intensive sector then it should be similar for the South.

⁶ For a small open economy, changes in the relative supply can affect the relative wage only if the country is completely specialized. See for example Leamer (1995).

To construct wage indexes of skilled and unskilled labor, we use International Labor Organization (ILO) data. This source, however, does not provide consistent time series for all countries. To address this limitation, we develop two data sets. The first data set is a shorter panel of those countries for which consistent time series data was available for at least four years over 1985-94 time period. The second data set includes all those countries for which information on wage rates were reported at least once between 1985 and 1994.

Using a panel data set for eleven developing countries from 1985 to 1994 and a cross-section data set for forty-five developing countries, we implement a test which nests the cases of complete and incomplete specialization. This test allows us to examine the impact not only of trade liberalization and Hicks-neutral technological change but also relative supply of unskilled labor on the relative wage in the South.

The remainder of the thesis is divided into six chapters. After the introduction, chapter 2 discusses a simple model to provide a theoretical basis for examining the relationship of the relative wage to technological improvements, trade liberalization and relative factor supplies. Chapter 3 discusses the empirical methodology and the data used in the study. Chapter 4 describes results of the panel data analysis while Chapter 5 reports results of cross-section analysis. Chapter 6 concludes the study.

CHAPTER 2

THEORETICAL FRAMEWORK

This section presents a simple theoretical framework to examine the impact of trade, technological changes and relative supplies of the skilled and unskilled workers on the unskilled-skilled wage ratio.

Consider the standard Heckscher-Ohlin-Samuelson (HOS) model with two countries, North and South; two goods, 1 and 2; and two factors of production, skilled and unskilled labor. Modify this model to allow for Hicks neutral sectoral differences between the two countries. Good 1 is relatively skill-intensive. All firms have identical and constant- returns-to-scale technologies in each sector. The production function for each sector can be written as

$$Q_i^j = A_i^j F_i(S_i^j, U_i^j), \quad i = 1, 2, j = N, S, \quad (1)$$

Where Q_i^j , S_i^j , U_i^j and A_i^j denotes, respectively, output, skilled labor, unskilled labor and Hicks-neutral technological index for good i and country j , and N and S stand for North and South.

Markets are perfectly competitive, factors of production are perfectly mobile between sectors and prices are perfectly flexible. The production function is linearly homogeneous, and therefore, can be expressed as

$$\tilde{Q}_i^j = U_i^j f(\theta_i^j), \quad i = 1, 2, j = N, S, \quad (2)$$

where $\tilde{Q}_i^j (\equiv \frac{Q_i^j}{A_i^j})$ denotes output normalized by the technology index,

$f_i(\theta_i^j) \equiv F(\theta_i^j, 1)$ and $\theta_i^j (\equiv \frac{S_i^j}{U_i^j})$ is the skilled-unskilled labor ratio. Sector 1 is relatively

more skill intensive, so that at a given relative wage, $\theta_1^j > \theta_2^j$. The marginal products of skilled and unskilled labor, are $A_i f_i'(\theta_i^j)$ and $A_i [f_i - \theta_i f_i'(\theta_i^j)]$, respectively. The profit maximization condition implies that the two factors are paid the values of their marginal products. Denoting W_U^j, W_S^j as wages of the skilled and unskilled labor and p_i^j as the price of the good i , perfect mobility of the two factors across the sectors would imply that

$$W_S = \tilde{P}_1^j f_1'(\theta_1^j) = \tilde{P}_2^j f_2'(\theta_2^j) \quad , \quad j = N \text{ or } S, \quad (3)$$

$$W_U = \tilde{P}_1^j [f_1(\theta_1^j) - \theta_1^j f_1'(\theta_1^j)] = \tilde{P}_2^j [f_2(\theta_2^j) - \theta_2^j f_2'(\theta_2^j)] \quad j = N \text{ or } S, \quad (4)$$

where $\tilde{P}_i^j (\equiv A_i^j P_i^j)$ represents the price of normalized units of output.

Now if we assume that each country is producing both goods, then changes in the wage of unskilled workers relative to skilled workers can be explained in terms of changes in relative prices and relative technologies employed. These changes can be explained using Stolper-Samuelson (1941)⁷ and Findlay-Grubert(1959) analysis⁸.

⁷ The Stolper-Samuelson theorem states that an increase in the relative prices has two effects; one, it raises the real return of the factor used relatively intensively and second, it lowers the real return of the other factor.

⁸ A sector-biased technological improvement will shift the isoquant to a lower level of isocost line, and as a result the relative wages will be changed accordingly.

Defining $\omega(\equiv \frac{W_u}{W_s})$ as the relative wage of the unskilled labor, $p(\equiv \frac{P_1}{P_2})$ as the ratio of prices of the skilled and unskilled-labor-intensive goods, and $a(\equiv \frac{A_1}{A_2})$ as relative technology, we can derive the following relationships

$$\omega^j = g(p^j, a^j) \quad j = N \text{ or } S, \quad (5)$$

where $\frac{\partial g}{\partial p^j} < 0$ and $\frac{\partial g}{\partial a^j} < 0$.

In contrast to diversified production, if we assume that both countries specialize in one of the two goods, then we can express the relative wage in each country as a function only of the relative supplies of the skilled and unskilled workers. That is

$$\omega^j = \phi(\bar{s}^j), \quad j = N, S, \quad (6)$$

where $\bar{s}^j(\equiv \frac{\bar{S}}{\bar{U}})$ is the ratio of the endowment of skilled labor ($\bar{S}$) and unskilled labor ($\bar{U}$) and $\frac{d\omega^j}{d\bar{s}^j} > 0$.

In this simple theoretical framework, we can show that the relative price, relative technology and relative supply affect the relative wages. These effects can be illustrated using a supply and demand curve diagram developed by Leamer (1995).

2.1 Case One: The Incomplete Specialization Case

Assume that South is relatively abundant in unskilled labor, is small and produces both goods in a trading equilibrium. In this case, changes in the relative labor endowments will not affect the relative wage in the South unless these shifts are large enough to cause specialization. This is explained in the following diagram.

In the above diagram relative factor supplies are measured along the horizontal axis and the relative wage along the vertical axis. Once the country is open to trade, then line $DabD$ is the demand curve, with the height of the flat segment, ab , determined by the relative international price and Southern trade barriers. The length of the segment represents the range of factor endowments in which a trading country would be producing both goods. Over this range, the relative supply does not cause the relative wages to change only a change in relative price would affect the relative wage behavior.

Consider for a moment that the relative supply in the South is at U_0/S_0 level, some-where within the range, ab , and it changes over this range only. Assume that the South liberalizes its trade with the North (so that the home relative price of skilled-labour-intensive good decreases), and thus the demand curve shifts to, $Da'b'D$. Assume also that the relative supply changes as well but remains within the range, $a'b'$. For simplicity first assume that the technology does not change. It is then clear that in this case, the increase in the relative wage in the South occurs only because of trade

liberalization, (which causes a decrease in the relative price in the South), and the change in the relative supply has no effect. Now suppose there is a Hicks-neutral technological improvement in the skill-intensive sector. This change will shift the $DabD$ curve downwards, and if it is sufficiently strong, it would lead to a decrease in the relative wage.

2.2 Case Two: The Complete Specialization Case

Now assume that South possesses relatively small endowment of skilled labor and thus completely specializes in unskilled labor intensive good. In this case, the equilibrium occurs on the downward sloping segment, bD , of the $DabD$ curve as shown in diagram 2.

. Diagram 2: Complete Specialization, Relative price has no effect.

Again let there be trade liberalization (without technological change) which shifts the demand curve to $Da'b'D$, and let relative supply shifts in either direction (as indicated by the arrows) but remains on the $b'D$ segment. In this case the relative wage will change only in response to the shift in the relative supply, and trade liberalization would have no effect. It can similarly be shown that the technological change would not affect the

relative wage as long as the flat segment, after the change, lies above the point of intersection between the relative supply line and the demand curve.

2.3 Case Three: The Mixed Case

Suppose again that initially South has very little relative endowment of skilled labor, represented by U_0/S_0 in diagram 3, and this allows it to completely specialize in the production of unskilled-labor-intensive good. For simplicity, focus on the case of trade liberalization without technological change. Let the trade liberalization shifts the demand curve, $DabD$, upward to $Da'b'D$. Also assume that due to expanded educational opportunities, the relative supply of unskilled labor decreases to U_1/S_1 . This shift in the relative supply is assumed to move the South to the range of diversification. In this case, the relative wage changes in response to the shift in relative supply as well as trade liberalization. Initially, the relative wage in the South was at OA . This relative wage indicates that the South had a very small relative endowment of skilled labor. Once trade liberalization occurs and relative supply of the skilled labor also increases, the relative wage is then OC . An increase in the relative wage up to the portion AB is due to the changes in the relative supply and BC is due to trade liberalization.

Diagram 3: Relative price and Relative supply have effects.

The discussion of above three cases suggest the following general relation

$$\omega^j = q(p^j, a^j, \bar{s}^j), \quad j = N \text{ or } S, \quad (7)$$

where $\frac{\partial q}{\partial p^j}$ and $\frac{\partial q}{\partial a^j}$ are negative if case one holds and equal to zero if case two holds. Similarly $\frac{\partial q}{\partial \bar{s}^j}$ is positive if case two holds and equal to zero if case one holds. In the mixed case (i.e., case 3), $\frac{\partial q}{\partial p^j}, \frac{\partial q}{\partial a^j}$ are negative and $\frac{\partial q}{\partial \bar{s}^j}$ is positive. Relation (7) nests the hypotheses implied by the three cases.

Relative price in the South is linked to the relative price in the North as follows:

$$p^S = \tau p^N, \quad (8)$$

where $\tau > 1$ is an index of trade restrictions that increases with τ^S or τ^N , which represents, respectively, trade restrictions in the South and the North⁹. Using (8) and letting $j = S$, (7) can be expressed as

⁹ In the presence of trade restrictions in the North and the South, $P_1^S = (1 + \tau^S)P_1^N$ and $(1 + \tau^N)P_2^S = P_2^N$ therefore $p^S = \tau p^N$ with $\tau = (1 + \tau^S)(1 + \tau^N)$

$$\omega^s = q(\tau p^N, a^s, \bar{s}^s). \quad (9)$$

This equation provides a basis for the empirical analysis in the thesis. The empirical model based on this equation is discussed in greater detail in the next chapter.

CHAPTER 3

EMPIRICAL IMPLEMENTATION AND DATA DESCRIPTION

This section describes the empirical methodology and the data used in the study. Although adequate data on relative wage and other explanatory variables are available for developed countries, there is little information for developing countries. Thus the structure of relative wages in developing countries has not received much attention. Notable exceptions are a study by Robbins (1996), who examines the effects of trade openness and relative factor supplies on the relative wage, but includes only 9 countries in his analysis, and a study by Abdi and Lawrence (2001) who discuss a case study for South Africa.

This study attempts to build a larger data set to explain the effect of trade liberalization, relative factor supplies and the relative technology index on the relative wage. The chapter first discusses the methodology used for estimating the wage relation. It then describes the data and explains the empirical measures of the potential determinants of the relative wage.

3.1 Empirical Methodology

This section discusses the empirical estimation of the relative wage equation in this study. As discussed in chapter 2, equation (9) nests different hypotheses about the structure of relative wages. The empirical analysis in the thesis estimates a model based on equation (9). Using a log linear approximation of (9), and letting subscript, i , t ,

representing the variable for Southern country i at time t , we can estimate the following equation.

$$\ln \omega_{it} = \alpha_0 + \alpha_1 \ln(\tau_{it} + p_t^N) + \beta_2 \ln a_{it} + \beta_3 \ln \bar{s}_{it}. \quad (10)$$

One way to estimate equation (10) is to use time series data for individual countries. However, one problem with this approach is that data on relative price (p^N) are difficult to obtain for developing countries. An additional problem with time series analysis is that data variations over time are affected by cyclical effects, which are difficult to distinguish from long-term movements. Given these data limitations time series analysis has been rarely used to examine the influence of relative technology, trade liberalization and relative factor supplies on the relative wage of skilled and unskilled workers. Notable exceptions are Robbins (1996) and Abdi and Lawrence (2001). These studies are discussed briefly below.

