

TRADE LIBERALIZATION, MINIMUM WAGES  
AND EMPLOYMENT IN THE SHORT RUN:  
SOME REFLECTIONS BASED ON THE CHILEAN EXPERIENCE

By

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## I. Introduction

The role of trade policies in the development strategies of LDC's has been extensively discussed in recent years. In particular, the effects of trade liberalization attempts on development have been the subject of great interest.<sup>1/</sup> Most theoretical analyses of trade liberalization processes have dealt with the long-run effects, assuming perfect factor mobility and full factor price flexibility. However, in the short run most developing economies are characterized both by imperfect mobility of at least one factor of production and by some type of factor price rigidities.<sup>2/</sup> In this paper the short-run employment effect of a trade liberalization process in a less developed country is investigated. It is shown that when it is assumed both that capital is immobile between sectors in the short run and that there is an economy-wide minimum wage, a trade liberalization process could result, in the short run, in unemployment. It is also shown that neither the assumption of specific capital or minimum wages by themselves generate unemployment as a consequence of the trade liberalization process. It is the combination of these two assumptions that can result in short-run involuntary unemployment.<sup>3/</sup>

The recent Chilean experience is then used to empirically illustrate the importance of this short-run unemployment effect of a trade liberalization process under the presence of minimum wages. During 1975-1979 the Chilean economy underwent a dramatic trade liberalization experience, with tariffs being reduced from an average rate of over 60% to an average uniform rate of 10%. During this period an economy-wide minimum wage, expressed in real terms, was in effect, and the level of unemployment reached considerably high levels.<sup>4/</sup>

The Chilean trade liberalization process was implemented at the same time as a dramatic stabilization program -- that eventually reduced inflation from more than 500% in 1974 to 33% in 1979 -- was in effect. Additionally, this period was characterized by an important deterioration of Chile's terms of trade, stemming both from a reduction of the price of copper and from increases in the prices of Chile's imports (see Table 3). Presumably, all these events negatively affected the level of employment, and it is difficult to exactly attribute a certain fraction of unemployment to a particular event. For this reason, the figures discussed in this paper should only be considered as an effort to illustrate how the combination of tariff reductions and minimum wages could have contributed to Chile's unemployment problem during the late 1970's.

The plan of the paper is as follows: In Section 2, the effect of a trade liberalization process on employment is briefly analyzed under alternative assumptions with respect to capital mobility between sectors and wage rate flexibility. Using a 2x2 trade model, it is shown that under the assumptions of sector-specific capital and an economy-wide minimum wage, a trade liberalization process could result in short-run unemployment. Section 3 briefly reviews the recent Chilean trade reform. The discussion in this section indicates that the combination of tariff reductions and the economy-wide minimum wage could have produced a maximum short-run unemployment effect of 2.1% to 4.0%, depending on how the short-run is defined. Even though these figures are rough approximations, they do serve the purpose of illustrating the fact that the short-run unemployment's effect of a trade liberalization process, in a minimum-wage economy, is not negligible. Finally, in Section 4, some concluding remarks are presented.

## 2. Trade Liberalization, Minimum Wages and Employment in the Short-Run

In this section, the effect of a trade liberalization process on employment is briefly analyzed, under alternative assumptions regarding wage-rate flexibility and capital mobility between sectors. The analysis is performed for the case of a less developed country (i.e., a country whose exports are labor intensive). It is first shown that if there is a minimum wage and capital is freely mobile between sectors, a tariff reduction process will have no negative effects on the level of employment. It is also shown that if capital is sector-specific in the short-run, but wages are fully flexible, the trade liberalization process will not affect total employment. Finally, it is demonstrated that the combination of sector-specific capital and an economy-wide minimum wage may result in short-run unemployment as a consequence of a tariff reduction policy.<sup>5/</sup>

### 2.1 Perfect Factors Mobility and Minimum Wage

Consider a less developed country that produces an exportable good X and an importable good Y using two factors of production: capital (K) and labor (L). Assume that both production functions are concave and homogeneous of degree one and that the production of the exportable good (X) is labor intensive while the importable good (Y) is capital intensive. Both factors of production are assumed to be perfectly mobile between sectors, even though they are internationally immobile. Assume further that the country faces given world prices, and that initially there is a tariff on the import of Y equal to  $t$  and that there is an economy-wide minimum wage expressed in real terms. Let the price of the exportable good be the numeraire, and assume that the minimum wage is expressed in terms of this good. Initially, the internal price of Y in terms of X is equal to  $p^0 = p^*(1+t)$ , where  $p^*$  is the world relative price.

