JOURNAL OF ECONOMIC DEVELOPMENT 109
Volume 29, Number 1, June 2004

FTAA, OUTPUT ADJUSTMENTS, AND INCOME REDISTRIBUTION IN A SMALL OPEN ECONOMY: THE CASE OF PERU

HUGO TOLEDO

American University of Sharjah

The Free Trade Agreement of the Americas (FTAA) expected to become effective by 2005 will advance South, North, and Central American free trade. As member countries adjust to free trade, various sectors of each economy will adjust differently. This paper uses the Specific Factors (SF) model of production and trade to estimate comparative statics elasticities of changing prices on factor prices and output for Peru under a free trade scenario. The model predicts that output changes and income redistribution in Peru resulting from the emerging FTAA are substantial.

Keywords: FTAA, Income Redistribution, Peru
JEL classification: F10, F13

1. INTRODUCTION

The well documented long term benefits of free trade in terms of increased global efficiency and domestic income continues to be clouded by concerns about income redistribution, topic that constantly dominate the political debate in developing countries. As different sectors of the economy experience increased import competition and lower prices, while others higher export demand and rising prices, some productive factors stand to lose real income with free trade. This paper uses the Specific Factors (SF) model of production and trade to examine the potential impact of the Free Trade Agreement of the Americas (FTAA) on Peru's output and wages, at least prior to retraining and long run economic growth.

The political debate about the FTAA is likely to continue in the agenda of Andean countries[1] as they prepare their economies to face increased competition from more developed and efficient economies. As a small open economy like Peru reorganizes its production pattern to face international prices, income is redistributed among factors of

[1] The Community of Andean Countries (CAN) is composed by Bolivia, Colombia, Ecuador, Peru, and Venezuela.

production, generally away from expensive and scarce factors relative to trading partners.

The current economic situation in Peru is critical despite the 4.1% expansion in economic activity in 2001 relative to 2000. El Niño still threatens the recovery of the mining and agricultural sectors and according to the US National Oceanic and Atmospheric Administration (2001), Peru could face destructive rainfalls and floods similar to that of 1998 when more than 250,000 people were left homeless, harvests were ruined, and 5% of the total road surface equivalent to about 3,000 kilometers were lost. Growth in 2001 was due mainly to the strong recovery of the mining and construction sectors, however, unfavorable climate conditions affected the performance of the fishing and agricultural industries lowering manufacturing output by 10.9% in 2001 relative to 2000.

The banking industry in Peru is also in trouble despite the restructuring of about 500 million dollars of private debt, 20% of which is in agriculture. Defaults have continued, adding more pressure on the government to rescue the banking sector. In the meantime, conservative lending practices are affecting the level of economic activity in the country.

Output adjustments and income redistribution due to FTAA are simulated for Peru using the SF model of production and trade. The SF model of production and trade is a general equilibrium model of production in which each sector employs one specific factor and shares common factors with every other sector. Using micro data provided by the National Institute of Statistics and Information of Peru and the International Labor Organization for the year 2000, I examine the comparative statics of a general equilibrium model of production in four sectors of the Peruvian economy: agriculture, mining, manufacturing, and services. The model assumes constant elasticity of substitution and constant returns to scale production functions, full employment of all factors of production, and perfect labor mobility across sectors. There is perfect competition in the output markets with cost equal to price. The paper derives the effects of projected price changes on factor prices and output, and discusses implications for economic policy.

Simulation in the present study is based on observed factors shares and industry shares that can be derived directly from the data provided by the National Institute of Statistics and Information of Peru. The critical question is how Peru would adjust to liberalization and how different sectors of the economy may be affected. Computable General equilibrium (CGE) models can address the issue of output adjustment and income redistribution caused by changing prices with free trade. The model has skilled labor, unskilled labor, and capital for each sector. Skilled and unskilled labor are factors shared in the four sectors. Capital is specific in the sense that capital used in one sector cannot be used in another. Thompson (1996) examined the effects of NAFTA in a SF model of Alabama, and Thompson and Toledo (2001) analyzed the effects of a potential merger between the Andean Market and MERCOSUR in a SF model for Bolivia.