An alternative approach may be to use cross-section data to estimate equation (10). In the cross-section analysis, it can be assumed that the relative price is the same across all countries. This assumption avoids the data limitation that relative price data are not easily available. The estimation need not be restricted to only time series or cross-section data. The two types of data could be combined for panel data analysis. The panel data analysis, as compared to the time series or cross-section estimation, gives more information, greater variability in data, less collinearity among the variables, more degrees of freedom and more efficiency. In addition, panel data are better able to study the dynamics of adjustment and allow us to construct and test more complicated behavioral models than purely cross-section or time series data¹⁰.

¹⁰ See for example, Greene (1999) for the benefits of panel data estimation.

One problem with the panel data analysis is that it usually requires the units to be observed over the entire sample period. However, if the units are countries (as is the case in this study), the problem of missing data for some countries is a norm. This is a serious problem for developing countries, for which there are major gaps in available data.

One possibility is to use an unbalanced panel data. We use an unbalanced panel data in this study to estimate equation (10). This data set includes all those countries for which consistent time series data were available for at least four years during the 1985 and 1994 period. We were able to include only eleven developing countries in the unbalanced panel. This data set is discussed further below. Results obtained in the panel data are reported in chapter four.

A limitation of the empirical analysis based on panel data is that it is based on only eleven countries. To obtain additional evidence, the study also undertakes a cross-section analysis, which allows the inclusion of forty-five developing countries in the analysis. The cross-section data set includes additional countries for which data are available for one or more years.

One of the key issues in the study is to measure the relative wage. There are two approaches to measuring the unskilled-skilled wage ratio. One approach identifies skills with education levels. This approach was used by Robbins (1996). The other approach distinguishes skills of workers by their occupations. Abdi and Lawrence (2001) followed this approach in their study on South Africa. The two studies are summarized below.

Using household survey data, for a set of Latin American countries, Robbins' study develops a special data set for the relative wages, which is based on wages by education levels. Based on this special household survey data set, he finds that relative

wages of unskilled workers had risen in most of the countries in his sample. He attributes this rise to the rise in relative supply of the skilled workers rather than trade liberalization.

The study by Abdi and Lawrence develops unskilled-skilled wage ratio based on occupational classification. This study develops a time series data set for the relative wage of the unskilled workers in South Africa and finds an increase in the relative wage over time. In contrast to the Robbins' results, however, the study does not find strong evidence that the rise in the relative wage is an outcome of the rise in the relative supplies of skilled workers. Their analysis rather suggests Hicks neutral technological improvement, biased in favor of unskilled-labor-intensive sector, as a principal contributing factor for the rise in the relative wage of unskilled workers in South Africa. This study does support Robbins' findings that trade liberalization is not an important source of rise in the relative wage.

This thesis employs a wage measure based on occupational classification, but utilizes a database that has not been used before. These data enable this study to undertake panel and cross-section analysis of many developing countries. Table 3.1 reports all the countries included in the analysis. Numbers of years for which wage data was available are indicated in parentheses. Countries with time series data are highlighted.

Table 3.1: Coverage of Countries (number of years for which data were available is in parenthesis)

Region	Countries
Africa	Angola (1), Benin (1), Botswana (1), Burundi (1), Cameroon (1), Comoros (4), Egypt (4) , Eritrea (1), Ghana (1), , Kenya (2), Madagascar (2), Mozambique (3), Niger (1), Rwanda (4), Sudan (1), Tunisia (5), Zambia (6)
Asia	Bangladesh (6) , China (3), India (7) , Jordan (4), Nepal (1), Pakistan (1), Papua New Guinea (1), Philippines (7), Tonga (1), Singapore (9) , South Korea (9) , Thailand (8)
Americas	Antigua (1), Barbados (5) , Bermuda (3), Bolivia (8) , Colombia (1), Costa Rica (2), Cuba (3), Honduras (8) , Peru (1), Trinidad and Tobago (5), Uruguay (8) , Venezuela (8)
Europe	Bulgaria (1), Estonia (2), Romania (9)
Pacific Islands	Guam (1)

3.2 Relative wages

We construct an index of the relative wage based on the skill classification used by Slaughter and Lawrance (1993). This classification identifies skilled and unskilled labor with non-production and production workers. We use ILO data to construct such indexes of skilled and unskilled labor. We develop two data sets. The first data set is a panel of 11 developing countries for which data were available for at least four years for the wage rate and all the independent variables (i.e. relative wage, trade openness, relative factor supplies and the relative technology index). The second data set is constructed for all those countries for which information on wage rates were available for at least one year between 1985 and 1994 time period.

The measure of relative wage is based on the data available from the ILO, *A Special Supplement To the Bulletin Of Labor Statistics, October Inquiry, (various issues)*. This supplement provides information about wage rates for 159 occupations in 49 major

industries. The data on 159 occupations were classified into two categories: unskilled and skilled labor. These two categories broadly follow Slaughter and Lawrence classification of labor in production and non-production categories. This classification is shown in Appendix Table 1. The unskilled group includes 23 occupations in professional, technical and administrative categories. The remaining 136 occupations are classified as the skilled group¹¹. Skilled and unskilled wage rates (i.e. W_S and W_U) are then measured as simple averages of the wage rates for all occupations reported in the two groups¹².

3.3 Relative Factor Supplies

In this study, we consider two measures of relative factor supplies. First measure identifies the skilled and unskilled workers into production and non-production categories following the classification used to construct the relative wage index. For this measure, the data on the total number of production and non-production workers (employed in major industries) is obtained from the ILO, *Yearbook of Labor Statistics, Section 3, (various issues)*. An index for relative factor supplies (RS2) is then obtained as the ratio of skilled to the unskilled workers. These data were not available for most of the developing countries. In view of this data limitation, we used an alternative measure of relative factor supplies defined as the ratio of university to primary school enrollments (RS1). This measure is related to the education-based index of relative supply of skilled workers used by Robbins. The data on enrollments in universities and primary schools is obtained from the United Nations Educational Scientific and Cultural Organization (UNESCO) publication, *Statistical Yearbook (various issues)*.

¹¹ For example, these occupations include clerical, sales workers, service workers other than administrative or professional workers, animal husbandry, agriculture, forestry, hunting, transport equipment operators and all other unskilled workers engaged in processing, assembling, inspecting, storing, handling, packing and repair activities.

One limitation of our measure is that enrollments actually represent additions to stocks of skilled and unskilled workers (i.e. ΔS and ΔU). However, if the rates of growth of enrollments in different categories (i.e. $\frac{\Delta S}{S}$, $\frac{\Delta U}{U}$) are similar, then $\frac{\Delta S}{\Delta U}$ would provide a reasonable proxy for the relative factor supplies (S/U).

3.4 Trade Liberalization

A number of proxies have been suggested in the literature to represent trade liberalization¹³. One measure is trade dependency ratio, which are easily available and most widely used as a proxy for trade liberalization.¹⁴ To construct the trade dependency ratio, we use data on the total value of exports and imports from International Monetary Fund, *Direction of Trade Statistics Yearbook*, (various issues) and GDP from World Bank, *World Tables*, (various issues).

One important limitation of this measure is that it may be affected by factors other than liberalization in trade (such as geographical location). To the extent that these factors do not change over time, the trade dependency ratio may serve as an adequate indicator of changes over time. However, it is a questionable proxy for differences of openness across countries. Therefore we use another proxy for openness, *GI*, which is based on several trade liberalization indicators developed by Sachs and Warner (1995). These indicators are

- Non-tariff barriers covering 40 percent or more of trade;

¹² Wages are not reported for occupations with small numbers.

¹³ These include average tariffs, average quantitative restriction coverage, average collected tariff ratios, the World bank index of outward orientation, average black market premia, Wolf's index of outward orientation and the trade dependency ratio-index. See Edwards (1997) for a detailed survey of these possible proxies.

- Average tariff rates of 40 percent or more;
- A black market exchange rate that is depreciated by 20 percent or more relative to the official exchange rate, on average, during the 1970's or 1980's;
- A socialist economic system;
- A state monopoly on major exports.

Sachs and Warner defined an open economy as one in which none of the above five conditions apply. We use this classification in both panel and cross-section analysis. One limitation of this measure, however, is that it represents only two states, open or closed.¹⁵

3.5 Relative Technology

In chapter 2 the production function for each sector is defined as follows:

$$Q_i^j = A_i^j U_i^j f_i(\theta_i^j), \quad i=1,2, j = N, S, \quad (11)$$

where $Q_i^j, S_i^j, U_i^j, A_i^j$ and $\theta_i^j (\equiv \frac{S_i^j}{U_i^j})$ denote, respectively, output, skilled labor, unskilled

labor, Hicks neutral technology index and skilled/unskilled labor ratio for sector i and

country j . Construction of the relative technology index, $\frac{A_1^j}{A_2^j}$, requires sectoral data on

skilled and unskilled labor (i.e. S and U) which is not available for the sample countries.

We use nominal value-added per employee as a proxy for the Hicks-neutral technology index. This measure (RT) can be expressed as:

¹⁴ Robbins, for example, used this measure for explaining trade liberalization in his study.

¹⁵ The Sachs-Warner index of openness is positively related to the trade dependency ratio (which varies within the range of 0.14 to 3.08). For example, regressing the trade dependency ratio (RT) on a constant (C) and the Sachs-Warner openness index (GI) we obtain: $TR = 0.405569C + 0.462307GI$. Both coefficients are significant at 1% level (Standard errors of these coefficients are 0.164374 and 0.070089, respectively).

$$RT = p^j \frac{q_1^j}{q_2^j} . \quad (12)$$

Where $q_i^j (\equiv \frac{Q_i^j}{S_i^j + U_i^j})$ represents average labor productivity (i.e. value of output per

worker in the skilled and unskilled group of industry i) and $p^j = \frac{P_1^j}{P_2^j}$ is the relative price.

Using (11) and (12), it can be shown that;

$$RT = \frac{A_1^j}{A_2^j} \varepsilon . \quad j = S \text{ or } N \quad (13)$$

Where $\varepsilon = [\frac{f_1(\theta_1^j)/(\theta_1^j + 1)}{f_2(\theta_2^j)/(\theta_2^j + 1)}] p^j$ is an error term that depends on the skilled/unskilled

labor ratios in the two sectors as well as the relative price.¹⁶

The above discussion is based on the simple two-factor framework and ignores the role of physical capital. For the more general case where the production function also includes physical capital, we assume that the contribution of physical capital (i.e., the effect of the capital-labor ratio on labor productivity) is not much different between the high and low skill sectors. Our relative technology measure (RT) would not be affected much by the presence of physical capital under this assumption.

¹⁶ For a given relative price, θ_1^j and θ_2^j depend on relative technology, $\frac{A_1^s}{A_2^s}$ and the relative wage, ω^s . An increase in the Hicks neutral technology, biased in favor of the skilled labor-intensive sector, for example, would decrease θ_i^j in both sectors and could change ε and hence RT . Similarly an increase in ω^s will increase θ_i^j in both sectors and could also affect the proxy for the relative technology. Another limitation of this measure is related with changes in trade liberalization. A decrease in τ , (i.e. increase in trade

To construct an index of relative technology measure, RT , we obtained data on the value added and employment in major industries. These industries are classified by International Standard Industrial Classification (ISIC) at 3-digit level and were identified into two groups—skilled labor-intensive and unskilled-labor intensive industries. The classification is based on average earnings of workers in corresponding industries in the United States (US). Skilled labor-intensive group includes those industries for which average earnings are relatively higher in the US¹⁷. These include Paper Products, Non-Ferrous Metal, Petroleum Refining, Transportation and Machinery. The other group, for which average earnings of workers are relatively low, includes Food, Beverages, Tobacco, Textiles, Wood Products, Furniture and Fixtures and other related industries¹⁸. A list of all industries included in each group and average earnings of US workers corresponding to these industries are reported in Appendix Table 3.