Assume now that a trade liberalization process takes place, and that the tariff is eliminated. The new relative price of imports in terms of exports will be  $p^* < p^0$ . According to the Stolper-Samuelson theorem, if both factors of production are mobile between sectors, and there is no initial specialization in production, the wage rate will tend to increase in terms of both final goods.<sup>6/</sup> This means that, under perfect capital mobility between sectors, the minimum wage will not be binding in a tariff reduction process in an LDC.<sup>7/</sup> The effect of this tariff reform can be illustrated using Brecher's (1974) diagram of the transformation-curve in a minimum-wage open economy (Figure 1). Assuming, in order to simplify the exposition, that the initial equilibrium is given by A, it may then be seen that after the tariff reduction, equilibrium will move to B on the concave segment of the production possibility curve.<sup>8/</sup> Thus, labor and capital have merely been relocated from Y to X, and the tariff reduction process has had no negative effect on the level of employment of this economy.<sup>9/</sup>

## 2.2 Specific Capital and Wage Flexibility

Assume now that in the short-run the capital stock is locked into its sector of origin. In this case our small economy can be described by equations (1) through (7), where, as before, the price of the exportable good is the numeraire:<sup>10/</sup>

$$W = p Y_L \quad (1)$$

$$W = X_L \quad (2)$$

$$r_x = X_K \quad (3)$$

$$r_y = p Y_K \quad (4)$$

$$L_x + L_y = \bar{L} \quad (5)$$

$$K_x = \bar{K}_x \quad (6)$$

$$K_y = \bar{K}_y \quad (7)$$

where  $W$  is the wage rate;  $r_x$  and  $r_y$  are the rental rates of capital in the exportable and importable sectors, respectively;  $X_L$  and  $Y_L$  are the marginal productivities of labor in the exportable and importable sectors;  $L_x$  and  $L_y$  are the amount of labor employed in each sector; and  $\bar{K}_y$  and  $\bar{K}_x$  are the stocks of capital locked in each sector. Equations (1), (2) and (5) describe the equilibrium in the labor market, while equations (3), (4), (6) and (7) refer to the equilibrium conditions in both capital markets. Equations (3), (4), (6) and (7) specify the assumption that capital is specific in the short run.

If it is assumed that wages are flexible, from (1), (2) and (3) it can be found that

$$dW = \frac{Y_L X_{LL}}{X_{LL} + pY_{LL}} dp > 0 \quad (8)$$

According to (8), a reduction of the import tariff ( $dp < 0$ ) will result, in the short run, in a reduction of the wage rate in terms of the exportable good. It is also possible to show that the wage rate will increase in terms of the other good (Y). Expressing (8) in percentage terms:

$$\frac{dW}{W} = \left( \frac{X_{LL}}{X_{LL} + p Y_{LL}} \right) \left( \frac{dp}{p} \right) \quad (9)$$

and since  $(X_{LL}/(X_{LL} + p Y_{LL})) < 1$ , it follows from (9) that the reduction in the wage rate will be smaller than that of the price of the importable good.

Equations (8) and (9) summarize the well-known result that, under specific capital, the Stolper-Samuelson theorem does not hold in the short run (see Mayer, 1974, and Mussa, 1974). From (8) it is clear that, contrary to the case of perfect factor mobility, if capital is sector-specific, a tariff reduction process in a minimum wage LDC will result in short-run unemployment.

### 2.3 Specific Capital and Minimum Wage

Assume now that there is both an economy-wide minimum wage, and that in the short run capital is sector specific. The minimum wage restriction can be written as:

$$W = pY_L = X_L \geq W \min \quad (10)$$

We know from (8) that if  $p$  is reduced due to a trade liberalization process, there will be a tendency for  $W$  to decrease. However, according to the minimum wage constraint (10) this cannot be the case. Thus, the only way to maintain the cost minimization condition (1) in the  $Y$  industry is to lay-off enough workers in this industry so that the increase in  $Y_L$  compensates for the reduction in  $p$ . In this case, it is easy to show that the elimination of the tariff will generate unemployment in the  $Y$  industry equal to:

$$dL = dL_y = \left[ \frac{Y_L}{pY_{LL}} \right] p^* t \quad (11)$$

This effect of a tariff reduction on employment, under sector-specific capital and an economy-wide minimum wage, can be illustrated using Figure 1, which summarizes the labor market equilibrium.<sup>11/</sup> In this figure, distance  $O_x O_y$  represents the initial labor force, and  $W_{\min}$  is the minimum wage. Prior to the trade liberalization process,  $O_x L_o$  persons were employed in the exportable sector, and  $O_y L_o$  persons were employed in the importable sector.

