Terms of Trade, Tariffs, and Labor Market Adjustment in Developing Countries

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A three-goods model (importables, exportables, and nontradables) is used to analyze labor market adjustment to changes in the terms of trade and import tariffs for a small, open economy. First, a three-goods, four-factor model (labor, and capital specific to each sector) is developed and used to investigate how an exogenously generated change in a country's terms of trade affects labor allocation and wages in the short run. Next, a more traditional three-goods, two-factor model is used to examine the effects in the long run. The analysis is carried out under alternative assumptions regarding wage flexibility: full flexibility, economy-wide real wage rigidity, and sector-specific real wage rigidity.

This article presents a theoretical analysis of the interaction between a developing country's external sector and its labor market. In particular, the article investigates how disturbances in the terms of trade and changes in import tariffs (that is, trade liberalization reforms) affect labor allocation, unemployment, and wages.

Historically, developing countries have faced an uncertain external environment characterized, among other things, by wide swings in the terms of trade. These changing external relative prices not only have an impact on the level of real income but also tend to affect the productive structure by provoking changes in relative sectoral profitabilities and resource allocations. The implications of adverse terms of trade shocks on employment and wages have been a recurrent concern of policymakers in developing countries. It has frequently been argued that because of the potentially harmful employment effects of changes in terms of trade, countries should adopt policies that reduce their openness and thus their vulnerability to externally generated economic disturbances. The possible unemployment effects of tariff liberalization reforms have

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also been a concern of policymakers. Thus, some politicians have resisted the advice of multilateral agencies regarding trade reform, fearing that the lowering of tariffs will generate political costs in the form of (short-run) unemployment.

Despite the importance for policy formation of an understanding of the interactions between terms of trade disturbances, import tariffs, and the labor market, there has been little analysis of these issues. The National Bureau of Economic Research (NBER) multicountry study on trade regimes and employment (Krueger 1983) provides ample evidence that countries which have followed outward-oriented policies generally have a better employment record—greater employment creation and lower unemployment rates over the long run—than nations that have adopted import-substitution industrialization strategies. But this study emphasized the long-run characteristics and performance of labor markets, saying little about aggregate employment effects during the transition immediately following tariff reform.

The limited evidence on the short-run aggregate employment consequences of trade liberalization indicates that mild trade reforms have not led to significant aggregate unemployment. This seems to be one of the preliminary conclusions of the exhaustive World Bank cross-country study of trade liberalization (Michaely, Choksi, and Papageorgiou 1986); however, the evidence from this massive investigation is somewhat difficult to interpret. The episodes analyzed were frequently exceedingly mild cases of liberalization—for example, the 1970 Turkish devaluation, which would barely qualify as even a very timid liberalization. Also, it is not possible to know precisely from these studies whether specific changes in aggregate employment resulted from the trade reform or from the effects of other policies. This is the case, for example, for the slight increases in aggregate unemployment observed after the trade reforms in Turkey in 1980, in the Republic of Korea during 1979–80, in the Philippines in 1981, and in Israel during 1972–77.

This article attempts to fill a gap in the literature by presenting a theoretical analysis of how changes in the external sector affect a developing country’s labor market in both the short and long runs and in the transition period between them. The analysis is conducted largely from the point of view of international trade theory. It also points out some of the weaknesses of this theory, suggesting ways in which it could be strengthened.

Section I uses a three-sector (exportables, importables, and nontradables), four-factor (labor, and capital specific to each sector) trade model to analyze labor market adjustments to changes in the relative prices of commodities resulting from terms of trade disturbances or tariff changes. The analysis also considers the long-run case in which capital is allowed to adjust across sectors. Section II applies the model to an analysis of how economy-wide and sector-specific wage rigidities affect labor market adjustment to exogenous shocks. In the tradition of international trade literature, the model used in sections I and II considers only final goods. Section III presents the conclusions.
I. TERMS OF TRADE, TARIFFS, AND LABOR MARKET ADJUSTMENT
IN AN OPEN ECONOMY

This section deals with the simple analytics of the interaction between the relative prices of commodities and labor market adjustment in a small open economy. The analysis uses a fairly standard international trade model with three final goods (importables, exportables, and nontradables) and examines both the long- and short-run labor market reactions to a terms of trade shock. The discussion in this section assumes full flexibility of wages (the case with a minimum wage is examined in section II). It is assumed that in the short run capital is sector specific, whereas labor can move freely across sectors; in the medium and long runs, however, both capital and labor can move across sectors. Consequently, for the short run, the model is a three-goods, four-factor model, and for the longer run it is a three-goods, two-factor model. To simplify the discussion, most of the analysis follows the international trade tradition and ignores issues related to capital accumulation. The discussion also ignores the existence of imported intermediate inputs.