The data on the value added and employment level for all industries is obtained from the United Nations Industrial Development Centre, *Annual Industrial Statistics (various issues)*. Nominal value-added per employee is obtained by dividing the value-added with number of workers in each group. The relative technology index is then measured as the ratio of nominal value-added per employee of the skilled and unskilled labor-intensive group of industries. Average earnings of workers in the corresponding

liberalization) would decrease the relative price in the South and could influence RT without a change in relative technology.

¹⁷ Average wage in an industry i can be defined as $\bar{W}_i = \frac{W_S S_i + W_U U_i}{S + U}$, let $\alpha = \frac{S}{S + U}$

then we can define average wage as $\bar{W} = \alpha W_S + (1 - \alpha) W_U$ or $\bar{W} = W_U + \alpha(W_S - W_U)$.

This implies that higher average wage in an industry is due to higher value of α .

¹⁸ In the US, average earnings of workers in Beverages and Tobacco industries are higher mainly due to sophisticated production process. However, this is not the case in developing countries.

industries in the U.S. are obtained from US Bureau of Census, Department of Commerce, *Annual Survey of Manufactures*, (1998).

Given the limitation of the proxy for relative technology, RT , we also explore another approach. In developed countries, Research and development (R&D) is undertaken mainly in skill-intensive sectors. Developing countries do little R&D of their own and rely mainly on transfer of technology. Thus RT reflects the gap in skill-intensive sectors. This gap depends on the developing countries ability to transfer technology.

Let the technological gap be as

$$A_1^j = \lambda^j A_1^N, \quad j = S. \quad (14)$$

Assuming there is no technological gap in the traditional sector

$$A_2^j = A_2^N, \quad j = S. \quad (15)$$

It follows then

$$a^j = \lambda^j a^N, \quad j = S. \quad (16)$$

Thus for a given relative technology in the North, the relative technology in the South is related to λ^j , which reflects the extent to which technology transfers from North to the South. One widely discussed channel of technology transfer is trade openness. Thus the proxy for trade liberalization, GI , may also be an indicator of relative technology. The two possibilities, however, imply different signs for the coefficient of GI in the equation explaining the relative wage. If the proxy GI captures largely the effect of technology, then the sign of the coefficient is expected to be negative. However, if it mainly reflects the impact of trade openness, then its sign would be positive.

Another possible source of technology transfer is the extent to which a southern country receives Foreign Direct Investment (FDI) from the North. Thus, we use the ratio

of the stock of FDI to GDP, denoted by *RTI* as an alternative proxy for relative technology. Data on stock of FDI is obtained from the United Nation Conference on Trade and Development, *World Investment Report (various issues)*. A consistent time series data is not available for all the countries. Therefore, we use this proxy only in the cross-section analysis.

CHAPTER 4

PANEL DATA ANALYSIS

This chapter examines the behavior of the relative wage, trade liberalization index, relative supply of skilled workers, and the relative technology measure in eleven developing countries of Asia and Latin America using a panel data set. Before presenting formal empirical analysis, we briefly review data to identify long run trends of different variables in each developing country and the variation of these variables across countries.

4.1 Changes Over Time

In this section, we first examine the behavior of the relative wage over time. Figure 4.1, shows the movement of the relative wage over time in each of the eleven developing countries. As the figure shows, the relative wage exhibits considerable variability over time, and it is difficult to discover a clear-cut trend in its behavior for most countries. There exists a mild tendency for the relative wage to increase in South Korea, Venezuela and Uruguay and to decrease in Egypt and Thailand. For rest of the countries, the relative wage does not exhibit any systematic trend.

Yearly fluctuations of relative wages are likely to be very sensitive to the short run cyclical factors. To get an indication of the underlying long run behavior, we next look at average annual changes of the relative wage for the whole sample period.

Figure 4.1: Relative wage in eleven developing countries (W_u/W_s).

Figure 4.1 continued:

Table 4.1 reports the average annual change in the relative wage. The table shows that the average change tends to vary considerably across countries. For example, four countries, Korea, Venezuela, India and Uruguay, experienced a significant increase of over 5% a year¹⁹; another two countries, Barbados and Bolivia, register only a modest increase between 0% to 1% a year; while the remaining countries show modest declines over time. It is interesting to explore whether these differences in the relative wage change could be explained by variables defined in my model, that is, trade liberalization, relative factor supplies and the relative technology index. Average annual change in these variables is also reported in Table 4.1.

The remainder of this section explores the relation between the relative wage change and the variables suggested by the theory. This relation is explored in figures 4.2 to 4.4. Figure 4.2 explores the association between average annual changes in the relative wage and the trade openness. The figure shows that there is no positive association between the two variables. In fact, some countries that had a negative average change in trade openness experienced an increase in the relative wage.²⁰

¹⁹Uruguay exhibits over 15% per year increase in the relative wage but note that it is mainly due to a sharp increase in relative wage in the year 1992. This point is reported in figure 4.1.

²⁰ For example, in South Korea, Barbados and Uruguay, trade openness declined at the rate of 3%, 2% and 0.07% per year while relative wages increased at an annual rate of 6%, 1% and 6% respectively. In Honduras, Thailand and Egypt average annual increase in trade openness was 5%, 7% and 32%, but relative wages declined at the rate of 3%, 2.7% and 7% per year respectively. Only exceptions are, however, India and Bolivia. In these two countries average annual changes in trade openness and the relative wage were positively related.

Table 4.1: Average Annual Change in Relative Wage, Trade Openness, Relative Factor Supplies and the Relative Technology.

Countries	Observations	Relative Wage (W_u/W_s)	Trade Openness	Relative Factor Supplies	Relative Technology
Barbados (BR)	5	0.009721 (0.006772)	-0.017978 (0.029171)	0.055182 (0.052021)	0.026084 (0.075971)
Bangladesh (BN)	6	-0.012354 (0.010527)	0.008753 (0.011125)	-0.660240 (0.025387)	0.043771 (0.099685)
Egypt (EG)	4	-0.069624 (0.034206)	0.323171 (0.207588)	0.005975 (0.032833)	-0.073897 (0.045250)
Honduras (HN)	8	-0.031928 (0.049099)	0.047138 (0.043599)	-0.053128 (0.007681)	0.026765 (0.004868)
Bolivia (BO)	8	0.005096 (0.039137)	0.030744 (0.004079)	0.004933 (0.009253)	0.123170 (0.029530)
South Korea (KR)	9	0.056185 (0.009235)	-0.037502 (0.004887)	0.158481 (0.008125)	0.001519 (0.003044)
Singapore (SN)	9	-0.022677 (0.019703)	0.004745 (0.010957)	0.082535 (0.002762)	-0.028763 (0.007686)
Venezuela (VN)	8	0.068046 (0.031528)	0.068778 (0.026158)	0.020833 (0.013547)	0.016531 (0.018016)
India (IN)	7	0.058176 (0.038481)	0.038423 (0.010376)	0.002107 (0.003817)	0.005443 (0.009992)
Thailand (TH)	8	-0.027453 (0.014872)	0.066295 (0.013368)	0.037583 (0.010055)	0.101547 (0.049163)
Uruguay (UR)	8	0.159763 (0.036028)	-0.000712 (0.008213)	0.050152 (0.006495)	-0.032121 (0.013099)

Source: Appendix Tables 4.1 to 4.13

Standard Errors are reported in parenthesis.

Figure 4.2: Relative wage and trade openness (average change per year)

Figure 4.3 explores the relation between relative factor supplies based on the university-primary enrollment ratio (*RSI*). This figure also reveals no clear-cut relation between average changes in relative factor supplies and the relative wage. It is interesting, however, to compare these findings with the results of Robbins (1996). Robbins noted a sharp increase in the supply of skilled workers in his sample of developing countries, which he attributed to expanded educational facilities²¹. He also found that changes in the supply of skilled workers were positively related to changes in the relative wage. The data in this study also confirms that relative factor supplies of skilled workers increased in most countries²². In contrast to Robbins' findings, however, the increase in relative supplies of skilled labor in this study's sample of countries did not generally produce an increase in relative wages.

²¹ Robbins' study includes Argentina, Chile, Costa Rica, Colombia, Malaysia, Mexico, Philippines, Taiwan and Uruguay.

²² Notable exception is Bangladesh where relative supply actually declined by 66%.

Figure 4.3: Relative wage and relative factor supplies (average change)

Finally, Figure 4.4 examines the relation between average changes in the relative technology index and the relative wage. The figure does not support the prediction of the theory. In fact, the figure suggests a weak positive association between the relative technology index and the relative wage.

One reason that the above data does not show an association between the relative wage and the explanatory variables might be that the sample is based on a short time period. It is possible that average annual changes over this short time period are very sensitive to short-term factors and do not adequately represent long-term trends. As an alternative, we next explore if inter-country differences in levels suggest an association between the relative wage and the three explanatory variables.

Figure 4.4: Relative wage and relative technology (average change)

4.2 Variation Across Countries

Table 4.2 reports average levels of the relative wage, trade openness, relative factor supplies and the relative technology index for each country. The average level of the relative wage ranges from a low level of 0.30 for India to a high level of 0.75 for Egypt. The value for Egypt is, however, surprisingly very high and likely reflects peculiarities of Egyptian wage data. If Egypt is excluded, average level of relative wage fluctuates between 0.30 and 0.52. To explore whether inter-country differences in average levels of the relative wage could be explained by the average levels of the explanatory variables, we plot average levels of relative wage against average levels of each of the three variables in Figures 4.5 to 4.7.

Table 4.2: Average Level of Relative Wage, Trade Openness, Relative Factor Supplies and the Relative Technology.

Countries	Observations	Relative Wage	Trade Openness	Relative Factor Supplies	Relative Technology
Barbados	5	0.520704 (0.012507)	0.500071 (0.040996)	0.206413 (0.055550)	1.382758 (0.296047)
Bangladesh	6	0.416841 (0.019225)	0.226139 (0.010220)	0.040145 (0.006463)	1.963461 (0.613435)
Egypt	4	0.743092 (0.085577)	0.189505 (0.129753)	0.110321 (0.010281)	0.582144 (0.077532)
Honduras	8	0.403658 (0.142041)	0.562822 (0.176677)	0.048351 (0.002220)	1.524012 (0.111831)
Bolivia	8	0.330055 (0.080201)	0.342528 (0.027268)	0.083933 (0.006234)	2.323944 (0.774522)
South Korea	9	0.463730 (0.081288)	0.569826 (0.062150)	0.356539 (0.057564)	1.479041 (0.033330)
Singapore	9	0.410579 (0.061338)	3.081666** (0.249246)	0.206882 (0.047089)	2.217866 (0.210806)
Venezuela	8	0.412210 (0.130110)	0.424709 (0.095134)	0.134588 (0.011575)	1.993935 (0.247903)
India	7	0.308562 (0.065653)	0.145177 (0.014156)	0.048541 (0.001034)	2.136053 (0.105868)
Thailand	8	0.446059 (0.045815)	0.589521 (0.099064)	0.151718 (0.023741)	2.991890 (0.989595)
Uruguay	8	0.352636 (0.116151)	0.334665 (0.016732)	0.188878 (0.018934)	1.720781 (0.195189)
All Countries	80	0.420782 (0.124750)	0.706610 (0.870279)	0.149807 (0.099119)	1.921052 (0.694665)

Source: Appendix tables 4.1 to 4.13.

Standard deviations are in parenthesis.

** Mainly due to re-exports.

Figure 4.5 examines the relation between average levels of relative wages and trade openness. The figure does not suggest a strong positive link between these variables. However, it is interesting to note that if the two outliers (Egypt and Singapore) are excluded, then the figure does indicate a positive association between the relative

wage and trade openness. In Figure 4.6, we have mapped the relative wage against the openness proxy, which is developed following the criteria defined by Sachs and Warner. This figure clearly distinguishes the open and closed economies, but suggests no association between the relative wage and openness. Figure 4.7 relates average levels of the relative wage to average levels of relative supplies of skilled workers (*RSI*). This figure also does not show a clear association between *RSI* and the relative wage. However, a positive, albeit weak, relation does emerge if the two outliers (Egypt and South Korea) are excluded.

Finally, Figure 4.8 examines whether countries with a higher level of relative technology would have a lower level of relative wages. A strong negative association between levels of relative technology and the relative wage is clearly indicated in this figure, and this relation survives even if the outliers, Egypt and Thailand, are ignored²³.