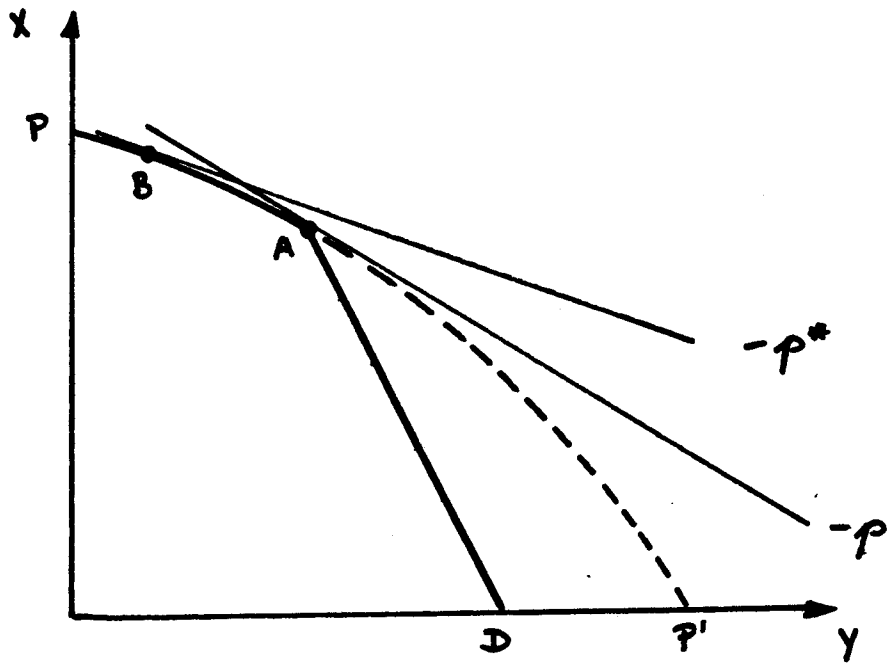


Figure 1

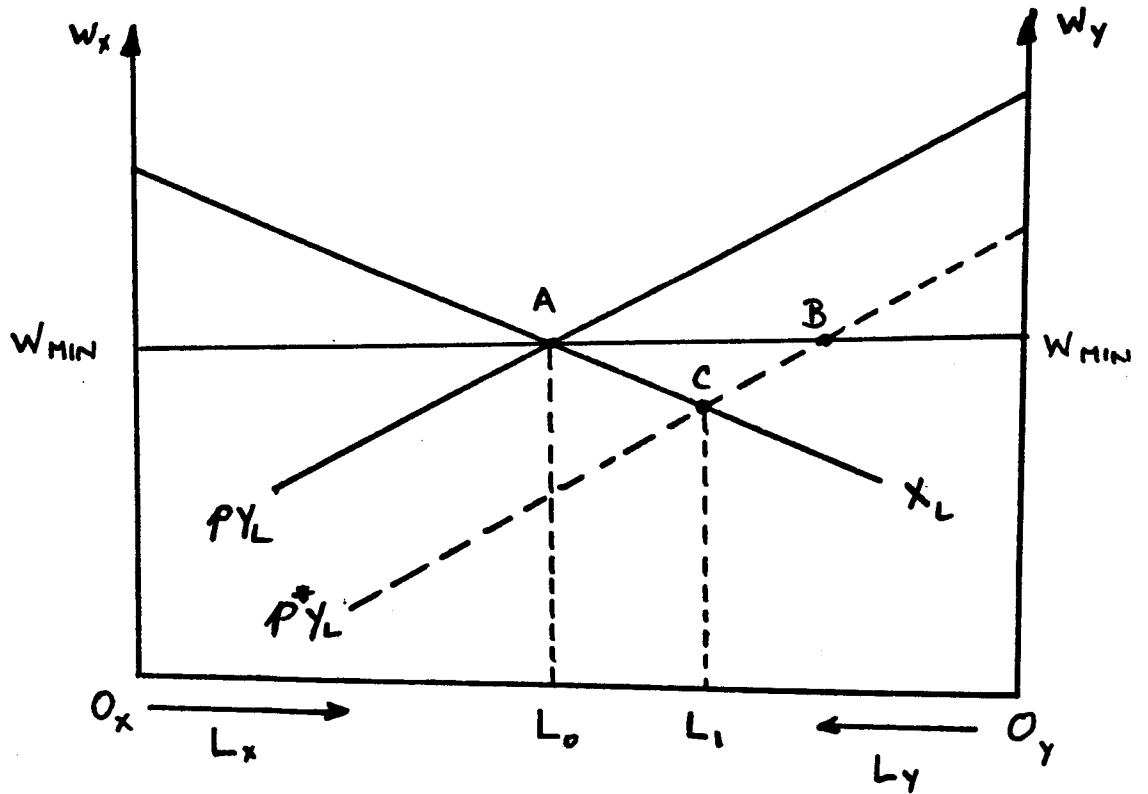


Figure 2



After the tariff removal, the demand for labor by the import sector becomes  $P^* Y_L$ . As may be seen, due to the minimum wage constraint, the wage rate will not be affected and unemployment equal to  $L_0 L_1$  will be generated.

The above results were obtained assuming that the minimum wage was expressed in terms of the exportable good X. However, if the minimum wage is expressed in terms of the importable good Y, a tariff reduction will have no effect on the total level of employment, even if there is sector specific capital. The reason for this is that, as shown in (9), a tariff reduction will generate a larger decline in the price of importables than in the wage rate W and, thus, the wage rate will increase in terms of Y, and this particular minimum wage will not be violated. In reality, however, minimum wages are not exclusively expressed in terms of the exportable or importable goods, but rather in terms of a price index that includes both types of goods. A more realistic assumption is that the minimum wage restriction can be represented by:

$$\frac{W}{PI} \geq W_{\min} \quad (9')$$

where PI is a price index equal to:

$$PI = P_y^\sigma P_x^{(1-\sigma)} \quad (12)$$

where  $P_y$  and  $P_x$  are the nominal prices of imports and exports respectively, and  $\sigma$  is the share of imports in the price index. It is then easy to show that the smaller is  $\sigma$ , the higher the probability that a trade liberalization process will result in short-run unemployment. In particular, it can be shown that if

$$\sigma < \frac{P_x X_{LL}}{P_x X_{LL} + P_y Y_{LL}}$$

a tariff reduction ( $dP_y < 0$ ) will result in unemployment. However, the resulting unemployment due to the tariff reduction will be smaller than in the case where

$\sigma=0$ . In this case ( $0 < \sigma < P_x X_{LL} / (P_x X_{LL} + P_y Y_{LL})$ ) the elimination of the tariff (i.e.,  $dP_y = -tp^*$ ) will generate unemployment equal to:

$$dL = \frac{(\pi - \sigma) Y_L (P_x X_{LL} + P_y Y_{LL}) p^* t}{P_x P_y Y_{LL} X_{LL}} \quad (13)$$

where  $\pi = P_x X_{LL} / (P_x X_{LL} + P_y Y_{LL})$ . It is easy to verify that if  $\sigma=0$  equation (13) reduces to (11).

The preceding discussion suggests that under the presence of minimum wages and specific capital, the probability that a trade liberalization process generates short-run unemployment will be higher in those countries that export "wage goods". In these countries the weight of exports in the price index will tend to be high and, thus,  $\sigma$  will be quite low.

### 3. Trade Liberalization and Employment in Chile

In this section the importance of the possible short-run unemployment effect of tariff reductions in a minimum wage economy is empirically illustrated. For this purpose, the recent Chilean trade liberalization is discussed in the light of the model presented in Section 2. During 1975-1979, Chile went through a trade liberalization process that greatly reduced the level and dispersion of the protective structure. In Table 1, the average tariffs for 1975-1979 for the Chilean import sectors are presented. During this period an economy-wide minimum wage was in effect, and the level of unemployment was considerably high (see Table 2). In this section an attempt is made to compute the "contribution" of the trade liberalization process to Chile's unemployment problem of the late 1970's. This is not an easy task, since at the same time the trade liberalization was being implemented, other events -- that presumably had a negative effect on the employment level -- were taking place. Among these events, it is especially worth mentioning the stabilization program, the reduction of the size of the public sector, and the dramatic deterioration of the terms of trade (see Table 3).<sup>12/</sup> For this reason, the figures discussed in this section should only be considered as a preliminary effort to understand the possible importance of the short-run unemployment effect of a tariff reduction process in a minimum-wage LDC.