The Economy under Consideration

Assume the case of a small country that produces three goods: exportables (X), importables (M), and nontradables (N). Production is carried out using capital and labor. Production functions have the conventional properties, in the short run capital is assumed to be sector-specific and labor is assumed to be perfectly mobile among the three sectors. Following the traditional international trade literature, it is assumed that available quantities of each factor are given and that their supplies are completely inelastic (see, for example, Jones 1971; Mayer 1974; Mussa 1974, 1978, 1982; Neary 1978a, 1978b, 1982; and S. Edwards 1986c).

Imports are initially subject to a tariff, and external borrowing is not allowed. (This assumption may be easily relaxed. See S. Edwards and van Wijnbergen forthcoming.) The labor market is initially assumed to be free of distortion. (Section II examines the consequences of assuming the existence of a minimum wage, which is binding in the short run.) It is also initially assumed that the domestic capital market is free of distortion, with the real rates of return on capital being equalized across sectors in the long run. The tariff proceeds are returned to consumers via lump sum transfers. Factor intensity assumptions are that importables have the highest capital-labor ratio, nontradables have the next highest ratio, and exportables are labor intensive. This latter assumption is probably the most appropriate for the case of developing

1. Some authors have assumed that labor rather than capital is sector specific in the short run. Alternatively, one can assume that both labor and capital are fixed to their sector of origin in the short run. Under these assumptions, some of the results would differ from those presented here.
countries; moreover, it ensures that the system is stable under sector-specific wage rigidity (Neary 1982).

In this model, the labor market effects of a terms of trade shock are (almost) equivalent to those of an import tariff change that results in a change of the same magnitude in the domestic price of imports. The only difference between these two disturbances is that, for the same relative price effect, the terms of trade disturbance will generate a larger income effect. With this caveat in mind, the results that follow can be interpreted to refer either to a terms of trade shock or to a change in import tariffs. To simplify the exposition, the discussion is actually carried out for the terms of trade disturbance.

**Terms of Trade Shocks, Relative Prices, and Structural Adjustment**

This subsection investigates the effects of a reduction in the world price of the country's importables. For analytical convenience, it is assumed that initially there are no quantitative import restrictions and that the nominal exchange rate is fixed and equal to one. As noted, while capital is assumed to be sector specific in the short run, it can move freely between sectors in the long run. The discussion deals first with long-run effects, then with the short-run effects, and finally with the transition to the long run. The analysis concentrates on the behavior of goods prices, employment allocation across sectors, wage behavior, and production. In the tradition of standard international trade models, it is initially assumed that there is no unemployment. This assumption is later relaxed.

**Long-run effects.** In this class of models (a small open economy with three goods) and with the usual competition assumptions in the medium and long runs, when all factors can move freely across sectors, domestic prices of the three final goods are fully determined (under nonspecialization) by world prices, technology, and tariffs. Equilibrium can be described in the following way: with no specialization in production, world prices of exportables and importables (plus the tariff) determine the rewards to both factors of production; these rewards, under the assumption of competition, determine the price of nontradables. Demand considerations for nontradables determine total output of nontradables and total factors used in their production. The remaining factors are used in the production of exportables and importables in a traditional Heckscher-Ohlin (H-O) fashion. In this analysis, the price of exportables is the numeraire (that is, $P_x = 1$).

The effect on factor rewards and the relative price of nontradables of an exogenous shock that reduces the international price of importables can be analyzed using figure 1, which is the dual to the well-known Lerner-Pearce diagram. The initial equilibrium is given by the intersection of the three

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2. This diagram and the discussion that follows assume that both before and after the relative price change there is no specialization (that is, the three goods are produced). This is a reasonable assumption
Figure 1. *Effect on Factor Rewards of a Reduction in the World Price of Importables*

![Diagram](image)

isocosts, $MM$, $XX$, and $NN$. These curves present the combinations of wage rates and rental rates of capital that result in a constant cost of producing these goods at the existing technology (see Mussa 1979). The slopes of these curves are equal to the capital-labor ratio and correspond to the assumptions of relative capital intensities.