Thus the evidence on level differences between countries provides some support for all three hypotheses, and is especially favorable to the relative technology hypothesis. These hypotheses are formally tested in the next chapter.

²³ Because Egypt has exceptionally high level of relative wage, it appears as an outlier in all three variables. The other outliers are based on relatively high value of the three explanatory variables and these vary from figure to the other.

Figure 4.5: Relative wage and trade openness (average level)

Figure 4.6: Relative wages and trade liberalization (proxy G1)

Figure 4.7: Relative wage and relative factor supplies (average level)

Figure 4.8: Relative wage and relative technology (average level)

4.3 Econometric Analysis of Panel Data

We now undertake econometric analysis to investigate the effect of trade liberalization, relative technology and relative factor supplies on the relative wage of unskilled workers in the South. I first pool the data for eleven countries. Equation (10) is estimated in the following form:

$$\ln \omega_{it} = \alpha_0 + \delta_t + \beta_1 \ln TR_{it} + \beta_2 \ln RT_{it} + \beta_3 \ln RSl_{it} + \varepsilon_{it}, \quad (17)$$

where TR_{it} is a proxy for $1/\tau_{it}$, RT_{it} and RSl_{it} are measures of a_{it} and $\bar{s}_{it}$, δ_t is a time dummy which represents the effect of $\ln p_t^N$, (which is the same for all sample countries but can vary over time) and ε_{it} is the error term.

The error term in (17) could be subject to heteroskedasticity and auto-correlation. To address these problems we use Newey-West (1987) procedure to obtain heteroskedasticity and auto-correlation consistent estimates of standard errors²⁴. Since the intercept in (17) is the same for all countries, we estimate a regression with common intercept for all the eleven countries. This restriction is implied by the model, which assumes identical technology across countries. The model also implies that $\beta_1 > 1$, $\beta_2 < 0$ and $\beta_3 = 0$ if countries are engaged in diversified production; $\beta_1 = 0$, $\beta_2 = 0$ and $\beta_3 > 0$ if countries are specialized in production; $\beta_1 > 0$, $\beta_2 < 0$ and $\beta_3 > 0$ if countries move from one of these states (e.g. Specialization) to another. Table 4.3 reports the results.

²⁴ In contrast to the White's covariance method that presumes residuals to the estimated equation as serially uncorrelated, Newey-West's estimator of the covariance matrix gives consistent estimates in the presence of heteroskedasticity and auto-correlation.

Table 4.3: Results of Pooled & Fixed Effects Regressions

Variables	(1) Pooled Estimation (Equation 17)	(2) Pooled Estimation Without Egypt and Singapore	(3) Pooled Estimation Without Egypt and Korea	(4) Pooled Estimation Without Egypt and Thailand	(5) Pooled Estimation (Equation 18)	(6) Pooled Estimation (Equation 19)	(7) Fixed Effects (Equation 20)
ln(TR)	0.040932 (0.049605)	0.192506* (0.091651)	0.086226 (0.046642)	0.071523 (0.049409)		-0.102033 (0.061157)	-0.002878 (0.125560)
ln(RT)	-0.334565* (0.123189)	-0.142618 (0.092765)	-0.105260 (0.107264)	-0.317646* (0.099642)	-0.345869* (0.117633)	-0.439520* (0.065725)	-0.083953 (0.104849)
ln(RS1)	0.071168 (0.055935)	0.036155 (0.071196)	0.015256 (0.071866)	0.040801 (0.057397)	0.054881 (0.077977)		-0.036688 (0.196515)
G1					0.091988 (0.112800)		
ln(RS2)						0.004947 (0.066040)	
1986	0.124817 (0.091174)	0.148250 (0.095766)	0.182178 (0.092447)	0.157900 (0.092553)	0.116475 (0.088075)	0.049473 (0.067221)	0.118266 (0.061894)
1987	0.112476 (0.094263)	0.091842 (0.089656)	0.102410 (0.104205)	0.065911 (0.081926)	0.093313 (0.096688)	0.038100 (0.069626)	0.126215 (0.078120)
1988	0.061270 (0.098967)	0.064112 (0.095332)	0.090333 (0.099987)	0.032822 (0.398893)	0.041020 (0.098107)	-0.009134 (0.095914)	0.080774 (0.065279)
1989	0.165083 (0.091611)	0.180555* (0.089430)	0.198853* (0.088912)	0.155570* (0.072375)	0.145809 (0.090976)	0.108067 (0.077516)	0.169833* (0.067745)
1990	0.151400 (0.095410)	0.159680 (0.107192)	0.173488 (0.111604)	0.172871 (0.098082)	0.139273 (0.095940)	0.170614 (0.091958)	0.172107* (0.078338)
1991	0.159388* (0.067513)	0.180161* (0.065349)	0.163744* (0.076261)	0.166679* (0.068770)	0.146866* (0.064626)	0.172480* (0.081773)	0.178333* (0.059564)
1992	0.280899* (0.102365)	0.357435* (0.083778)	0.298838* (0.129001)	0.321858* (0.124042)	0.266027* (0.101167)	0.273565* (0.121576)	0.327209* (0.133528)
1993	0.007756 (0.113344)	0.052006 (0.180043)	-0.098665 (0.066273)	0.046058 (0.139051)	-0.004214 (0.102566)	0.207786* (0.103119)	0.111054 (0.148906)
1994	0.095126 (0.055743)	0.056522 (0.070965)	0.086777 (0.066273)	0.123159* (0.051690)	0.071807 (0.074566)	0.177912* (0.068197)	0.198603 (0.104473)
Constant	-0.656221* (0.110899)	-0.735080* (0.093424)	-0.930183 (0.168125)	-0.754935* (0.094355)	-0.745953* (0.187596)	-0.696446 (0.121069)	-0.873829* (0.338923)
Bangladesh							-0.213439 (0.341033)
Egypt							0.302896 (0.215098)
Honduras							-0.326261 (0.330181)
Bolivia							-0.457544* (0.218275)
Korea, R. P.							-0.057171 (0.123068)
Singapore							-0.158374 (0.241224)
Venezuela							-0.210137 (0.125276)
India							-0.542148 (0.333612)
Thailand							-0.069278 (0.103837)
Uruguay							-0.369306* (0.109048)
R-Squared	0.209756	0.342987	0.247371	0.309759	0.335785	0.455358	0.611459
Adjusted R²		0.194229	0.080121	0.159160	0.216821	0.338649	0.461495
F-Statistics							4.132120
($\alpha_i \neq \alpha$)							

*Indicates significance at 1%. Standard errors are in parenthesis. Newey-West HAC Standard Errors & Covariance (lag truncation=3).

As shown in regression (1) of table 4.3, out of the three explanatory variables (i.e. trade openness, relative factor supplies and the relative technology index), only relative technology has a statistically significant effect on the relative wage of the unskilled workers. The other two variables do not help explain changes in the relative wage. These results for the Southern countries support the Slaughter and Lawrence findings for the U.S. that technological improvement in skilled-intensive sector is a key determinant of the relative wage. These results, however, do not support Robbins' view that changes in the relative wage largely resulted from changes in relative supply of skilled workers.

Regressions (2) – (4) explore the sensitivity of the results to outliers identified in Figures 4.5, 4.7 and 4.8. Regression (2) excludes Egypt and Singapore, the outliers in the relation between trade openness and the relative wage. Egypt and South Korea, the outliers in the relation between relative factor supplies and the relative wage, are excluded in regression (3) while regression (4) drops Egypt and Thailand, the outliers for the technology-wage relationship. As the results show, the factor supply variable remains insignificant even if outliers are excluded. However, the trade liberalization does become significant without the outliers.

We next introduce an alternative measure for trade openness, which is based on the classification of Sachs and Warner and divide the countries into two groups. Group 1 includes those countries that were open in 1985-86 and remained open till 1994. This group consists of Barbados, Bolivia, South Korea, Singapore, and Thailand. Group 2 includes the remaining countries. The following equation is then estimated:

$$\ln \omega_{it}^S = \alpha + \delta_i + \beta_1 GI + \beta_2 \ln \bar{S}_{it}^S + \beta_3 \ln a_{it}^S + \varepsilon_{it}, \quad (18)$$

where $G1$ is a dummy variable that equals 1 if a country is in group 1 and 0 otherwise. These results are reported in column 5 of the Table 4.3. As the table shows, even this proxy for trade openness has no effect on the relative wage.

The proxy for relative factor supplies ($RS1$) uses the ratio of the enrollments in the university to that in the primary school, as discussed in chapter 3. This ratio represents additions to stocks of skilled and unskilled workers and the rates of growth of enrollments in different categories could be different. Thus it is possible that proxy, $RS1$, does not fully capture the effect of changes in the relative factor supplies. Thus we also try the alternative proxy, $RS2$, which identifies the skilled and unskilled workers into production and non-production categories (following the same classification as the one used to construct the relative wage index). The data for this proxy are available only for 9 developing countries. The following equation is then estimated as:

$$\ln \omega_{it} = \alpha_0 + \delta_t + \beta_1 \ln TR_{it} + \beta_2 \ln RT_{it} + \beta_3 \ln RS2_{it} + \varepsilon_{it} . \quad (19)$$

Estimation results are reported in column 7 of the table 4.3. As the Table 4.3 shows, even this proxy for relative factor supplies does not produce any significant influence on the relative wage.

Finally we test for the presence of country fixed effect. Although the model does not imply such effects, they could arise because of country-specific biases in indexes used to measure explanatory variable. A limitation of the fixed effect model, however, is that its estimates are based on within-country variations, which is relatively small and subject to influences of short-term factors. This model is estimated as

$$\ln \omega_{it} = \alpha_i + \delta_t + \beta_1 \ln TR_{it} + \beta_2 \ln RT_{it} + \beta_3 \ln RS1_{it} + \varepsilon_{it} . \quad (20)$$

Results are reported in column 8 of the Table 4.3. In this table, the country dummy variables represent the effect relative to the omitted country Barbados. The F-test rejects the hypothesis that country dummy variables are the same. The table shows, moreover, that all three variables become insignificant once the country fixed effects are introduced. These results may simply reflect the fact that much of the variation in explanatory variables is between countries, and this type of variation is suppressed in the fixed-effect model. Thus the earlier model without country fixed effects may be more useful in assessing the influence of trade liberalization, relative technology, and relative factor supplies on relative wages.

In fact, it may be appropriate to focus only on between-country variations. Table 5.6 reports cross-country relations explaining average levels (over the sample time period). Since sample countries are only eleven, we regress each and every explanatory variable separately.

Table 4.4: Between-Country Regressions

Variables	Coefficient	Coefficient	Coefficient	Coefficient
ln(TR)	0.045311 (0.086306)			
ln(RT)		-0.437714* (0.080243)		
ln(RS)			0.050883 (0.041269)	
G1				0.018522 (0.146264)
Constant	-0.903349* (0.054782)	-0.616320* (0.056432)	-0.757639* (0.131607)	-0.863924* (0.124786)
R-Squared	0.024088	0.776611	0.025185	0.001642
Adjusted R²	-0.084346	0.751790	-0.083128	-0.109287

* Indicates significance at 1%. Standard errors are in parenthesis. Newey-West HAC Standard Errors & Covariance (lagtruncation=3).

As the Table 4.4 shows, the only explanatory variable that helps explain changes in the relative wage is the relative technology index. The other two explanatory variables,

(i.e. trade liberalization and the relative factor supplies index) do not play any significant role in explaining changes in relative wages.

CHAPTER 5

CROSS-SECTION ANALYSIS

In order to include a larger number of countries into our analysis, this chapter undertakes cross-section analysis based on data for 45 countries. The basic data is presented in Table 5.1, which shows levels of relative wages, relative technology, trade openness and relative factor supplies for the sample countries. Note that measures of the technology variable based on the relative technology index or the FDI stock to GDP ratio are not available for a number of countries. Thus the empirical analysis including the technology variable is restricted to a smaller sample of countries. As discussed in chapter 3, the relative wage of unskilled workers is obtained for all the countries that have reported occupational wage rates at least once during the 1985-94 period. We take a simple average of wage rates if these were reported for more than one year. Indexes of trade openness, relative factor supplies and relative technology are estimated for the year 1985, which represents the initial year for the wage data sample²⁵.