2. FACTOR SHARES AND INDUSTRY SHARES IN PERU

Table 1 provides the total payment matrix in domestic currency for each of the six factors of production:

S skilled labor
U unskilled Labor
K_j capital in each sector
  A agriculture
  M mining
  F manufacturing
  V services

One of the most important pieces of information in the data is the total payment to each productive factor in each of the four sectors. Treating the wage of skilled and unskilled labor as the average wage in the four industries separates payment to skilled and unskilled labor. Capital payments are derived as residuals of sector value added after labor payments. The foundation of the model is the total payment matrix to each productive factor in each of the four sectors.

Table 1. Factor Payment Matrix (In Millions of Current New Soles)

	A (Agriculture)	M (Mining)	F (Manufacturing)	V (Services)	Total
S	1,203	1,112	6,775	8,625	17,715
U	5,395	3,795	6,050	3,142	18,382
K	7,906	5,025	15,057	15,790	43,778
Total	14,504	9,932	82,862	27,557	

Source: Elaborated based on Statistical Information from the National Institute of Statistics of Peru, 2002.

Table 2 presents shares of each factor in the revenue of each sector. Summing down a column in Table 1 gives total sector revenue. For instance, the total revenue of agriculture in Peru is 14,504 millions New Soles and the share of skilled labor is 1,203/14,504 = 0.083 = 8.3%. Assuming equal skilled wages across sectors, 8.3% of skilled workers will be in agriculture. Similarly, the share of unskilled workers in Peru is 5,395/14,504 = 0.372 = 37.2%. Assuming equal unskilled wages across sectors, 37.2% of unskilled workers will be in agriculture. The implicit share of each type of capital is 1 in its sector and 0 in all other sectors. Agricultural land is implicit in that capital residual. The SF model implies an implicit zero share for each type of capital in every sector except its own.

Table 2. Factor Shares, θ_{ij}

	A	M	F	V
S	0.083	0.112	0.243	0.313
U	0.372	0.382	0.217	0.114
K_A	0.545	0	0	0
K_M	0	0.506	0	0
K_F	0	0	0.540	0
K_V	0	0	0	0.573

Industry shares for labor are presented in Table 3. Summing across a row in Table 1 gives total factor income. Assuming perfect labor mobility across sectors, the wage of each type of labor would be the same across sectors. The resulting industry shares are the portions of each factor employed in each sector. For instance, the total income of skilled labor is 17,715 millions New Soles, and 1,203/17,715 = 0.068 = 6.8% of this total income is earned in agriculture.

Table 3. Industry Shares, λ_{ij}

	A	M	F	V
S	0.068	0.063	0.382	0.487
U	0.293	0.206	0.329	0.171
K_A	1	0	0	0
K_M	0	1	0	0
K_F	0	0	1	0
K_V	0	0	0	1

Factor intensities are in Table 4. Agriculture uses skilled labor the least intensively relative to both unskilled labor and capital. The services sector uses skilled labor the most intensively relative to other inputs. The service sector also uses unskilled labor the least intensively. Agriculture and mining are closed to each other in skilled and unskilled labor intensities, both sectors rely heavily on unskilled labor. Capital intensities refer to each specific capital.

Table 4. Factor Intensities

	S/K_j	U/K_j	S/U
Agriculture	0.152	0.682	0.223
Mining	0.221	0.752	0.293
Manufacturing	0.450	0.401	1.118
Services	0.546	0.199	2.745

3. A SPECIFIC FACTOR MODEL OF PRODUCTION FOR PERU

Substitution elasticities describe the change in the cost minimizing input of one factor given a change in the price of another, as developed by Jones (1965) and Takayama (1982).

Following Allen (1938), the cross-price elasticity between the input of factor *i* and the payment to factor *k* is sector *j* can be written

$$E_{ij}^{k} = \hat{a}_{ij} \big/ \hat{w}_{k} = \theta_{kj} S_{ij}^{k} \tag{1}$$

where ^ represents and percentage change in a variable, and S_{ij}^{k} is the Allen partial elasticity of substitution from the production function. With Cobb-Douglas production functions, the partial elasticities of substitution must equal one: $S_{ij}^{k} = 1$. Homogeneity means that $\sum_{k} E_{ij}^{k} = 0$, and the own price elasticity E_{ij}^{i} is found as the negative of the sum of the cross-price elasticities. Since the cross price elasticity is a weighted Allen elasticity, with Cobb-Douglas production functions it follows that the cross price elasticity is equal to the factor share.