Initially, equilibrium is obtained at $A$, with a wage rate (relative to exports) equal to $u_0$ and a rental rate equal to $r_0$. The reduction in the price of importables will result in a leftward shift of the $MM$ curve toward $M'M'$ because lower combinations of wages and rental rates will now be required to maintain equilibrium between domestic costs and the world price of importables (plus tariff). New long-run equilibrium will be obtained at $B$, where the new $M'M'$...
curve intersects the XX curve. The NN curve will consequently shift back until it intersects the other two curves at B, reflecting a reduction in the equilibrium price of nontradable goods. As the Stolper-Samuelson theorem indicates, a reduction in the price of importables in an economy where exportables are labor intensive will result in higher wages and lower rental rates, that is, \( w_1 > w_0 \) and \( r_1 < r_0 \).\(^3\)

The production side of the model, as well as factor adjustments, can be analyzed using a three-goods Edgeworth-Bowley box as developed by Melvin (1968) and used by Corden and Neary (1982) and S. Edwards (1986b). Figure 2 illustrates the case considered here, in which exportables are the most labor-intensive good. In this diagram, isoquants for nontradables are drawn from origin \( O_N \). At the initial prices, the nontradable goods market clears at a level of production given by isoquant \( NN_0 \). The capital-labor ratio in nontradables production is given by the slope of \( O_N O_M \). Production of exportables is measured from \( O_x \) and that of importables by the distance \( O_y R \). In equilibrium, the slope of isoquant \( NN_0 \) at \( O_M \) equals the slopes of the corresponding isoquants for exportables and importables (not drawn), which are tangent at \( R \).

Because the reduction in the price of importables generates an increase in the wage rate relative to the rental rate, all three sectors now become more capital intensive. This is shown in figure 2, where the dashed rays depict the new capital-labor ratios after adjustment to the reduction in the world price of

\(^3\) Alternatively, a standard supply and demand diagram for nontradables could be used to analyze how the price of nontradables reacts to the terms of trade shock.
importables. But to determine the new equilibrium, it is necessary to know what will happen to the demand for nontradables as a consequence of the reduction in the world price of importables.

Where will the new equilibrium point be for the production of nontradables? If total output of nontradables remained constant, the new equilibrium would be on the $NN_0$ isoquant at point $O'_N$. Production of importables would be reduced to $O'_X T$, and production of exportables would increase to $O'_X T$. This result is obtained under the assumption that demand for nontradables is not affected by the reduction in the world (and domestic) price of importables. In general, however, this will not be the case. Moreover, given the assumptions regarding capital-labor intensity, it is expected that demand for nontradables will increase as a result of improvement in the terms of trade. There are two reasons for this: (1) after the exogenous shock the (relative) price of nontradables will decline (see figure 1), producing a substitution effect in demand toward nontradables; and (2) the improvement in the terms of trade will generate a positive income effect, as national income at international prices increases, which will also have a positive effect on demand for nontradables. With a higher demand for nontradables, long-run equilibrium in figure 2 will be on the new capital-labor ratio ray to the left of the $NN_0$ isoquant on a point such as $O''_N$, with production of exportables being equal to $O''_X S$, production of importables having been reduced to $O''_M S$, and production of nontradables being equal to $O''_N O''_M$.

In summary, under the assumptions on capital intensity, the effects of an improvement in the terms of trade, when all factors can move freely across sectors, will be as follows: (1) prices of nontradables relative to exportables will fall; (2) wages relative to all goods will increase; (3) the real rate of return on capital relative to all goods will decrease; (4) production of exportables and nontradables will increase; and (5) production of importables will decline.

These equilibrium price movements give us information on potential adjustment problems emerging from shocks stemming from abroad. If, for example, under fixed exchange rates nominal prices on nontradables are downwardly rigid, there may be a problem. In the small country case, the world price of exportables is given, so the nominal price of nontradables would have to decline to attain equilibrium; under nominal price rigidity, this will not happen and unemployment will result. Notice, however, that if real wages are downwardly rigid, no disequilibrium will emerge in the long run because real wages will increase in terms of all goods. This is not the case in the short run, however, as will be shown below.

It is important to recall that the discussion presented here can also be applied to the case of a trade liberalization reform aimed at reducing taxes on imports. As noted above, the magnitude of the income effect is the main difference between the case of a policy-induced reduction in the price of importables (via a lower import tariff) and an exogeneously generated reduction (via a lower
Figure 3. Short-Run Labor Market Equilibrium before a Reduction in the World Price of Importables

The initial labor market equilibrium is illustrated in figure 3, in which the horizontal axis measures total labor available in the economy and the vertical axis depicts the wage rate in terms of exportables. Demand for labor by the tradable goods sector, \( L_T \), is equal to the horizontal sum of the demand for labor by the exportables sector, \( L_X \), and demand for labor by the importables sector. Demand for labor by the nontradable goods sector is shown by \( L_N \). The initial equilibrium is characterized by a wage rate equal to \( w_0 \), with \( O_T L_T \) labor used in the production of exportables, \( L_A L_B \) labor used in the production of importables, and \( O_N L_B \) labor used in the production of nontradables.