5.1 Basic Evidence

As the table shows, there is considerable variation in relative wages across countries.²⁶ To explore the association between the inter-country differences in average

²⁵ Alternatively we also consider estimates of these variables for the year 1990, which is closer to the middle of the wage sample. However, this change did not affect the results much.

²⁶ The relative wage of unskilled workers ranges from a low level of 0.142 for Ghana to a high level of 1.34 for Angola. Value for Angola is greater than 1, but note that it is based on a single year of observation and may reflect peculiarities of wage data in Angola. If

levels of relative wage and the explanatory variables, we plot average levels of relative wage against each of the three explanatory variables in Figures 5.1 – 5.3.

Table 5.1: Levels of Relative Wage, Trade Openness, Relative Factor Supplies, Relative Technology and FDI-GDP Ratio

Countries	Observations	Relative Wage	Trade Openness	Relative Factor Supplies	Relative Technology	FDI Stock to GDP Ratio
Angola	1	1.339402	0.448507	0.005166	N/A	0.099192
Antigua	1	0.343712	0.625	0.628630	N/A	0.465347
Bangladesh	6	0.416841	0.226139	0.040145	1.963461	0.007156
Barbados	5	0.520704	0.500071	0.206413	1.382758	0.103506
Benin	1	0.50561	0.613542	0.020405	N/A	0.032505
Bermuda	3	0.607978	0.36201	0.10246	N/A	7.743269
Bolivia	8	0.330055	0.342528	0.08393	2.323944	0.199125
Botswana	1	0.597564	0.296532	0.008667	1.751369	0.781353
Bulgaria	1	0.733847	0.836241	0.10527	2.172908	N/A
Burundi	1	0.567986	0.313402	0.00703	0.150948	0.002946
Cameroon	1	0.74364	0.435013	0.011941	1.036278	0.003689
China	3	0.744157	0.26307	0.026293	1.24227	0.300865
Colombia	1	0.609368	0.227006	0.096915	0.019898	0.083000
Comoros	4	0.558547	0.464912	0.003656	N/A	N/A
Costa Rica	2	0.536615	0.541995	0.175737	1.292629	0.244195
Cuba	3	0.7458	0.777271	0.218363	1.680421	N/A
Egypt	4	0.743092	0.189505	0.110321	0.582144	0.154079
Eritrea	1	0.456834	0.189505	0.169586	N/A	N/A
Estonia	2	0.590118	0.189504	0.013987	N/A	N/A
Ghana	1	0.141676	0.276543	0.049805	N/A	0.073712
Guam	1	0.524087	N/A	0.421443	1.71044	N/A
Honduras	8	0.403658	0.562822	0.048351	1.524012	0.047253
India	7	0.308562	0.145177	0.048541	2.136053	0.005017
Jordan	4	0.484736	1.02087	0.101248	0.916086	0.096289
Kenya	2	0.277486	0.47387	0.004627	2.082167	0.078454
Madagascar	2	0.492296	0.27094	0.024379	1.39846	0.016795
Mozambique	3	0.378576	0.22322	0.001155	N/A	0.006630
Nepal	1	0.41476	0.264957	0.030049	1.552282	0.000763
Niger	1	0.476420	0.381646	0.011301	N/A	0.140972
Pakistan	1	0.565104	0.305595	0.037742	1.43145	0.034641
Papua N. Guinea	1	0.459555	0.879736	0.017115	1.79347	0.281766
Peru	1	0.720023	0.284926	0.121905	1.850165	0.061152
Philippines	7	0.915186	0.309543	0.15707	2.709696	0.084596
Rwanda	4	0.363914	0.181287	0.002374	4.157925	0.077551
Romania	9	0.727848	0.389498	0.052727	0.881110	N/A
Singapore	9	0.410579	3.081667	0.206882	2.217866	0.735741
South Korea	9	0.46373	0.569826	0.356539	1.479041	0.022900
Sudan	1	0.624254	0.165224	0.021492	N/A	N/A
Thailand	8	0.446059	0.589521	0.151718	2.99189	0.051387
Tonga	1	0.638654	0.821429	0.041424	N/A	N/A
Trinidad & Tobago	5	0.395738	0.486744	0.039107	1.149386	0.233053
Tunisia	5	0.675275	0.620856	0.032206	3.303452	0.169084
Uruguay	8	0.352636	0.334665	0.188878	1.720781	0.168220
Venezuela	8	0.41221	0.424709	0.134588	1.993935	0.024984
Zambia	6	0.682046	0.636481	0.01052	N/A	0.188721

Angola is excluded, average level of relative wage still fluctuates between 0.14 and 0.92.

Figure 5.1: Relative wage and trade openness (average level)

Figure 5.2: Relative wage and relative factor supplies (average level)

Figure 5.3: Relative wage and relative technology (average level)

Figure 5.1 relates average levels of the relative wage to trade openness. No strong positive link between the two variables emerges in this figure. However, if we ignore two outliers, Singapore and Angola, the figure does indicate a positive association between levels of relative wages and the level of trade openness. Similarly, in Figure 5.2, we plot the levels of relative wages against the average level of relative supplies of skilled workers (*RSI*). This figure does not suggest any clear association between the two variables even if the three outliers, Angola, Guam and South Korea are excluded. Finally, Figure 5.3 examines the relation between the relative technology (*RT*) and the relative wage. A modest negative association is evident from the figure.

5.2 Econometric Analysis of Cross-section Data

The descriptive evidence in Figures 5.1 – 5.3 appears to support the hypotheses that links relative wage to trade openness and relative technology. I now formally test the three hypotheses using a cross-section regression analysis. I first estimate equation (10) in the following form:

$$\ln \omega_i = \alpha_0 + \beta_1 \ln TR_i + \beta_2 \ln RT_i + \beta_3 \ln RSI_i + \varepsilon_i, \quad (21)$$

where, as before, TR_i is a proxy for τ_i , RT and RSI are measures of a_i and $\bar{s}_i$, ε_i is an error term and subscript i indexes variables for Southern countries.

Table 5.2 (column 1) reports these results for equation (21). Because the RT index is not available for a number of countries, the estimation of equation (21) is based on only 30 observations.

Table 5.2: Cross-section Regressions (Small Sample)

Variables	Full Sample			Sample Without Philippines		
	(1)	(2)	(3)	(4)	(5)	(6)
ln(TR)	0.033891 (0.099268)	0.001058 (0.112658)	--	0.069329 (0.093478)	-0.003814 (0.139505)	--
ln(RT)	-0.076067* (0.040176)	--	-0.071765* 0.037137	-0.098845** (0.038221)	--	-0.083684** 0.040209
ln(RS1)	0.003642 (0.049029)	-0.028587 (0.054198)	0.006764 0.052903	-0.018104 (0.045976)	0.027202 (0.049122)	0.000170 0.053978
G1	--	--	0.000132 0.136906	--	--	-0.065351 0.124671
ln(RT1)	--	0.031291 (0.026043)	--	--	0.031956 (0.039861)	--
Constant	-0.610234* (0.136800)	-0.726471* (0.131689)	-0.630788* 0.193395	-0.663553* (0.129751)	-0.626529* (0.178457)	-0.651616* 0.197285
R-Squared	0.05	0.02	0.05	0.11	0.07	0.09
Adjusted R²	-0.04	-0.07	-0.05	0.13	-0.10	-0.001

** Indicates significance at 1%.

* Indicates significance at less than 10%. Standard errors are in parenthesis

As the results show, out of the three explanatory variables, only relative technology has a statistically significant impact on the relative wage. These results support the conclusions of the earlier analysis based on the panel data for a smaller number of countries that the technological improvement in skilled-intensive sector is a key determinant of the relative wage. It is, moreover, interesting to note that results from both cross-section and panel data analysis do not support Robbins' view that changes in relative supplies of skilled workers were largely responsible for changes in the relative wage.

Column 2 of the Table 5.2 reports results based on the alternative technology proxy, RTI , the foreign direct investment stock ratio. The effect of this variable is insignificant. Thus the foreign direct investment measure of the technology transfer does not explain inter-country differences in levels of the relative wage.

As discussed earlier, the proxy for trade openness based on trade dependency ratio may not fully capture the effect of trade liberalization. Thus we also tried the alternative Sachs-Warner measure of openness. Using their classification, we divide all the countries into two distinct groups. Group 1 includes all those countries that were open in 1985 and remained open till 1994. This group includes Barbados, Singapore, Thailand, Jordan, South Korea, Botswana, Bolivia and Costa Rica. Group 2 includes all the other countries. Following equation is then estimated

$$\ln \omega_i = \alpha_0 + \beta_1 \ln GI + \beta_2 \ln RT_i + \beta_3 \ln RS1_i + \varepsilon_i \quad , \quad (22)$$

where GI is a dummy variable that equals 1 if a country belongs to Group 1 and 0 otherwise. Results are reported in column 3 of Table 5.2. As the table shows, even this proxy for trade liberalization does not produce any impact on the relative wage of unskilled workers.

As Table 5.1 shows, the relative wage in Philippines is surprisingly the highest among all the sample countries. Extremely high level of relative wage (0.92) makes Philippines a clear outlier. We thus now explore the sensitivity of the result to the inclusion of Philippines. These results excluding Philippines are reported in the last 3 columns (column 4-6) of the Table 5.2. As the table shows, the exclusion of Philippines from the analysis further strengthen the results and suggest a stronger impact of the relative technology on the relative wages (This effect is significant at 1% level). However, the results on the role of relative factor supplies and trade liberalization are not affected by the exclusion of Philippines.

The above data are based on a smaller sample of countries. A number of countries had to be excluded from the analysis mainly because of the non-availability of data for relative technology indices (i.e. *RT* and *RTI*). It is possible that a larger sample might provide some support at least for the other two hypotheses (i.e. trade liberalization and relative factor supplies). Thus to expand my sample size and to include a larger number of countries into analysis, we exclude the relative technology variable from the regression equation. Exclusion of this variable allows me to estimate the equation for 45 countries. We first estimate the following equation.

$$\ln \omega_i = \alpha_i + \beta_1 \ln TR_i + \beta_2 \ln RSl_i + \varepsilon_i. \quad (23)$$

Once again we use Sachs-Warner index (i.e. *GI*) as an alternative proxy for trade liberalization. As discussed earlier, this proxy could also capture the effect of technology specifically in a regression that excludes the technology variable. If Sachs-Warner index reflects the technology effect, then the sign of its coefficient is expected to be negative.

However, if it reflects the impact of trade openness, then the sign of the coefficient would be positive. The estimated equation is

$$\ln \omega_i = \alpha_i + \beta_1 G1 + \beta_2 \ln RS1 + \varepsilon_i. \quad (24)$$

Table 5.3 reports the results for equations 23 and 24. As the table shows, both *TR* and *RSI* do not exert a significant impact on the relative wage. The effect of *G1* is also insignificant. However, the sign of this variable provides some support to the interpretation of *G1* as an indicator of technology rather than trade liberalization.

Table 5.3: Cross-section Analysis (Large Sample)

Variables	Estimation Results (Equation 23)	Estimation Results (Equation 24)
ln(TR)	0.071516 (0.097742)	--
ln(RS1)	-0.013348 (0.039651)	0.001030 (0.042031)
G1	--	-0.117031 (0.156581)
Constant	-0.644212* (0.157665)	-0.641805* (0.158419)
R-Squared	0.014072	0.014611
Adjusted R²	-0.032877	-0.032312

* Indicates significance at 1%. Standard errors are in parenthesis.

Finally, we perform sensitivity analysis to examine if results (i.e. insignificance of trade liberalization and relative factor supplies) are robust to the exclusion of the outliers. From Figures 5.1 and 5.2, we know that Singapore and Angola are the outliers in the relation between trade openness and the relative wage and Angola, Guam and South

Korea are the outliers in the relation between relative factor supplies and relative wages.