According to the discussion presented in the preceding section, the reason why, following a tariff reduction, unemployment might arise in a minimum wage economy, is that since the wage rate cannot be reduced (by law), the physical marginal product of labor has to increase in order to compensate for the reduction of the domestic price of the importable good. This fact is captured by equation (11) in Section 2. Extending the model presented in that section to the case of  $j$  importable sectors, the change in the level of employment in the  $i$ -th sector is given by:<sup>13/</sup>

Table 1  
 AVERAGE NOMINAL TARIFFS  
 OF IMPORTABLE SECTORS IN CHILE  
 1975-1979  
 (Percent)

Sector	1975	1976	1977	1978	1979
Agriculture and Fishery	n.a.	n.a.	n.a.	n.a.	10%
Food Products, Beverages, Tobacco, Textiles and Leather Products	74%	42%	22%	14%	10%
Timber Products, Furniture, and Paper Products	68%	40%	22%	14%	10%
Non-Metallic Mineral Products	62%	35%	22%	14%	10%
Basic Metallic Industries	38%	30%	22%	14%	10%
Chemicals and Products Derived from Oil, Coal and Rubber	58%	41%	22%	14%	10%
Metallic and Metallurgical Industries <sup>a/</sup>	73%	48%	22%	14%	10%

Sources:  
 Pollack (1980)

<sup>a/</sup> Excludes the transportation Vehicles Sector.

Table 2

WAGES, EMPLOYMENT AND UNEMPLOYMENT  
IN CHILE: 1973-1979  
(Yearly Averages)

Year	(1) Index of Real Minimum Wage <sup>a/</sup> (1975=100.00)	(2) Index of Real Wages and Salaries <sup>a/</sup> (1975=100)	(3) Labor Force (000)	(4) Employment (000)	(5) Unem- ployment (000)	(6) Unem- ployment Rate (%)
1973	121.27	89.58	3,324	3,170	154	4.6
1974	88.73	93.29	3,410	3,081	329	9.7
1975	100.00	100.00	3,409	2,858	551	16.2
1976	105.78	101.46	3,518	2,930	588	16.7
1977	115.76	122.81	3,624	3,145	479	13.2
1978	131.08	130.55	3,757	3,231	526	13.2
1979	120.01	133.53	3,830	3,301	529	13.8

SOURCES:

Column (1) is equal to the nominal minimum wage, obtained from Indicadores Economicos 1960-1980, Banco Central de Chile (p. 88), deflated by the GDP deflator. Column (2) is equal to the Nominal Index of Wages and Salaries, obtained from Indicadores Economicos 1960-1980, Banco Central de Chile (p. 81), deflated by the GDP deflator. Columns (3) through (6) are taken from Edwards (1980).

<sup>a/</sup> The GDP deflator has been used to calculate real wages since there is a strong presumption that the Chilean CPI contains serious flaws during 1973-1979. See Harberger (1982).

Table 3

## SOME MACROECONOMIC INDICATORS FOR CHILE: 1973-1979

(1)	(2)	(3)	(4)	(5)	(6)	(7)
PERCENT INCREASE IN GDP (%)	PERCENT INCREASE IN OFFICIAL CPI (AVERAGE) (%)	PERCENT INCREASE IN WPI (AVERAGE) (%)	PERCENT INCREASE IN GDP DEFLATOR (%)	PERCENT INCREASE IN M2 (DECEMBER TO DECEMBER) (%)	FISCAL DEFICIT ÷ GDP (%)	TERMS OF TRADE (1970=100)
1973	-1.1%	511.4%	427.0%	473.0%	23.6%	81.0
1974	4.2%	1,029.0%	652.0%	338.0%	10.3%	66.0
1975	-14.3%	482.0%	328.0%	257.0%	3.1%	42.0
1976	3.8%	221.1%	252.0%	166.0%	2.7%	43.0
1977	9.7%	86.0%	103.0%	130.0%	2.3%	50.0
1978	8.3%	42.9%	56.0%	91.0%	1.2%	n.a.
1979	8.2%	49.4%	45.0%	68.0%	-2.3%	n.a.