Short-run effects. Given the assumption that in the short run capital is sector specific while labor can move freely across sectors, the model discussed here can be considered to have three final goods and four factors (labor, capital in \( X \), capital in \( M \), and capital in \( N \)).

There are several differences between this short-run model and the long-run model discussed in the previous subsection. Because capital is sector specific in the short run, the direct link between the prices of tradable goods and factor rewards is broken. The Stolper-Samuelson theorem does not hold, and the price of nontradables will be determined by the intersection of its demand and supply schedules.

In the short run, under the assumption of sector-specific capital, the reduction in the price of importables will generate changes in the domestic prices of both importables and nontradables (see, for example, Dornbusch 1974, 1980; S. Edwards 1986c). Whereas the domestic price of importables will unambiguously fall, the behavior of the price of nontradables will depend on the assumptions regarding substitutability and the magnitude of the income effect. Assuming that the three goods are gross substitutes in consumption and production and that the income effect does not exceed the substitution effect, it can be shown that as a result of the terms of trade improvement the price of nontradables will fall relative to that of exportables and increase relative to that of importables (S. Edwards 1986c).

The labor market adjustment process is illustrated in figure 4. The reduction in the world price of importables will result in a lower domestic price of

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**Figure 4. Short-Run Labor Market Adjustment to a Reduction in the World Price of Importables**

- Wage rate $w$
- $L_X$, $L_T$, $L_I$, $L_{IT}$
- $w_0$, $w_1$
- $O_L$, $O_N$
- $L_A$, $L_Q$, $L_T$, $L_I$

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importables, generating a downward shift of the $L_T$ curve (with the $L_X$ curve constant). The new $L'_T$ curve will intersect the $L_N$ curve at $R$. This is not a final equilibrium situation, however, because the reduction in the world price of importables will also result in a decline in the price of nontradables (relative to exports). As a consequence, $L_N$ will shift downward (by less than the shift in $L'_T$), and final short-run equilibrium will be achieved at $S$. In this new equilibrium, production of exportables has increased—with labor used by this sector increasing by $L_{ALQ}$. The production of nontradables may either increase or decrease, and production of importables will fall. In the case depicted in figure 4, labor has moved out of the importables sector and into the exportables and nontradables sectors.

What has happened to factor rewards in the short run? Wages have declined in terms of exportables (from $w_0$ to $w_1$ in figure 4). Wages have also declined in terms of nontradables because the vertical distance between the $L_N$ and $L'_N$ curves is smaller than the reduction in $w$ from $w_0$ to $w_1$. Wages, however, have increased relative to importables because the domestic price of importables has fallen by more than the fall in wages. In the exportables sector, the real return to capital has increased; the real returns to capital in the importables and nontradables sectors could have either increased or decreased.$^5$

Figure 5 summarizes the adjustment in production of the three goods when capital is sector specific. The initial (pre-shock) equilibrium is given by points $A$ and $G$, with production of exportables proportional to the distance $OXA$, production of nontradables given by isoquant $NN_0$, and production of importables proportional to the distance $GA$.

$^5$ Formally, the real return on capital specific to the importables sector will decrease in terms of importables and could either increase or decrease in terms of the other two goods.
Initially, the nontradable goods sector uses $O_N K_N$ capital, the exportables sector uses $O_X K_X$ capital, and the importables sector uses the rest ($K_{N X} K_{X}$). Because capital is sector specific in the short run, these amounts of capital will also be used by each sector after the terms of trade disturbance. This means that the new short-run equilibrium points will necessarily lie on the $K_N K_N$ and $K_X K_X$ lines. The reduction in the world price of importables will result in an increase in the use of labor (and thus in production, for given amounts of capital) in the exportables and nontradables sectors. This is shown in figure 5 by the movement of the equilibrium points to $B$ and $F$. The dashed lines representing the new capital-labor ratios show that both the exportables and nontradables sectors have become relatively more labor intensive, whereas the importables sector has become more capital intensive. A comparison of figures 5 and 2 provides some indication of how the transition period after the terms of trade shock will look, with factors moving from their short-run allocation toward their long-run allocation.