Table 5.4 (column 1) reports the regression estimates without Angola and Singapore while the regression results without Angola, Guam and Korea are reported in column 2 of the Table 5.2. As the results show, both the factor supply variable and the trade liberalization variable remain insignificant even if outliers are excluded.

Table 5.4: Cross Section Analysis (Without Outliers)

Variables	Without Angola and Singapore (1)	Without Angola, Singapore and South Korea (1)
ln(TR)	0.066142 (0.090372)	--
ln(RS1)	--	0.044668 (0.030216)
Constant	-0.622243* (0.098601)	-0.491418* (0.103412)
R-Squared	0.012896	0.048364
Adjusted R²	-0.011179	0.026233

* Indicates significance at 1%. Standard errors are in parenthesis.

CHAPTER 6

SUMMARY AND CONCLUSION

The debate about the extent to which relative wages are affected by trade liberalization, relative factor supplies and relative technology dates back to the experience of the U.S. where a marked decline in the relative wage of unskilled workers was observed during the 1980's and the 1990's. The striking feature of these changes was that it occurred during the period when the U.S. was engaged in import expansion with other developing countries. Many other developed countries were also following trade liberalization policies. Thus a similar concern with income inequality was voiced in these developed countries.

Although a number of studies provided empirical evidence to support the link between trade liberalization and changes in the relative wage of skilled and unskilled workers, their findings were based mainly on the Factor Content of Trade approach. These studies were criticized on the ground that the link between trade liberalization and changes in factor prices works through changes in product prices. If relative prices of commodities had not changed in the required direction, then the link between international trade and the relative wage could not be established. A number of studies suggested Hicks-neutral technological change, biased in favor of skilled-labor-intensive sector, as an alternative explanation for a decline in the relative wage in the U.S.

A noteworthy aspect of the debate was that most of the work focused on the North and little attention was given to the South. The main exception was Robbins, who explored the behavior of the relative wage in nine developing countries, but did not explicitly address the technology hypothesis. His study, however, examined one other explanation -- possible effects of changes in the relative supply of unskilled labor. This thesis follows Robbins in focusing on the developing countries. One contribution of the thesis is to develop a special data set that can be used to examine the behavior of the relative wage for a large number of developing countries. A second contribution is to test all three explanations of the relative wage change, using a relation derived from the theory.

Although adequate data on the relative wage index and the explanatory variables are available for developed countries, very little information is readily available for developing countries. This study attempted to utilize whatever data were available for developing countries. To construct wage indexes of skilled and unskilled workers, we used ILO data on wage rates for 159 occupations in 49 industries. Time series of reasonable length were available for only 11 developing countries. Thus the study developed two data sets. First data set is a shorter panel of 11 developing countries for which consistent time series on wage rates were available for at least four years for all the dependent and independent variables. This data set was used for panel data analysis. A serious limitation of this analysis, however, is that it is based on an unbalanced panel with a small number of countries and periods. The second data set includes all of the developing countries for which information on wage rates was available at least once

during the 1985-94 period. This data set allowed us to utilize information for a larger number of countries to undertake cross-section tests.

Both data sets were used to explore the influence of trade liberalization, relative technology and relative factor supplies on the relative wage of unskilled workers. The theoretical framework suggests that relative wages are positively related with the trade openness and relative factor supplies, and negatively related with relative technology. Empirical analysis based on both panel and cross-section data finds a significant negative link between the relative wages and the relative technology index. The analysis, however, does not find a significant role for factor supplies or trade liberalization in determining the relative wage.

The findings of this thesis are consistent with the Slaughter and Lawrence (1993) and Slaughter and Swagel (1997) results for the U.S. that the technological improvement in skilled-labor-intensive sector was a key determinant of the relative wage. Our evidence, however, does not support Robbins' view that changes in the relative wage in the developing countries largely resulted from changes in relative supply of skilled workers. An important caveat to this conclusion is that this study's proxy for relative factor supplies is based on the ratio of university to primary school enrollments and may not adequately capture relative stocks of unskilled labor. The study also did not find evidence that trade liberalization has caused relative wage to increase in the South. This finding would raise doubts about the view that trade liberalization was the key source of the change in the relative wage in the North. Thus the study does not lend support to the concern that increase in trade between developed and developing countries would lead to income inequality in the North.

APPENDICES

Table 1: List of Non-production & Production workers

Skilled Workers	Unskilled and Semi-skilled Workers			
Accountant	Aircraft Engine Mechanic	Able Seamen	Electronic Assemblers	Post Office Counter Clerk
Air Traffic Controller	Aircraft Fire Fighters	Aircraft Cabin Attendants	Electronics Fitters	Postmen
Air Transport Pilot	Airline Ground Receptionist	Aircraft Loaders	Field Crop Farm Workers	Printing Pressmen
Chemical Engineer	Automobile Mechanic	Ambulance Drivers	Firefighters	Quarrymen
Coalmining Engineer	Auxiliary Nurses	Bakers	Forestry Workers	Railway Engine Drivers
Computer Programmer	Bank Tellers	Bench Moulders	Furniture Upholsterers	Railway Engine Firemen
Dentists	Book Keeping Machine Operator	Blast Furnaces	Garment Cutters	Railway Guards
Electronics Draughtsmen	Building Electrician	Book Keepers	Grain Millers	Railway Signalmen
Flight Operations Officer	Card & Tape Punching Machine Operators	Book Binders	Hand Compositors	Railway Vehicle Loaders
General Physician	Farm Supervisor	Bricklayers	Hot Rollers	Refuse Collectors
Government Executive Officials	Foremen	Bus Conductors	Hotel Receptionists	Reinforced Concreters
Journalists	Forest Supervisor	Butchers and Packers	Inshore Maritime Fishermen	Room Attendants
Mathematics Teachers (All levels)	Insurance Agents	Cabinet Makers	Laborers	Sales Persons (general)
Petroleum and Natural Gas Engineer	Machine Assembler	Cashiers	Lasters	Sawmill Sawyers
Physiotherapists	Machine Compositor	Cement Finishers	Leather Goods Makers	Ship's Platters
Power Distribution and Transmission Engineer	Medical x-rays Technician	Clerks of Works	Loggers	Shoe Sewers
Professional Nurses	Mixing and Blending Machine Operator	Clicker Cutters	Loom Fixers & Tuners	Stenographers
Ship's Chief Engineer	Occupational Health Nurse	Cloth Weavers	Metal Melters	Stock Record Clerks
Teachers in Languages and Literature (All levels)	Paper Making Machine Operator	Construction Carpenters	Metal Working Setters	Tanners
Technical Education Teacher	Plantation Supervisor	Constructional Steel Erectors	Miners	Thread & Yarn Spinners
	Plywood Press Operator	Controlmen	Motor Bus Drivers	Ticket Sellers
	Power Generating Machine Operator	Cooks	Office Clerks	Tree Fellers & Buckers
	Railway Service Supervisor	Dairy Product Processors	Packers	Underground Helpers
	Road Transport Services Supervisor	Deep Sea Fishermen	Painters	Veneer Cutters
	Ship's Stewards	Derrickmen	Plantation Workers	Waiters
	Technicians	Dock Workers	Plasterers	Welders
	Telephone Switchboard Operators	Electric Linemen	Plumbers	Wood Grinders
				Wooden Furniture Finishers

Table 2: List of Industries for which wages are reported

Agricultural Production
Air transport
Banks
Coal Mining
Communications
Construction
Crude Petroleum & Natural Gas Production
Deep-sea and Coastal Fishing
Education services
Electric light & power
Engineering & architectural services
Forestry
Freight transports by road
Grain Mill Products
Insurance
Iron & Steel basic industries
Logging
Manufacture of Bakery Products
Manufacture of electronic equipment, machinery & supplies
Manufacture of footwear
Manufacture of industrial chemicals
Manufacture of leather and leather products (except footwear)
Manufacture of machinery (except electrical)
Manufacture of metal products (except machinery & equipment)
Manufacture of other chemicals
Manufacture of wearing apparel (except footwear)
Manufacture of wooden furniture & fixtures
Manufacturer of Dairy Products
Manufactures of pulp, paper & paperboard
Maritime transport
Medical & dental services
Other Mining & Quarrying
Passenger transports by road
Petroleum refineries
Plantation
Printing, Publishing & Allied industries
Public administration
Railway transports
Repair of motor vehicles
Restaurants & hotels
Retail trade (grocery)
Sanitary services
Sawmills, planing & other wood mills
Shipbuilding & repairing
Slaughtering, Preparing & Preserving Meat
Spinning, weaving and finishing textiles
Supporting services to air transport
Supporting services to maritime transport

Table 3: Skilled labor-intensive and unskilled labor-intensive group of industries (ISIC are in parenthesis)

Skilled Labor-intensive Industries	
Paper & Paper Products (341)	
Printing & Publishing (342)	
Industrial Chemicals (351)	
Other Chemical Products (352)	
Petroleum Refineries (353)	
Misc. Petroleum & Coal (354)	
Rubber Products (355)	
Plastic Products (356)	
Pottery China & Earthware (361)	
Glass & Glass Products (362)	
Other Non Metal Products (369)	
Iron & Steel (371)	
Non-ferrous Metal Products (372)	
Metal Products (381)	
Non-Electrical Machinery (382)	
Electrical Machinery (383)	
Transport Equipment (384)	
Professional & Scientific Products (385)	
Unskilled Labor-intensive Industries	
Food Products (311/12)	
Beverages (313)	
Tobacco Products (314)	
Textiles (321)	
Wearing Apparel (322)	
Leather & Fur Products (323)	
Footwear (324)	
Wood & Wood Products (331)	
Furniture & Fixtures (332)	
Other Manufacturing Industries (390)	

Source: International Handbook of Industrial Statistics, UNIDO.

Table 4: Relative Wage Rate, Trade Openness, Relative Factor Supply and Relative Labor Productivity in Barbados: 1985-1994.

<u>Year</u>	<u>RW</u>	<u>TR</u>	<u>RS 1</u>	<u>RS 2</u>	<u>RT</u>
1985	0.496189	0.791528	--	0.161412	--
1986	0.461489	0.654255	--	0.173171	--
1987	0.496191	0.462388	--	0.142357	--
1988	0.503627	0.488961	0.143456	0.142531	1.513713
1989	0.514266	0.509038	0.148758	0.134249	1.154420
1990	0.534226	0.530029	0.241074	0.146129	1.061578
1991	0.531173	0.537322	0.258345	0.149830	1.804800
1992	0.520227	0.435003	0.240434	0.142687	1.379280
1993	0.522614	0.434703	--	0.171990	--
1994	--	--	--	--	--

Source: Data sources discussed in section 3 of the text.

RS 1 is obtained by dividing University level enrolment with Primary school level enrolment.

RS 2 is obtained by dividing number of non-production workers with number of production labor employed in major industries.

RW is relative wage rate of unskilled-skilled workers.

RT is obtained by dividing the value added per worker of relatively skilled labor intensive industries with the value added per worker of unskilled labor intensive industries.

TR is obtained dividing the value of imports and exports by the GDP.

Table 5: Relative Wage Rate, Trade Openness, Relative Factor Supply and Relative Labor Productivity in Bangladesh: 1985-1994.

<u>Year</u>	<u>RW</u>	<u>TR</u>	<u>RS 1</u>	<u>RS 2</u>	<u>RT</u>
1986	0.447395	0.220449	0.050712	--	2.508108
1987	0.423967	0.216295	0.044689	--	1.714054
1988	0.404809	0.223955	0.038855	--	0.920000
1989	0.398937	0.239900	0.032865	0.044693	1.807466
1990	0.399399	0.237889	0.036374	0.044315	2.396647
1991	0.426539	0.218347	0.037375	0.039133	2.434494
1992	0.404770	0.242761	0.038403	0.033950	--
1993	0.429621	0.262418	0.039459	--	--
1994	0.468773	0.248565	0.040545	--	--

Source: Data sources discussed in section 3 of the text.

RS 1 is obtained by dividing University level enrolment with Primary school level enrolment.

RS 2 is obtained by dividing number of skilled occupation employment with unskilled employment.

RW is relative wage rate of unskilled-skilled workers.

RT is obtained by dividing the value added per worker of relatively skilled labor intensive industries with the value added per worker of unskilled labor intensive industries.