## Sources:

Columns (1) through (3): Indicadores Economicos 1960-1980, Banco Central de Chile (pages 13 and 73).  
 Columns (4) and (5): Harberger (1982, page 7). Column (6): Indicadores Economicos 1960-1980, Banco Central de Chile (page 36). Column (7): World Bank, World Tables, 1980.

$$dL_i = - \frac{Y_{Li}}{P_i Y_{LiLi}} dp_i \quad (11')$$

Further, if it is assumed that the production function in each sector is Cobb-Douglas, and that all the change in the physical marginal product of labor has to come from a reduction of the number of people employed in sector  $i$ , (11') can be written as

$$dL_i = \frac{L_i}{(1+t_i^o)} [t_i^N - t_i^o] \quad (14)$$

where  $L_i$  represents the initial number of people employed in sector  $i$ ,  $t_i^o$  is the average tariff in sector  $i$  previous to the liberalization process, and  $t_i^N$  is the post-liberalization tariff for sector  $i$ .

In order to compute the approximate effect of the liberalization process (and minimum wages) on Chile's unemployment, equation (14) was applied to six importable sectors for the Chilean economy;  $t_i^o$  was considered as the average tariff prevailing in 1975.<sup>14/</sup> However, the selection of a  $t_i^N$  is not trivial since, as has been emphasized, we want to capture the short-run effect (when capital is immobile) of a tariff reduction. For this reason, alternative values of  $t_i^N$ , corresponding to the average tariffs prevailing in 1976, 1977, 1978 and 1979, were considered. Table 4 presents the results obtained when  $t_i^N$  was set equal to the average tariff prevailing in 1977. As may be seen, according to these results, the short-run unemployment effects of the tariff reduction process were approximately equal to 129.000 people, or 3.5% of the 1977 labor force. It is important to notice that this figure represents an upper-bound of the unemployment effect of tariff reductions between 1975 and 1977. The reason for this is that this figure has been obtained using equation (14), which assumes that the minimum wage is set in terms of the exportable good. However, if, as previously discussed, the minimum wage is set in terms

Table 4

**ESTIMATED SHORT-RUN UNEMPLOYMENT EFFECT  
OF TRADE LIBERALIZATION PROCESS IN CHILE**

Sector	(1) Employment in 1975 (000)	(2) Average Tariff 1975 (%)	(3) Average Tariff 1979 (%)	(4) Estimated Short-Run Employment Effect of Tariff Reduction (000)
Food, Beverages, Tobacco, Textiles and Leather Products	191	74%	22%	-57
Timber Products, Furniture, and Paper Products	56	68%	22%	-15
Non-Metallic Mineral Products	54	62%	22%	-13
Basic Metallic Industries	24	38%	22%	- 3
Chemicals and Products Derived from Oil, Coal and Rubber	39	58%	22%	- 9
Metallic and <sup>a/</sup> Metallurgical Industries	109	73%	22%	-32

**Sources:**

Column (1) computed from Pollack (1980) and Instituto Nacional de Estadísticas. Column (2) computed from Pollack (1980). Column (3) taken from Pollack (1980). Column (4) computed from columns (1), (2) and (3), according to equation (14).

<sup>a/</sup> Excludes the Transportation Vehicles Sector.



of a price index, the unemployment effect would be reduced.

If, on the other hand, the short-run is confined to 1975-1976, the unemployment effect would have had an upper bound of 75.000 people or 2.1% of the 1976 labor force. If, however, period 1975-1978 is considered, this unemployment upper bound would be equal to 152.000 people or 4.0% of the labor force. Even though these figures are only rough approximations, they serve the purpose of illustrating the fact that in LDC's with an economy-wide minimum wage, a trade liberalization process could result in non-negligible short-run unemployment. Additionally, these results suggest that, in the case of Chile, the combination of tariff reductions and minimum wages can explain, at the most, less than one-third of the unemployment of the late 1970's.<sup>15/</sup>

#### 4. Concluding Remarks

This paper has discussed the possible short-run unemployment effects of a trade liberalization process in an LDC with an economy-wide minimum wage. In Section 2, it was shown that if it is assumed that capital is sector-specific in the short run and that there is an economy-wide minimum wage, a tariff reduction process may result in unemployment. In Section 3, the relevance of this short-run unemployment effect was empirically illustrated by briefly discussing the recent Chilean experience. It was shown that in a middle-income, minimum-wage economy, a substantial tariff reduction could result in a short-run unemployment effect as high as 4% of the labor force.