The aggregate substitution elasticities for the economy are the weighted average of the cross-price elasticities for each sector. In other words, elasticities are summed across industries to arrive at the aggregate substitution elasticities, as described by Thompson (1994):

$$\sigma_{ik} \equiv \hat{a}_{i} \big/ \hat{w}_{k} = \sum_{j} \lambda_{ij} E_{ij}^{k} = \sum_{j} \lambda_{ij} \theta_{kj} S_{ij}^{k} \ . \tag{2}$$

Factor shares and industry shares can be used to derive the aggregate elasticities of substitution for each Cobb-Douglas production function in Table 5. Constant elasticity of substitution (CES) production would scale the elasticities in Table 5.

Table 5. Cobb-Douglas Substitution Elasticities, σ_{ik}

	$\hat{w}_S$	$\hat{w}_U$	$\hat{w}_A$	$\hat{w}_M$	$\hat{w}_F$	$\hat{w}_V$
$\hat{a}_S$	-0.736	0.182	0.037	0.032	0.207	0.219
$\hat{a}_U$	0.181	-0.721	0.160	0.104	0.178	0.098
$\hat{a}_A$	0.083	0.372	-0.455	0	0	0
$\hat{a}_M$	0.112	0.382	0	-0.494	0	0
$\hat{a}_F$	0.243	0.217	0	0	-0.460	0
$\hat{a}_V$	0.313	0.114	0	0	0	-0.427

With CES of 0.5, for instance, elasticities would be half as large as in Table 5. With CES of 2, they would be twice as large. The largest own substitution elasticity occurs for unskilled labor and the smallest for capital in services as shown in Table 5. Every 1% increase in the unskilled wages causes 0.736% decrease in the unit input of unskilled labor. Every 1% increase in the price of services capital decreases its unit input by 0.43%. Own labor substitution elasticities are larger than own capital elasticities. All three factors, skilled and unskilled labor, and capital are relatively inelastic inputs.

Competitive pricing and full employment are stated

$$\sum_j a_{kj} x_j = v_k , \qquad (3)$$

$k = S, U, K_A, K_M\, KF, KV$

$$\sum_i a_{im} w_i = p_m , \qquad (4)$$

$m = A, M, F, V,$

where a_{ij} is the cost minimizing input of factor i in sector j, x_j is the output of good j, v_k is the endowment of factor k, w_i is the price of factor i, and p_m is the price of good m. As developed in the literature, for instance, Takayama (1982), fully differentiating (3) and (4) leads to

$$\sum_i \sigma_{ki} \hat{w}_i + \lambda_{kj} \hat{x}_j = \hat{v}_k , \qquad (5)$$

$k = S, U, KA, KM, KF, KV$

$$\sum_i \theta_{im} \hat{w}_i = \hat{p}_m , \qquad (6)$$

$m = A, M, F, V,$

Equations (6) is simplified by the cost minimization assumption and the ten Equations in (5) and (6) can be put into matrix form as

$$\begin{bmatrix} \sigma & \lambda \\ \theta' & 0 \end{bmatrix} \begin{bmatrix} \hat{w} \\ \hat{x} \end{bmatrix} = \begin{bmatrix} \hat{v} \\ \hat{p} \end{bmatrix} \qquad (7)$$

where σ is the 6 x 6 matrix of elasticities of substitution, λ is the 6 x 4 matrix of industry shares, and θ' is 4 x 6 the matrix of factor shares. Note that endowments are held constant. The ^ represents percentage changes. Vectors of factor prices, output, factor endowments, and prices are represented by w, x, v, and p.

The 10 x 10 matrix in (7) relates exogenous percentage changes in factor endowments and prices to endogenous percentage change in factor prices and output. Output and factor prices adjust to maintain the full employment and competitive pricing conditions in the comparative statics of the general equilibrium model. The model will show the general equilibrium effects of changing prices on factor prices and output.