TR is obtained dividing the value of imports and exports by the GDP.

Table 6: Relative Wage Rate, Trade Openness, Relative Factor Supply and Relative Labor Productivity in Egypt: 1987-1994.

<u>Year</u>	<u>RW</u>	<u>TR</u>	<u>RS 1</u>	<u>RS 2</u>	<u>RT</u>
1987	0.871047	0.129809	0.124390	--	0.696856
1988	0.710104	0.123449	0.103699	--	0.534192
1989	0.695920	0.120712	0.111472	0.151443	0.561934
1990	0.695298	0.384051	0.101721	0.179846	0.535595
1991	0.611447	0.344729	--	0.174490	--
1992	0.550039	0.277763	--	0.188299	--
1993	0.673684	0.223118	--	0.213806	--
1994	0.687313	0.264921	--	0.219369	--

Source: Data sources discussed in section 3 of the text.

RS 1 is obtained by dividing University level enrolment with Primary school level enrolment.

RS 2 is obtained by dividing number of skilled occupation employment with unskilled employment.

RW is relative wage rate of unskilled-skilled workers.

RT is obtained by dividing the value added per worker of relatively skilled labor intensive industries with the value added per worker of unskilled labor intensive industries.

TR is obtained dividing the value of imports and exports by the GDP.

Table 7: Relative Wage Rate, Trade Openness, Relative Factor Supply and Relative Labor Productivity in Honduras: 1987-1994.

<u>Year</u>	<u>RW</u>	<u>TR</u>	<u>RS 1</u>	<u>RS 2</u>	<u>RT</u>
1987	0.357385	0.438719	0.044670	0.144152	1.395485
1988	0.327127	0.472292	0.049285	0.139725	1.434453
1989	0.517817	0.554597	0.051280	0.135434	1.474509
1990	0.708507	0.592253	0.049923	0.079662	1.515683
1991	0.324820	0.568189	0.048644	0.100199	1.471977
1992	0.357348	0.354868	0.046501	0.011759	1.513512
1993	0.271896	0.950942	0.046594	--	1.679248
1994	0.364361	0.570717	0.049915	--	1.707227

Source: Data sources discussed in section 3 of the text.

RS 1 is obtained by dividing University level enrolment with Primary school level enrolment.

RS 2 is obtained by dividing number of non-production workers with number of production labor employed in major industries.

RW is relative wage rate of unskilled-skilled workers.

RT is obtained by dividing the value added per worker of relatively skilled labor intensive industries with the value added per worker of unskilled labor intensive industries.

TR is obtained dividing the value of imports and exports by the GDP.

Table 8: Relative Wage Rate, Trade Openness, Relative Factor Supply and Relative Labor Productivity in Bolivia, 191987-1994

<u>Year</u>	<u>RW</u>	<u>TR</u>	<u>RS 1</u>	<u>RS 2</u>	<u>RT</u>
1987	0.436667	0.307888	0.074652	0.078920	1.359202
1988	0.261702	0.321049	0.089781	0.078865	1.501631
1989	0.287794	0.320914	0.076609	0.078889	1.658985
1990	0.240679	0.340316	0.079765	0.078862	2.178793
1991	0.331816	0.329860	0.084588	0.080195	2.872555
1992	0.455191	0.368361	0.086423	0.081550	3.405536
1993	0.274636	0.373281	0.088298	0.094122	3.116213
1994	0.351955	0.378554	0.091349	0.089591	2.498635

Source: Data sources discussed in section 3 of the text.

RS 1 is obtained by dividing University level enrolment with Primary school level enrolment.

RS 2 is obtained by dividing number of non-production workers with number of production labor employed in major industries.

RW is relative wage rate of unskilled-skilled workers.

RT is obtained by dividing the value added per worker of relatively skilled labor intensive industries with the value added per worker of unskilled labor intensive industries.

TR is obtained dividing the value of imports and exports by the GDP.

Table 9: Relative Wage Rate, Trade Openness, Relative Factor Supply and Relative Labor Productivity in Republic of Korea, 1985-1994

<u>Year</u>	<u>RW</u>	<u>TR</u>	<u>RS 1</u>	<u>RS 2</u>	<u>RT</u>
1985	0.399646	0.650400	0.299739	0.078530	1.459276
1986	0.399448	0.612511	0.315690	0.092522	1.463721
1987	0.403353	0.647946	0.324573	0.081540	1.468179
1988	0.400647	0.618711	0.326435	0.084603	1.472651
1989	0.405758	0.543349	0.333120	0.090000	1.477136
1990	0.479384	0.531732	0.347422	0.095391	1.507201
1991	0.508419	0.521384	0.370237	0.101432	1.543365
1992	0.576594	0.510603	0.407569	0.111358	1.494833
1993	0.600320	0.491801	0.484063	0.114559	1.425010
1994	0.512162	0.520950	0.535907	--	--

Source: Data sources discussed in section 3 of the text.

RS 1 is obtained by dividing University level enrolment with Primary school level enrolment.

RS 2 is obtained by dividing number of non-production workers with number of production labor employed in major industries.

RW is relative wage rate of unskilled-skilled workers.

RT is obtained by dividing the value added per worker of relatively skilled labor intensive industries with the value added per worker of unskilled labor intensive industries.

TR is obtained dividing the value of imports and exports by the GDP.

Table 10: Relative Wage Rate, Trade Openness, Relative Factor Supply and Relative Labor Productivity in El Salvador, 1989-1994

<u>Year</u>	<u>RW</u>	<u>TR</u>	<u>RS 1</u>	<u>RS 2</u>	<u>RT</u>
1989	0.522965	0.415280	0.079531	0.130057	--
1990	0.574034	0.334543	0.077558	0.113479	--
1991	0.528771	0.344426	0.083872	0.101584	--
1992	0.407941	0.333612	0.087534	0.115928	--
1993	0.411080	0.349407	0.092727	--	--
1994	0.414274	0.352787	0.100345	--	--

Source: Data sources discussed in section 3 of the text.

RS 1 is obtained by dividing University level enrolment with Primary school level enrolment.

RS 2 is obtained by dividing number of non-production workers with number of production labor employed in major industries.

RW is relative wage rate of unskilled-skilled workers.

RT is obtained by dividing the value added per worker of relatively skilled labor intensive industries with the value added per worker of unskilled labor intensive industries.

TR is obtained dividing the value of imports and exports by the GDP.

Table 11: Relative Wage Rate, Trade Openness, Relative Factor Supply and Relative Labor Productivity in Singapore, 1985-1994

<u>Year</u>	<u>RW</u>	<u>TR</u>	<u>RS 1</u>	<u>RS 2</u>	<u>RT</u>
1985	0.345765	2.807613	0.143541	0.192620	2.381340
1986	0.447723	2.767378	0.158243	0.203830	2.387174
1987	0.459694	3.081860	0.174493	0.208100	2.393021
1988	0.458563	3.483710	0.188934	0.226800	2.398883
1989	0.442867	3.330853	0.203872	0.243700	2.410508
1990	0.481047	3.286329	0.215840	0.254500	1.964730
1991	0.404257	3.138505	0.229501	0.163900	2.002994
1992	0.327467	2.947441	0.258835	0.187800	1.967531
1993	0.327826	2.891302	0.288675	--	2.054612
1994	0.346008	2.803876	0.304024	--	--

Source: Data sources discussed in section 3 of the text.

RS 1 is obtained by dividing University level enrolment with Primary school level enrolment.

RS 2 is obtained by dividing number of non-production workers with number of production labor employed in major industries.

RW is relative wage rate of unskilled-skilled workers.

RT is obtained by dividing the value added per worker of relatively skilled labor intensive industries with the value added per worker of unskilled labor intensive industries.

TR is obtained dividing the value of imports and exports by the GDP.

Table 12: Relative Wage Rate, Trade Openness, Relative Factor Supply and Relative Labor Productivity in Venezuela, 1985-1992

<u>Year</u>	<u>RW</u>	<u>TR</u>	<u>RS 1</u>	<u>RS 2</u>	<u>RT</u>
1985	0.335340	0.398764	0.125163	0.175442	1.809190
1986	0.362423	0.359810	0.120589	0.185182	1.845347
1987	0.360111	0.279036	0.159749	0.186441	1.882226
1988	0.403394	0.427075	0.132438	0.188938	1.919842
1989	0.360999	0.365108	0.136619	0.194500	2.204038
1990	0.343165	0.465317	0.135711	0.199121	2.529008
1991	0.404023	0.551410	0.131450	0.196815	1.883880
1992	0.728222	0.551150	0.134985	0.195041	1.877945

Source: Data sources discussed in section 3 of the text.

RS 1 is obtained by dividing University level enrolment with Primary school level enrolment.

RS 2 is obtained by dividing number of non-production workers with number of production labor employed in major industries.

RW is relative wage rate of unskilled-skilled workers.

RT is obtained by dividing the value added per worker of relatively skilled labor intensive industries with the value added per worker of unskilled labor intensive industries.

TR is obtained dividing the value of imports and exports by the GDP.

Table 13: Relative Wage Rate, Trade Openness, Relative Factor Supply and Relative Labor Productivity in India, 1987-1994.

<u>Year</u>	<u>RW</u>	<u>TR</u>	<u>RS 1</u>	<u>RS 2</u>	<u>RT</u>
1987	0.199691	0.129528	0.047268	--	2.162856
1988	0.278783	0.144975	0.047305	--	2.064868
1989	0.412827	0.128162	0.048706	--	1.966880
1990	0.299241	0.140688	0.049950	--	2.306759
1991	0.305863	0.148873	0.049613	--	2.127428
1992	0.308525	0.156192	0.048683	--	2.195722
1993	0.355004	0.167820	0.048259	--	2.127860
1994	0.371884	0.164802	0.048743	--	--

Source: Data sources discussed in section 3 of the text.

RS 1 is obtained by dividing University level enrolment with Primary school level enrolment.

RS 2 is obtained by dividing number of non-production workers with number of production labor employed in major industries.

RW is relative wage rate of unskilled-skilled workers.

RT is obtained by dividing the value added per worker of relatively skilled labor intensive industries with the value added per worker of unskilled labor intensive industries.

TR is obtained dividing the value of imports and exports by the GDP.

Table 14: Relative Wage Rate, Trade Openness, Relative Factor Supplies and Relative Labor Productivity in Thailand, 1985-1994.

<u>Year</u>	<u>RW</u>	<u>TR</u>	<u>RS 1</u>	<u>RS 2</u>	<u>RT</u>
1985	0.447738	0.421157	0.143620	--	--
1986	0.453514	0.418359	0.133454	--	1.546737
1987	0.459364	0.486138	0.124787	--	2.392986
1988	0.465290	0.523513	0.140848	--	3.239234
1989	0.471292	0.630413	0.146536	--	3.630197
1990	0.477372	0.659505	0.144185	--	1.645456
1991	0.482314	0.675862	0.153100	--	3.695255
1992	0.413879	0.655855	0.171080	--	3.825310
1993	0.345444	0.666520	0.199760	--	3.959942
1994	0.466946	0.676520	0.214396	--	--

Source: Data sources discussed in section 3 of the text.

RS 1 is obtained by dividing University level enrolment with Primary school level enrolment.

RS 2 is obtained by dividing number of non-production workers with number of production labor employed in major industries.

RW is relative wage rate of unskilled-skilled workers.

RT is obtained by dividing the value added per worker of relatively skilled labor intensive industries with the value added per worker of unskilled labor intensive industries.

TR is obtained dividing the value of imports and exports by the GDP.

Table 15: Relative Wage Rate, Trade openness, Relative Factor Supplies and Relative Labor Productivity in Uruguay, 1985-1992.

<u>Year</u>	<u>RW</u>	<u>TR</u>	<u>RS 1</u>	<u>RS 2</u>	<u>RT</u>
1985	0.335340	0.332062	0.166943	--	1.723667
1986	0.314516	0.334187	0.170287	0.151167	1.898283
1987	0.301087	0.318008	0.173501	0.153919	2.072898
1988	0.280833	0.338257	0.177454	0.166807	1.721750
1989	0.311296	0.364692	0.198131	0.158615	1.577280
1990	0.294279	0.364692	0.206723	0.187748	1.750466
1991	0.348713	0.320277	0.216145	0.171859	1.539755
1992	0.635023	0.318281	0.201843	0.175572	1.482148

Source: Data sources discussed in section 3 of the text.