These results have a number of policy implications. On one hand, it is clear that the elimination of minimum wage laws would not only help the adjustment process following a tariff reduction, but would have a number of beneficial effects of its own. On the other hand, if, for political reasons, the minimum wage could not be reduced, it would be advisable to reduce tariffs by stages. If it is assumed that capital moves slowly between sectors, it is possible to compute the magnitude of a tariff reduction per period that would not generate unemployment. Furthermore, in order to minimize the transition cost, a staged tariff reduction process could be implemented on the basis of a pre-announced tariff reduction schedule.

Finally, it is important to stress that even though this paper has analyzed the possible short-run unemployment effects of a trade liberalization, the results by no means suggest that tariffs should be maintained at high levels in LDC's. Quite on the contrary, the analysis has been developed under the implicit assumption that, as the empirical evidence has shown, export promotion development strategies are preferable to import substitution strategies.<sup>16/</sup> The main implication of this analysis, then, is that in the presence of an economy-wide minimum wage, a trade liberalization should be carried out in pre-announced stages.

FOOTNOTES

- 1/ See, for example, Bhagwati (1978), Bhagwati and Srinivasan (1979), Findlay (1979), Krueger (1978, 1980).
- 2/ In a large number of LDC's, minimum wages have been in effect for a long period of time. See, for example, PREALC (1980) and ILO (1981).
- 3/ On the effect of factor price rigidities in traditional trade models, see, for example, Bhagwati (1968), Johnson (1965), Lefeber (1971), Brecher (1974a, 1974b), Leamer (1980), and Hillman (1981). On models with short-run specific capital, see Jones (1971), Mayer (1974), Mussa (1974) and Neary (1978). In their recent review article, Bhagwati and Srinivasan (1979) indicated that the notion of adjustment cost stemming from short-run specific capital was too narrow, and that these adjustment costs were more likely to reflect sticky real wages (page 23). Indeed, this paper demonstrates that, as Bhagwati and Srinivasan (1979) suggest, it is the combination of these two effects that generates unemployment.
- 4/ On the recent performance of the Chilean economy, see Harberger (1982). On the Chilean unemployment problem, see Cox (1981) and Edwards (1980). On the Chilean trade liberalization experience, see Sjaastad and Cortes-Douglass (1981).
- 5/ This unemployment effect could only result in the short-run. In the long-run, however, the trade liberalization process in an LDC would result in higher wages and/or higher levels of employment. For a simulation analysis of the possible long-run employment effect of the Chilean tariff reform, see Coeymans (1977).

- 6/ See Stolper and Samuelson (1941).
- 7/ Notice that in the case of a country whose exports are capital intensive (presumably a developed country), under the presence of a minimum wage, a tariff reduction would result in unemployment even if factors of production are fully mobile. The reason for this resides, again, on Stolper-Samuelson's theorem.
- 8/ In this figure,  $PP'$  is the regular transformation curve,  $AD$  is the Rybczynski line for changes in the quantity of labor that crosses the initial equilibrium point, and  $PA DP'$  is the transformation curve in the minimum wage economy. In this figure, it is implicitly assumed that the demand conditions are such that  $A$  is the initial equilibrium. For further details, see Brecher (1974).
- 9/ In fact, if initially there is unemployment (the initial equilibrium is on segment  $ADP'$ ), the tariff reduction could even result in a higher level of employment.
- 10/ This model draws on Jones (1971), Mayer (1974) and Mussa (1974).
- 11/ This figure is borrowed from Mussa (1974).
- 12/ On the recent behavior of the Chilean economy, see Harberger (1982), Edwards (1980) and Sjaastad and Cortes-Douglass (1981).
- 13/ Notice that in the present model, a larger number of goods does not alter any of the results derived in Section 2. The reason for this is that under the assumption of specific capital, augmenting the number of goods results in an increase in the number of factors by exactly the same number.

14/ An additional reason why the results obtained from (14) are a rough approximation is that this equation assumes a constant real minimum wage, while in the case of Chile, the minimum wage had some variations during 1975-1979.

15/ Alternative possible explanations of the high unemployment are the stabilization policy and the reduction of the public sector. See Edwards (1980).

16/ See Bhagwati and Srinivasan (1979) and Krueger (1978).

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