The model's comparative static elasticities $\hat{w}/\hat{p}$ and $\hat{x}/\hat{p}$ are found by inverting (7). For reference, the inverse of 7 is given by 8:

$$\begin{bmatrix} \hat{w} \\ \\ \hat{x} \end{bmatrix} = \begin{bmatrix} M & N \\ \\ Q & R \end{bmatrix} \begin{bmatrix} \hat{v} \\ \\ \hat{p} \end{bmatrix} \tag{8}$$

$$\begin{bmatrix} M & N \\ \\ Q & R \end{bmatrix} = \begin{bmatrix} \hat{w}/\hat{v} & \hat{w}/\hat{p} \\ \\ \hat{x}/\hat{v} & \hat{x}/\hat{p} \end{bmatrix}$$

Matrix *M* describes how factor prices are affected by changing endowments with prices constant. Matrix *Q* captures the effects of changing endowments on outputs, known as the Rybczynski result. Matrix *N* describes how changing prices affect factor prices, the traditional Stolper-Samuelson result. Matrix *R* describes a local surface of production possibilities. Each output should be positively related with its own price, and some other outputs must decline with unchanged factor endowments. Since endowments are held constant, this paper is concerned with matrix *N* and matrix *R*.

4. COMPARATIVE STATIC ELASTICITIES IN THE PERUVIAN MODEL

Table 6 shows elasticities of factor prices with respect to prices of goods in the general equilibrium comparative statics. As an example, a 10% decrease in agricultural prices would have no effect on skilled wages while unskilled wages would fall by 3.5%. Payment to capital in agriculture would fall by 15.9%, a significant impact for capital owners. The lower price of agricultural products would decrease agricultural output and released unskilled labor. Movements of labor to other sectors would cause the return to capital in those sectors to rise. Agriculture uses skilled labor the least intensively and the no effect on skilled wages with lower agricultural prices can be understood as a relative increase in the demand of skilled labor with declining agricultural output. In this particular case, the relative increase in the demand for skilled labor is enough to offset potential loses in skilled wages due to lower agricultural prices.

A 10% increase in the price of minerals would raise the wages of skilled labor by 0.2% and wages of unskilled labor by 2.6% while the capital return in mining rises by 17.7%. Capital owners, and to a lesser degree skilled labor, benefit with a higher price in the mining industry.

Table 6. Elasticities of Factor Prices with Respect to Prices, $\hat{w}/\hat{p}$

	$\hat{p}_A$	$\hat{p}_M$	$\hat{p}_F$	$\hat{p}_V$
$\hat{w}_S$	0.000	0.023	0.412	0.566
$\hat{w}_U$	0.354	0.262	0.311	0.073
$\hat{w}_A$	1.593	-0.180	-0.280	-0.136
$\hat{w}_M$	-0.267	1.773	-0.330	-0.180
$\hat{w}_F$	-0.142	-0.120	1.542	-0.284
$\hat{w}_V$	-0.071	-0.060	-0.290	1.416

A higher price in a sector increases its capital return but lowers the return in other sectors. While some factors benefit and others lose with any price change, the benefits are uneven. Price changes affect the returns to specific capital more than shared labor.

Thompson and Toledo (2000) proved that the comparative static effects of price changes on factor prices are the same for al CES production functions. Comparative statics elasticities in Table 6 extend to all CES production functions regardless of the degree of substitution. The degree of substitution, if it is constant along the isoquants, does not affect the general equilibrium elasticities of prices on factor prices in competitive models of production.

Table 7. Elasticities of Outputs with Respect to Prices, $\hat{x}/\hat{p}$

	$\hat{p}_A$	$\hat{p}_M$	$\hat{p}_F$	$\hat{p}_V$
$\hat{x}_A$	0.593	-0.180	-0.280	-0.136
$\hat{x}_M$	-0.267	0.773	-0.330	-0.180
$\hat{x}_F$	-0.142	-0.120	0.542	-0.284
$\hat{x}_V$	-0.071	-0.060	-0.290	0.422

Table 7 shows the price elasticities of outputs along the production frontier. A higher price raises output in a sector, drawing labor away from other sectors and lowering other outputs. For example, the largest own output effect occurs in minerals, where a 10% price increase would raise output by 7.7%, however all the effects are inelastic and the smaller effect occurs in services where a 10% increase in price raise output by only 4.2%.