In summary, for the general case with wage flexibility, the short-run effects on production, prices, and factor rewards of an improvement in the terms of trade will be as follows: (1) production of exportables will increase; (2) production of importables will decrease; (3) production of nontradables may increase or decrease; (4) wages will increase in terms of importables and decrease in terms of exportables and nontradables; (5) the real return to capital in the exportables sector will increase relative to all goods; (6) the real return to capital in the importables sector will decrease relative to importables but could increase or decrease relative to the other goods; and (7) the real return to capital in the nontradables sector will increase relative to nontradable goods but could either increase or decrease relative to the other two goods.

Effects during the transition period. The model used in this section assumes that the main difference between short- and long-run effects of a trade liberalization is that in the short-run capital is locked into its sector of origin. As time passes, however, capital will (slowly) move between sectors. To simplify the exposition, we assume that the movement of capital does not require the use of resources. However, the analysis could be modified by introducing a "moving industry," which uses labor and a specific factor, as in Mussa (1978).

The transition period will be characterized by factors (both capital and labor) moving between sectors, until the new long-run equilibrium (that is, post-shock) capital-labor ratios and production levels are attained. As discussed in the subsection on long-run effects and shown in figure 2, in the final long-run equilibrium all sectors will be more capital intensive, with the exportables sector using more capital than before the shock and the importables sector using less capital than before the shock. As may also be seen from figure 2, the nontradables sector could use either a larger or smaller absolute amount of labor than before the reduction in the world price of importables.

The nature of factor movements during the transition period can be seen in
figure 6, which combines figures 2 and 5. (To avoid cluttering the diagram, capital-labor ratios have been drawn only for the post-terms of trade shock situation.) The arrows between points B and C and between F and H show the way resources will move during the transition. As may be seen in figure 6, the transition for the case considered here will be characterized by the following: (1) capital and labor will move out of the importable goods sector; (2) capital and labor will move into the exportable goods sector; (3) capital will move into the nontradable goods sector; and (4) labor will move out of the nontradable goods sector.

Table 1 summarizes the short-run, transition-period, and long-run movements of factors and changes in factor prices that follow an exogenously generated improvement in the terms of trade. The rows which show factor movements reveal potential sources of labor market disequilibria and adjustment costs following an exogenous shock stemming from the external sector. Equilibrium will require that labor move into the nontradables sector in the short run and out of it in the longer run. If, however, there are rigidities in the labor market, the adjustment costs of this movement of labor in and then out of the nontradables sector may be high.

This analysis also raises the question, largely ignored until now, of the role of expectations in labor market adjustment following a shock to the external sector. If the terms of trade shock is perceived as temporary, the short-run case will be more relevant. The role of expectations is even more important in the case of a trade liberalization reform that lowers tariffs. If the belief is widespread that the new tariff structure will not be maintained and that tariffs will be raised again, no one will be willing to incur the costs associated with the reallocation of capital.

Figure 6. Adjustments in Production and Factor Allocation during the Transition Period after a Reduction in the World Price of Importables
Table 1. Short- and Long-Run Factor Movements and Changes in Factor Rewards Following a Positive Terms of Trade Shock

<table>
<thead>
<tr>
<th>Sector</th>
<th>Short-run versus initial situation</th>
<th>Long-run versus initial situation</th>
<th>Long-run versus short-run (transition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exportables</td>
<td>$K$</td>
<td>$L$</td>
<td>$K$</td>
</tr>
<tr>
<td>Importables</td>
<td>$-$</td>
<td>$+$</td>
<td>$+$</td>
</tr>
<tr>
<td>Nontradables</td>
<td>$-$</td>
<td>$+$</td>
<td>$+$</td>
</tr>
</tbody>
</table>

Changes in factor rewards

<table>
<thead>
<tr>
<th>r^a</th>
<th>w</th>
<th>r^b</th>
<th>w</th>
<th>r^b</th>
<th>w</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exportables</td>
<td>$+$</td>
<td>$-$</td>
<td>$+$</td>
<td>$-$</td>
<td>$+$</td>
</tr>
<tr>
<td>Importables</td>
<td>$-$</td>
<td>$+$</td>
<td>$-$</td>
<td>$+$</td>
<td>$-$</td>
</tr>
<tr>
<td>Nontradables</td>
<td>$+$</td>
<td>$+$</td>
<td>$-$</td>
<td>$+$</td>
<td>$+$</td>
</tr>
</tbody>
</table>

a. Because capital is sector specific in the short run, the real return to capital can move in different directions in the different sectors. (The arrows in these rows refer to the real return to capital in terms of that sector’s price; see text.)
b. In the medium and long runs, capital can move across sectors.