RS 1 is obtained by dividing University level enrolment with Primary school level enrolment.

RS 2 is obtained by dividing number of non-production workers with number of production labor employed in major industries.

RW is relative wage rate of unskilled-skilled workers.

RT is obtained by dividing the value added per worker of relatively skilled labor intensive industries with the value added per worker of unskilled labor intensive industries.

TR is obtained dividing the value of imports and exports by the GDP.

Table 16: Economic Indicators in Barbados

Year	Imports (Million US\$)	Exports (Million US\$)	GDP (Million US\$)	Primary level Enrollment (Nos.)	University Level Enrollment (Nos.)
1985	607	346	1204	N/A	N/A
1986	587	274	1316	N/A	N/A
1987	515	155	1449	N/A	N/A
1988	579	174	1540	29584	4244
1989	678	198	1715	28516	4242
1990	700	209	1743	27589	6651
1991	700	207	1688	26662	6888
1992	553	133	1577	26003	6252
1993	574	135	1631	N/A	N/A
1994	608	139	1727	N/A	N/A

Source: Data on value of imports and exports is obtained from Direction of Trade Statistics, Yearbook (various issues). Data on GDP is obtained from World Bank's World Tables. Data on University/College and Primary level enrollments is obtained from UNESCO publication, Statistical Yearbook (various issues).

Table 17: Economic Indicators in Uruguay

Year	Imports (Million US\$)	Exports (Million US\$)	GDP (Million US\$)	Primary level Enrollment (Nos.)	University Level Enrollment (Nos.)
1985	708	859	4719	356002	59432
1986	870	1088	5859	354883	60432
1987	1142	1189	7330	354177	61450**
1988	1177	1388	7583	351984	62461**
1989	1197	1613	7993	350415	69428
1990	1317	1730	8355	346416	71612
1991	1552	1588	9804	340789	73660
1992	2010	1620	11405	338020	68227
1993	2344	1678	13144	338204	N/A
1994	2785	1914	16199	337889	N/A

** Excludes college.

Source: Data on value of imports and exports is obtained from Direction of Trade Statistics, Yearbook (various issues). Data on GDP is obtained from World Bank's World Tables. Data on University/College and Primary level enrollments is obtained from UNESCO publication, Statistical Yearbook (various issues).

Table 18: Economic Indicators in South Korea

Year	Imports (Million US\$)	Exports (Million US\$)	GDP (Million US\$)	Primary level Enrollment (Nos.)	University Level Enrollment (Nos.)
1985	31058	30289	94322	4856752	1455759
1986	31734	34792	108612	4798323	1514784
1987	41025	47301	136317	4771722	1548772
1988	51433	61178	182009	4819857	1573369
1989	60210	60496	222152	4894261	1630374
1990	69858	65027	253671	4868520	1691429
1991	81508	71870	294175	4758505	1761775
1992	80602	76632	307938	4560128	1858568
1993	80967	81736	330831	4336252	2099021
1994	102348	96040	380820	4099395	2196895

Source: Data on value of imports and exports is obtained from Direction of Trade Statistics, Yearbook (various issues). Data on GDP is obtained from World Bank's World Tables. Data on University/College and Primary level enrollments is obtained from UNESCO publication, Statistical Yearbook (various issues).

Table 19: Economic Indicators in Bolivia

Year	Imports (Million US\$)	Exports (Million US\$)	GDP (Million US\$)	Primary level Enrollment (Nos.)	University Level Enrollment (Nos.)
1985	683	673	2973	1189685	88175*
1986	667	640	3883	1204534	92598
1987	757	570	4310	1299664	97022*
1988	776	644	4423	1187355	106602
1989	620	827	4509	1225843	93911*
1990	700	923	4487	1278775	102001*
1991	994	652	4990	1294538	109503*
1992	1137	798	5253	1310837**	113287**
1993	1205	804	5382	1327341**	117201**
1994	1207	1123	6155	1344053**	121251**

*University and equivalent institutions only.

**Values have been obtained using annual growth rates.

Source: Data on value of imports and exports is obtained from Direction of Trade Statistics, Yearbook (various issues). Data on GDP is obtained from World Bank's World Tables. Data on University/College and Primary level enrollments is obtained from UNESCO publication, Statistical Yearbook (various issues).

Table 20: Economic Indicators in Thailand

Year	Imports (Million US\$)	Exports (Million US\$)	GDP (Million US\$)	Primary level Enrollment (Nos.)	University Level Enrollment (Nos.)
1985	9260	7123	38900	7150489	1026952
1986	9166	8864	43097	7160494	955594
1987	13003	11564	50535	7086116	884237
1988	16292	15992	61668	6518540	918124
1989	25373	20175	72251	6496758	952012*
1990	33408	23072	85640	6956717	1003052*
1991	37925	28811	98742	6906935	1056829*
1992	40686	32472	111546	6758091	1156174*
1993	46065	37158	124862	6098103	1218160*
1994	54716	46044	N/A	5986446	1283469*

* Values have been obtained using growth rates.

Source: Data on value of imports and exports is obtained from Direction of Trade Statistics, Yearbook (various issues). Data on GDP is obtained from World Bank's World Tables. Data on University/College and Primary level enrollments is obtained from UNESCO publication, Statistical Yearbook (various issues).

Table 21: Economic Indicators in Singapore

Year	Imports (Million US\$)	Exports (Million US\$)	GDP (Million US\$)	Primary level Enrollment (Nos.)	University Level Enrollment (Nos.)
1985	26237	22812	17470	278060	39913
1986	25513	22501	17350	268820	42539
1987	32626	28703	19900	261603	45648
1988	43869	39322	23880	259270	48985
1989	49694	44769	28360	257833	52565
1990	60954	52753	34600	257932	55672
1991	66271	59219	39984	260286	59741
1992	72181	63475	46025	257909*	66756
1993	85393	74071	55153	255554*	73772
1994	102287	96376	70853	253220*	76985

* Values have been obtained using annual growth rates.

Source: Data on value of imports and exports is obtained from Direction of Trade Statistics, Yearbook (various issues). Data on GDP is obtained from World Bank's World Tables. Data on University/College and Primary level enrollments is obtained from UNESCO publication, Statistical Yearbook (various issues).

Table 22: Economic Indicators in Honduras

Year	Imports (Million US\$)	Exports (Million US\$)	GDP (Million US\$)	Primary level Enrollment (Nos.)	University Level Enrollment (Nos.)
1985	827	787	3640	765809	36620
1986	818	906	3809	810412	37003
1987	848	974	4153	836862	37386
1988	926	949	3970	863313	42548
1989	1057	873	3480	874596	44848
1990	910	833	2943	886027	44233
1991	903	801	2999	908446	44190
1992	668	513	3328	949399	44148
1993	1807	1372	3343	990352	46144
1994	1325	614	3415	1008181	50323

Source: Data on value of imports and exports is obtained from Direction of Trade Statistics, Yearbook (various issues). Data on GDP is obtained from World Bank's World Tables. Data on University/College and Primary level enrollments is obtained from UNESCO publication, Statistical Yearbook (various issues).

Table 23: Economic Indicators in Bangladesh

Year	Imports (Million US\$)	Exports (Million US\$)	GDP (Million US\$)	Primary level Enrollment (Nos.)	University Level Enrollment (Nos.)
1985	2526	999	15651	8920293	457862
1986	2550	889	15600	9115554	462265
1987	2730	1077	17601	9206710	411442
1988	2989	1291	19111	11075476	430335
1989	3618	1305	20521	11285445	370900
1990	3656	1672	22397	11939949*	434309
1991	3421	1687	23394	12613591*	471433*
1992	3731	2037	23760	13325240*	511732*
1993	4015	2277	23977	14077040*	555474*
1994	4584	2650	29103	14871256*	602956*

* Values have been obtained using annual growth rates.

Source: Data on value of imports and exports is obtained from Direction of Trade Statistics, Yearbook (various issues). Data on GDP is obtained from World Bank's World Tables. Data on University/College and Primary level enrollments is obtained from UNESCO publication, Statistical Yearbook (various issues).

Table 24: Economic Indicators in Venezuela

Year	Imports (Million US\$)	Exports (Million US\$)	GDP (Million US\$)	Primary level Enrollment (Nos.)	University Level Enrollment (Nos.)
1985	8107	14189	61966	3539890	443064
1986	8475	8412	60519	3663128	441734
1987	9669	10843	48029	2925663	467371
1988	11624	10365	60226	3777575	500295
1989	7694	12571	43551	3871040	528857
1990	6783	20015	48599	4052947	550030
1991	11205	18249	53441	4190047	550783
1992	13765	15830	60423	4222035	569913
1993	12556	16016	59995	4217283	N/A
1994	9213	18342	58128	N/A	N/A

Source: Data on value of imports and exports is obtained from Direction of Trade Statistics, Yearbook (various issues). Data on GDP is obtained from World Bank's World Tables. Data on University/College and Primary level enrollments is obtained from UNESCO publication, Statistical Yearbook (various issues).

Table 25: Economic Indicators in India

Year	Imports (Million US\$)	Exports (Million US\$)	GDP (Million US\$)	Primary level Enrollment (Nos.)	University Level Enrollment (Nos.)
1985	17502	10179	214308	87440514	4470844
1986	18421	10489	229061	89993046	4806179
1987	20439	12841	256933	90459726	4275859
1988	24310	15324	273384	95739976	4528956
1989	19297	15839	274153	97318114	4739965
1990	23990	17813	297133	99118320	4950974
1991	19509	17872	251093	101577089	5039589*
1992	23227	18498	267139	105370216	5129791*
1993	21699	20258	250966	108200539	5221606*
1994	25477	24195	301404	109043663	5315065*

* Values have been obtained using annual growth rates.

Source: Data on value of imports and exports is obtained from Direction of Trade Statistics, Yearbook (various issues). Data on GDP is obtained from World Bank's World Tables. Data on University/College and Primary level enrollments is obtained from UNESCO publication, Statistical Yearbook (various issues).

Table 26: Economic Indicators in El Salvador

Year	Imports (Million US\$)	Exports (Million US\$)	GDP (Million US\$)	Primary level Enrollment (Nos.)	University Level Enrollment (Nos.)
1985	961	679	4060	N/A	70499
1986	912	735	4161	N/A	74024
1987	1091	621	4433	995890	75572
1988	1257	689	4686	1029341	77120
1989	1161	498	4959	1016181	80818
1990	1277	586	5409	1008426	78211
1991	1407	588	5980	1000671	83928
1992	1699	598	6574	1028877	90062
1993	1953	737	7625	1042256	96645
1994	2574	1249	8090	1064279*	106795

* Value has been obtained using annual growth rate.

Source: Data on value of imports and exports is obtained from Direction of Trade Statistics, Yearbook (various issues). Data on GDP is obtained from World Bank's World Tables. Data on University/College and Primary level enrollments is obtained from UNESCO publication, Statistical Yearbook (various issues).

Table 27: Economic Indicators in Egypt

Year	Imports (Million US\$)	Exports (Million US\$)	GDP (Million US\$)	Primary level Enrollment (Nos.)	University Level Enrollment (Nos.)
1985	9841	1838	52311	6214250	854584
1986	8680	2214	58314	6613503	878323
1987	7596	2037	74209	7034617	875033
1988	8657	2120	87299	7343716	761539
1989	7434	2565	82829	6578126	733279
1990	16783	4957	56607	6964306	708417
1991	8310	3790	35100	6541725	N/A
1992	8325	3063	40999	6791128	N/A
1993	8214	2252	46908	7732308	N/A
1994	10218	3475	51687	7313038	N/A

Source: Data on value of imports and exports is obtained from Direction of Trade Statistics, Yearbook (various issues). Data on GDP is obtained from World Bank's World Tables. Data on University/College and Primary level enrollments is obtained from UNESCO publication, Statistical Yearbook (various issues).

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