5. PROJECTED PRICE CHANGES AND ADJUSTMENTS FOR PERU

The overall pattern of trade in Peru as in many developing countries is the export of primary commodities and import of manufactures. Major import categories as a percentage of total imports are consumer goods, both durables and non-durables (21.8%), intermediate goods for agriculture and industry (50.1%), and capital goods for construction, agriculture, industry and transportation equipment (26.6%). Major exports categories as a percentage of total exports are traditional products including minerals, agriculture and fishing (66.7%) and non-traditional products such as textiles, metal products, and livestock (30.7%). Peruvian exports are heavily skewed towards primary commodities, which leave the country exposed to instability in world prices. The domestic economy will be affected with some industries winning while others losing with FTAA. Investors need to make additional investments to face FTAA but the lack of public security have both prevented and slowed down additional investment making adjustment to free trade more difficult.

In a study conducted by Bolivia's National Council of Economic Policy (1998), expected price changes as a result of the FTAA were estimated for countries of the Andean region. Expected price changes for Peru are used in the present study. Predictions include higher prices for mining and manufacturing due to an increased export demand. Prices of minerals are expected to increase by as much as 4% and manufacturing by 30%. Import competition will lower prices in agriculture and services. Agricultural prices are expected to fall by as much as 12% and services prices as much as 20%. These price projections are based on comparisons of similar products in surrounding countries. A sensitivity analysis is conducted with various price changes.

The effect of changing prices on the Peruvian economy depends on the relative magnitudes of factor shares and industry shares, and input substitution as output adjusts. The results expected are gains for sectors that will experience high export prices due to an increase in export demand. On the other hand, sectors that will experience increased competition are expected to be losers due to lower prices.

The vector of projected price changes is multiplied by the matrix of factor price elasticities in Table 6 to find the vector of price adjustments in Table 8. This is presented by Equation (9).

$$\left[N_{6x4}\right]\begin{bmatrix}\hat{p}_A\\ \hat{p}_M\\ \hat{p}_F\\ \hat{p}_V\end{bmatrix}=\begin{bmatrix}\hat{w}_S\\ \hat{w}_U\\ \hat{w}_A\\ \hat{w}_M\\ \hat{w}_F\\ \hat{w}_V\end{bmatrix} \quad (9)$$

where N represents the Stolper-Samuelson elasticities and the $\hat{p}$ the vector of projected price changes.

The vector of factor price adjustments is presented in Table 8. Skilled wages are projected to fall by 1.1% and unskilled wages by 4.7% due mainly to the falling prices in services and agriculture. Other losers in Peru due to the FTAA would be capital in services and agriculture with returns declining by 36.48% and 25.4% respectively. The FTAA will benefit return to capital in mining increasing by 4.1% while in manufacturing by 53.2%. The impact of the FTAA on the return to capital in manufacturing is very significant.

Similarly, the effects of the FTAA on outputs are also in Table 8, and are found by multiplying the output elasticities of Table 6 by the projected vector of price changes as in Equation (10).

$$\left[R_{4x4}\right]\begin{bmatrix}\hat{p}_A\\ \hat{p}_M\\ \hat{p}_F\\ \hat{p}_V\end{bmatrix}=\begin{bmatrix}\hat{x}_A\\ \hat{x}_M\\ \hat{x}_F\\ \hat{x}_V\end{bmatrix} \quad (10)$$

where R represents production possibilities elasticities from (8).

Agricultural output is expected to fall by 13.4% and services sector output by 16.4%. Mining output is predicted to rise by 0.1% while output in manufacturing by 23.2%.

Projected output adjustments are large. The model projects revenue in services will fall by 36.4% due to lower prices and falling output. The service sector represents about 15% of Peru's GDP. The agricultural sector represents about 8% of Peru's GDP and revenue in the agricultural sector is expected to fall by 25.4% due to lower prices and falling output. The model projections indicate that firms in the agricultural and services sectors will find it difficult to survive. Joint ventures among domestic agricultural and services firms with more efficient foreign companies could become a life saving alternative for some Peruvian companies.