II. TERMS OF TRADE SHOCKS IN THE PRESENCE OF LABOR MARKET RIGIDITIES

The discussion up to this point has followed the more traditional models of international trade, which assume that all factor prices, including wages, are perfectly flexible. That, of course, is a simplifying assumption that does not correspond to reality in many developing countries. Most developing countries have minimum wage laws or other types of rigidities that affect the whole economy or some parts of it. In the past ten years or so, a number of trade models have been developed that assume some type of factor price rigidity (see Brecher 1974; Bruce and Purvis 1984). These models have been useful and have added considerable realism to the analysis, but most of them have concentrated on the case of two goods only. This section extends the three-goods model used in the previous section and discusses the effects of a terms of trade shock under both economy-wide and sector-specific wage rigidities stemming from exogenously imposed minimum wages. The analysis concentrates mainly on the short-run case in which capital is locked into its sector of origin. Although the discussion emphasizes the case of minimum wages, other mechanisms widely applied in developing countries, especially wage indexation, also lead to wage rigidity.

Economy-wide Wage Rigidities

Consider first the case of an economy-wide minimum wage. In order to facilitate the diagramatical exposition, this minimum wage is assumed to be

6. In the long run, as shown above, a terms of trade improvement generates an equilibrium increase in real wages, so a minimum wage in real terms will become less binding.
expressed in terms of exportables. This, naturally, is a simplifying assumption, because in the real world minimum wages are set with respect to a price index. The key consideration is the weight of different prices in the index; if exportables have a "large enough" weight in the index, all the results presented here will follow (see footnote 8). It is also assumed that the initial level of the minimum wage corresponds to the wage that initially generates full employment. This means that before the terms of trade shock, there is no unemployment. Although this simplifying assumption greatly facilitates the exposition, it does not affect the findings significantly.

It is easy to see from figure 4 that if wages, expressed in terms of exportables, are downwardly rigid and capital is sector specific, unemployment will result as a consequence of the shock that reduces the relative price of importables. The magnitude of this unemployment will be equal to the distance FG. This is basically a short-run adjustment cost, which will tend to disappear as capital moves between sectors in the medium and long runs.\(^7\) In general, in the presence of wage rigidity and sector-specific capital, a short-run disequilibrium will emerge as a result of the terms of trade shock. The extent of the disequilibrium will depend on whether wages are inflexible in terms of exportables, as was assumed above, or inflexible in terms of importables or an index of all three goods. The reason for this, of course, is that if wages are flexible in terms of importables, no unemployment will result because real wages in terms of importables will increase. If, however, real wages are inflexible measured in terms of a price index that includes importables and exportables, unemployment may result if the weight of importables in the price index is sufficiently small.\(^8\)

It is interesting to note that if the decline in the price of importables is due to a tariff reduction rather than to a terms of trade shock, this possible short-run unemployment effect might call for a second-best argument in favor of a gradual reduction in tariffs. (The first-best policy, of course, would be to remove the minimum wage distortion.) This would be the case, for example, if the maximum amount of capital that can move across sectors in each period is small compared to the total desired capital reallocation given the relative price changes (see S. Edwards 1982). A potential problem with gradual trade reform, however, is that it may result in a loss in credibility. With expectations of a reversal of tariff reform, no capital will actually be moved, and unemployment will take place.

What happens in the long run in this case with an economy-wide minimum

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7. See Neary (1982) and S. Edwards (1982) for discussions of trade liberalization, sticky wages, and unemployment. It is interesting to note that an effect of this type can be used to analytically derive short-run output losses following a trade liberalization process, as is done by Khan and Zahler (1983). For a comprehensive synthesis of the literature on this topic, see Neary (1985).

8. S. Edwards (1982) has shown that if the weight of exportables is "sufficiently" large, a positive terms of trade shock will result in short-run unemployment. A "sufficiently large" weight of exportables is defined as \(\alpha > P_0F_{x1}/(P_0F_{x1} + P_0F_{x2})\), where \(F_{x1}\) is the second derivative of the production function relative to the amount of labor. If \(N\), is added, a similar expression is obtained.
wage? As time passes capital can move across sectors, and it will flow steadily out of the importables sector. As was shown in section I, as long as there is no specialization in production, the Stolper-Samuelson result will hold in the long run. When the world price of importables declines, real wages in terms of all goods will go up, rendering the preexisting downwardly inflexible real wage redundant. As capital is reallocated out of importables, unemployment will fall until it completely disappears. In this case unemployment will be only a short-run phenomenon. The long run will be characterized by full employment and higher real wages. Naturally, this result would not hold if the terms of trade shock were negative (for example, an increase in the price of importables). In that case, with an economy-wide minimum wage, the long-run equilibrium would be characterized by unemployment.