Table 8. Simulating Trade Liberalization with Cobb-Douglas Production

Predicted % Δ in Price with Trade Liberalization	Effects on Factor Prices	Output Adjustments
$\hat{p}_A$ = -12.0 %	$\hat{w}_S$ = -1.1 %	$\hat{x}_A$ = -13.4 %
$\hat{p}_M$ = 4.0 %	$\hat{w}_U$ = -4.7 %	$\hat{x}_M$ = 0.1 %
$\hat{p}_F$ = 30.0 %	$\hat{w}_A$ = -25.4 %	$\hat{x}_F$ = 23.2 %
$\hat{p}_V$ = -20.0 %	$\hat{w}_M$ = 4.1 %	$\hat{x}_V$ = -16.4 %
	$\hat{w}_F$ = 53.2 %	
	$\hat{w}_V$ = -36.4 %	

To gain additional insight into the sensitivity, more conservative price changes are used in Table 9. The resulting decrease in skilled and unskilled wages is about one half lower than the ones in Table 8. Effects on capital returns are about the same for mining but differ substantially for agriculture, manufacturing, and services with returns declining about one half as much.

Table 9. Simulating Trade Liberalization with Cobb-Douglas Production and Smaller Projected Price Changes

Projected Price Changes	Factor Price Adjustments	Output Adjustments
$\hat{p}_A$ = -6.0 %	$\hat{w}_S$ = -0.6 %	$\hat{x}_A$ = -7.1 %
$\hat{p}_M$ = 4.0 %	$\hat{w}_U$ = - 2.9 %	$\hat{x}_M$ = 1.6 %
$\hat{p}_F$ = 15.0 %	$\hat{w}_A$ = -13.1 %	$\hat{x}_F$ = 11.4 %
$\hat{p}_V$ = -10.0 %	$\hat{w}_M$ = 5.6 %	$\hat{x}_V$ = -8.4 %
	$\hat{w}_F$ = 26.4 %	
	$\hat{w}_V$ = -18.4 %	

Table 10. Simulating Trade Liberalization with CES Production

Projected	Factor	Output Adjustments	
Price Changes	Price Adjustments	CES = 0.5	CES = 2
$\hat{p}_A$ = -12.0 %	$\hat{w}_S$ = -1.1 %	$\hat{x}_A$ = -6.7 %	$\hat{x}_A$ = -26.8 %
$\hat{p}_A$ = 4.0 %	$\hat{w}_U$ = -4.7 %	$\hat{x}_M$ = 0.1 %	$\hat{x}_M$ = 0.2 %
$\hat{p}_A$ = 30.0 %	$\hat{w}_A$ = -25.4 %	$\hat{x}_F$ = 11.6 %	$\hat{x}_F$ = 46.3 %
$\hat{p}_A$ = -20.0 %	$\hat{w}_M$ = 4.1 %	$\hat{x}_V$ = -8.2 %	$\hat{x}_V$ = -32.9 %
	$\hat{w}_F$ = 53.2 %		
	$\hat{w}_V$ = -36.4 %		

Table 10 shows factor price and output adjustments with CES production. Projected price changes from Table 8 are used under two different assumptions: when CES = 0.5 and CES = 2. Factor price adjustments remain large. Output adjustments are larger with the higher degree of substitution.

6. CONCLUSION

Neoclassical international trade theory emphasizes the gains in welfare with free trade. In factor proportions trade theory, gains are broken down into factoral income redistribution.

This article uses the SF model to project the magnitude of output changes and income redistribution for skilled labor, unskilled labor, and capital in four sectors of the Peruvian economy due to the emerging FTAA.

The model used in this paper offers preliminary results consistent with quantitative analysis in the literature. Attanasio, Goldberg, and Pavnik (2002) investigate the effects of the Colombian tariff reductions of the 1980s and 1990s on wages and find that higher wages for skilled workers with college education was driven by technological change but that technological change was driven by lower tariffs and increased foreign competition. These results are consistent with the present factor price adjustments due to higher mineral and manufacturing prices with free trade. Attanasio, Goldberg and Pavnik also look at wages in the industrial sector and find that wages decreased more in sectors that experienced larger tariff cuts, consistent with our results as larger tariff cuts imply lower output prices. The main implication of the SF model is that when the relative price of an output changes, markets for inputs adjust as the economy moves along its Production Possibilities Frontier toward a new production pattern. An increase in the price of goods in one industry tends to increase the return to capital in that sector and decrease the return to capital in all other sectors. The reason is that shared skilled and unskilled labor move into this industry in response to higher wages, creating a shortage of labor in other sectors of the economy. With less labor available in other sectors of the economy, production and return to capital fall.