**Sector-Specific Wage Rigidity**

In most countries, minimum wages do not cover all sectors but are generally enforced only for the urban sector. The analysis of labor market adjustment to externally generated relative price shocks in the presence of sector-specific minimum wages can get quite complicated. The analysis that follows focuses on the case of a minimum wage that applies to the importables sector, which is consistent with the stylized fact that in most developing countries minimum wage legislation covers the manufacturing sector only. To facilitate the diagrammatical exposition, the minimum wage is assumed to be expressed in terms of exportables.

Consider now the case of a binding minimum wage in the importables sector only. In order to analyze this case, the diagrams used previously must be somewhat modified. Figure 7 is similar to figure 3, except that in figure 7 total labor used in the importables sector is measured from the right-hand side origin $O_M$. The wage rate $W_M$ is the minimum wage in the importables sector (that is, manufacturing); $L_M$ is employment in this sector. Curve $qq$ is a rectangular hyperbola known as the Harris-Todaro locus, along which the following equation is satisfied:

$$W_N = W_X = \frac{L_M}{L_M + U} W_M,$$

where $U$ is the equilibrium level of unemployment. In the absence of a minimum wage, equilibrium is attained at point $Z$. With a minimum wage, however, the intersection of $(L_X + L_N)$ with $qq$ at point $S$ gives the wage rate in the uncovered (no minimum wage) sectors, employment in each sector, and total unemployment. The distance $O_X L_X$ is total employment in the exportables.

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9. This formulation, of course, follows from Harris’s and Todaro’s (1970) classical article on migration (see also Harberger 1971). For the use of this discussion in the context of a two-sector economy, see Corden and Findlay (1975) and Neary (1981). Notice that for exposition purposes, the wage rate in importables is assumed to be fixed with respect to exportables. See Neary (1981) for an illustration of what will happen if this assumption is changed.
Figure 7. Labor Market Equilibrium before a Reduction in the World Price of Importables in an Economy with a Minimum Wage in the Importables Sector

sector; the distance \( L_X(L_X + L_N) \) is employment in nontradables; the distance \( (L_X + L_N)L_M \) is the initial equilibrium level of unemployment; and the distance \( O_M L_M \) is employment in the covered sector.\(^{10}\)

The short-run (with capital immobile across sectors) effects of a reduction in the world price of importables are illustrated in figure 8. As a result of the decline in the world price of importables, demand for labor in that sector shifts downward. At the given minimum wage, \( \bar{W}_M \), total demand for labor in the importables sector will decline. The new demand for labor in the importables sector (not drawn) will intersect \( \bar{W}_M T \) at \( A \). Now labor demanded by the importables sector is reduced to \( O_M \bar{L}_M \). A new rectangular hyperbola \( q'q' \) passes through \( A \).

What will happen to wages and employment in the uncovered sectors, and to unemployment? Under the assumption that the price of nontradables remains constant, curve \( (L_X + L_N) \) remains at its original location, and point \( B \), given by the intersection of \( q'q' \) and \( (L_X + L_N) \), is the new equilibrium. The new equilibrium is characterized by a lower wage and higher employment in

\(^{10}\) There is an important difference between this type of minimum wage model in which total availability of labor to the economy is given and models with an upwardly sloping aggregate supply of labor. On this last type of model, see A. C. Edwards (1986), and S. Edwards and A. C. Edwards (1987).
Figure 8. Short-Run Labor Market Adjustment to a Reduction in the World Price of Importables in an Economy with a Minimum Wage in the Importables Sector

the uncovered sectors. As discussed above, however, the improvement in the terms of trade will affect the price of nontradables and \((L_X + L_N)\) will not remain constant. Under the assumptions discussed above in the subsection on terms of trade shocks, relative prices, and structural adjustment, the improvement in the terms of trade generates a reduction in the price of nontradables, which is, however, smaller than the decline in the price of importables. As a result, in the final short-run equilibrium, \((L_X + L_N)\) will shift downward to \((L_X + L_N)'\) (not drawn). The intersection of \((L_X + L_N)'\) and the \(qq'\) rectangular hyperbola at point C is the final equilibrium when capital is locked in its sector of origin.