Peruvian agriculture and services are projected to suffer falling prices with FTAA, while minerals and manufacturing are projected to enjoy higher prices. Resulting output adjustments in the SF model are quite large, ranging from an average decrease of about 16% in services to an average increase of 23% in manufacturing.

Projected factor price adjustments are smaller than output adjustments but still significant. Skilled wages are expected to fall by 1.1% while unskilled wages by 4.7%, situation that may deteriorate even further the poor social condition of unskilled workers in Peru. The return to capital in manufacturing and mining is projected to increased by 26.4% and 5.6% while the return to capital in the agriculture and services sectors is projected to fall by 13.1% and 18.4% respectively.

Increased investment in a competitive and more efficient Peruvian economy could result in higher income in the long run for every factor of production. The benefits of free trade from increased competition and efficiency have been extensively documented in the literature, results in the present model are by no means intended to avoid free trade, rather, they should be used to recognize that various sectors and factors of production in the Peruvian economy will lose with FTAA at least prior to retraining and long run economic growth. At present, the greatest threat of FTAA to the Peruvian economy lies on its impact in the agricultural and services sector. The rate of default of agricultural loans is high in Peru and with projected lower prices and falling output in agriculture the situation could worsen affecting the financial sector. The financial sector, which itself is facing lower output and lower return to capital would find difficult to survive without massive government aid.

With falling output and income in agriculture, it is possible to see urban unemployment in Peru increasing in the short run as internal migration from rural areas to the cities is an expected possibility. Lost of income for agricultural workers would provide some motivation for joining guerrilla groups, thus it is important for the government to design policies to anticipate the effects of income redistribution in Peru and to deal with them in a timely fashion. Investment incentives for agricultural and services firms could be provided to acquire new technology and retrain workers. The generation of alternative incomes for farmers, developing markets for agricultural products, and eliminating the excessive regulation in the banking sector as to allow Peruvian banks to merge with more efficient foreign banks could become one of the most important challenges for the actual President Alejandro Toledo, but at the same time, it may ease the political struggle to establish the FTAA.

REFERENCES

Allen, R.G.D. (1938), *Mathematical Analysis for Economist*, MacMillan.

Attanasio, O., P. Goldberg, and N. Pavnik (2002), "Trade Reforms and Wage Inequality in Colombia," Prepared for the 2002 IMF Conference on Macroeconomic Policies and Poverty Reduction, Washington, DC.

International Labor Organization (2001), *Yearbook of Labor Statistics*, Geneva: Author.

International Monetary Fund (2003), *Peru; Statistical Appendix*, Country Report No. 03/73, Washington, DC.

Jones, R.W. (1965), "The Structure of Simple General Equilibrium Models," *The Journal of Political Economy*, 557-572.

National Council of Economic Policy (1998), *Analysis of Economic Policy*, La Paz, Bolivia: Author.

National Institute of Statistics and Information of Peru (2002), Various Publications, Lima, Peru: Author.

Takayama, A. (1982), "On Theorems of General Competitive Equilibrium of Production and Trade - A Survey of Some Recent Developments in the Theory of International

Trade," *Keio Economic Studies*, 1-37.
Thompson, H. (1994), "An Investigation into the Quantitative Properties of the Specific Factors Model of International Trade," *Japan and the World Economy*, 375-388.
_____ (1996), "NAFTA and Industrial Adjustment: A Specific-Factors Model of Production," *Growth and Change*, 3-28.
Thompson, H., and H. Toledo (2000), "A Note on General Equilibrium Price Elasticities with CES Production," mimeo, Auburn University.
______ (2001), "Bolivia with South American Free Trade," *The International Trade Journal*, 113-126.
United States Oceanic and Atmospheric Administration (2001), *El Niño Impacts*, http//www.noaa.gov

Mailing Address: Department of Economics, American University of Sharjah, P.O. Box 26666, College of Arts and Sciences, Sharjah, United Arab Emirates. Tel: 971-6-515-2524, Fax: 558-5066. E-mail: htoledo@aus.ac.ae

Manuscript received April, 2003; final revision received April, 2004.