Under the given assumptions, the post-terms of trade shock equilibrium is characterized by the following: (1) lower employment in the sector covered by the minimum wage (importables); (2) lower wages in the uncovered sectors, expressed in terms of exportables; (3) either higher or lower equilibrium unemployment; (4) either lower or higher employment in nontradables; and (5) higher employment and production in exportables.11

11. In this setting, unemployment is given by \(U = L_m \left( \frac{W_M}{W_N} - 1 \right) \). Because \(L_m\) declines and \(\frac{W_M}{W_N}\) goes up, it is not possible to know a priori which way \(U\) will go. The final direction will depend on the elasticities of demand for labor in each sector.
Not surprisingly, the case of partial minimum wage coverage generates very different results than the case of an economy-wide minimum wage. First, under partial coverage, there is an increase in production and employment in exportables. Second, under partial coverage, employment in nontradables may also increase. Also, in the short run, a positive terms of trade shock can result in a reduction in the equilibrium level of unemployment in the case of partial minimum wage coverage, whereas greater unemployment always results after such a shock in the case of an economy-wide minimum wage. This illustrates an important finding: in the presence of labor market distortions, exogenous shocks usually considered to be beneficial may generate nontrivial (short-run) unemployment problems.

What will happen in the long run in this case with a sector-specific minimum wage? In the short run, after the world price of importables has gone down, the real return to (sector-specific) capital will be different across sectors. The terms of trade shock reduces the return to capital in the importables (manufacturing) sector and increases it in the exportables and nontradables sectors. Of course, this situation with different real returns to capital cannot continue in the long run. As time goes by, capital will be reallocated, moving out of importables and into the other sectors. In terms of figure 8, this means that \( L_M \) will shift downward—and with it the rectangular hyperbola \( qq \)—while demand for labor in the uncovered sectors will shift upward. Moreover, these curves will shift in such a way that the final outcome will be characterized by a higher wage in the absence of wage rigidities.

The final long-run equilibrium will have to satisfy two conditions: the return to capital will be equalized across sectors and the labor market will be in equilibrium, in the sense that \( LN = WX = \{L_M/(L_M + U)\} W_M \). As capital is reallocated, employment in the importables sector declines and employment in the exportables and nontradables sectors increases in relation to the short-run levels depicted in figure 8. It is not possible, however, to know a priori whether wages in the uncovered sectors (nontradables and exportables) will be higher or lower in the long run than their initial levels. This will depend on the elasticities of substitution and on the relation between the slopes of the \( L_M \), \( qq \), and \( (L_X + LN) \) curves.

III. Summary and Concluding Remarks

The way in which labor markets react to disturbances generated in the external sector has important policy implications, particularly in terms of the employment effects of tariff liberalization reforms. For obvious political economy reasons, governments will generally try to avoid the generation of high unemployment: the costs of unemployment are recognized in the short run, while the benefits associated with the structural reforms that provoked the unemployment (that is, trade liberalization) are usually reaped in the medium run, when a different government is likely to be in office.
This article has analyzed the reaction of labor markets in open economies to terms of trade disturbances and tariff liberalization reforms. In section I a three-goods trade model was developed to investigate how sectoral labor allocations and wages react to shocks in the terms of trade. The analysis looked at both the short and long runs and, in the tradition of standard trade theory, assumed that total labor supply is given. Under the assumption of flexible wages, it was shown that labor will move to a particular sector in the short run, only to move out of it in the longer run. This brings up the issue of adjustment costs and the role of expectations in determining labor movements. Section II introduced wage rigidities in the form of an economy-wide minimum wage and a sector-specific minimum wage. It was shown that even when importables are capital intensive, and the minimum wage is expressed in terms of the exportable good, a positive terms of trade shock will generate unemployment in the short run. The labor market reaction will depend, however, on the extent of the minimum wage coverage.

An important policy implication of the analysis is that under inflexible wages there are strong presumptions that a gradual, preannounced trade reform will be able to avoid some of the unemployment costs associated with the reform. This, however, will require that the reform be credible. If the public expects the trade liberalization to be reversed, investment in the export-oriented sectors will not take place, and unemployment will tend to persist.

The model developed in this article has ignored the role of intermediate inputs. If, however, imported intermediate goods are introduced into the analysis, there will be additional channels through which disturbances emanating from the external sector will affect the labor market (see S. Edwards forthcoming).

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Vol. 35 No. 1 CONTENTS MARCH 1988

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by James M. Boughton

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by Paul de Grauwe

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by Peter S. Sephton

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by Ke-young Chu and Thomas K. Morrison

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