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Trade liberalization and unemployment

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Abstract

This paper examines the effect of trade reform on wages and unemployment in a two-sector, three-good economy in which labour is imperfectly mobile across sectors. Wages in the export sector are set so as to minimize turnover costs. The analysis shows that a reduction in tariffs, coupled with an adjustment in lump-sum taxes to equilibrate the government budget, lowers wages in all production sectors in the short and the medium run and has an ambiguous effect on unemployment. Although employment and production of exportables expand in the medium run, the unemployment rate may rise or fall depending on whether the elasticity of wages in the export sector with respect to wages in the non-traded goods sector is lower or greater than unity. Potentially adverse effects may be mitigated in the long run, however, as a result of induced shifts in the structure of production activities.

Keywords

Trade liberalization, unemployment, wage expectations

1. INTRODUCTION

Recognition of the adverse effects of import substitution strategies – an industrial structure heavily dependent upon imported intermediates and capital goods; slow export growth and recurrent balance of payments problems; and severe allocative distortions – has led an increasing number of countries in the developing world to adopt a more liberal external trade regime. Traditional economic arguments suggest that a reduction in trade barriers (such as tariffs, import licensing requirements and import quotas) enhances efficiency by reducing the value of implicit rents captured by rent seekers, and fosters an adjustment in relative prices that leads to a reallocation of resources towards the exportable sector (Krueger, 1985). In the long run, the realignment of relative prices leads to an expansion of output of exportables and a contraction of activity in import competing industries. To the extent that trade reform is accompanied by a real exchange rate depreciation – that is, a fall in the price of home goods relative to the weighted average of prices of exportables and importables – a reduction in barriers to foreign trade may also lead to an overall transfer of resources from sectors producing non-tradables towards those producing tradables.

While there appears to be broad agreement on the allocative effects of trade liberalization in the long run, the short- and medium-run impact of trade

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reform on the wage structure, the composition of employment and aggregate unemployment, remains imperfectly understood. The evidence gathered in the comprehensive study of trade reform episodes in developing countries conducted in the early 1980s at the World Bank and summarized by Papageorgiou *et al.* (1990) appears to be largely inconclusive in that regard.[1] While most individual country studies suggest that total employment in the manufacturing sector either fell or remained stable in the aftermath of the liberalization programme, they often do not distinguish between traded and non-traded manufacturing goods, and are therefore unable to characterize changes in the distribution of employment across inward and outward oriented industries. In addition, they provide only limited evidence on changes in employment in non-manufacturing production activities, or changes in the aggregate unemployment rate. These limitations (which in several cases result from the paucity of appropriate data) are compounded by the methodological shortcomings that affect many of the specific country studies. For instance, although in several cases trade reforms were implemented simultaneously with macroeconomic stabilization programmes – and in an environment characterized by severe external shocks – few authors have attempted to disentangle rigorously the employment effects associated with each set of measures (Edwards, 1993). Despite this important caveat, Papageorgiou *et al.* (1990) attribute the fall in manufacturing sector employment observed in a few cases in the aftermath of reform entirely to restrictive macroeconomic policies.

Some recent studies have attempted to study directly the effects of tariff reform on the labour market. Rama (1994) has examined the relationship between tariffs, employment and wages in the Uruguayan manufacturing sector. He finds no impact of the reform on wages but a negative effect on employment. His estimates indicate that a reduction in the tariff-inclusive price of imports by 1 percentage point led to an employment drop in manufacturing of between 0.4 and 0.5 percentage points. In a study of the trade liberalization programme implemented in Mexico between 1985 and 1988, Revenga (1994) has estimated that the reduction in tariffs during the period (of about 10 percentage points)[2] led to a much smaller reduction in aggregate employment in the manufacturing sector (by 2 to 3 percentage points) and an increase in average wages.[3] However, her study also suggests that, despite relatively limited aggregate effects, significant changes occurred in the composition of employment across industries. Currie and Harrison (1994) have found that the comprehensive trade reform that was implemented in Morocco between 1984 and 1990 (which led to a reduction in the coverage of import licences from 41 per cent of imports in 1984 to 11 per cent in 1990, and a reduction in the maximum tariff rate from 165 per cent to 45 per cent) also had a small (albeit significant) impact on aggregate wages and employment in the formal manufacturing sector. As in the case of Mexico, pronounced sectoral shifts in employment appeared to have taken place,

particularly in the manufacturing industries that were subject to large tariff reductions.

Despite these recent advances in the empirical literature, progress in understanding the conceptual issues involved in analysing the effects of trade liberalization on the labour market has been more limited. Existing analytical models, in particular, abstract from potentially important factors that may affect the impact of trade reform on the composition of employment and the aggregate unemployment rate in developing countries. Buffie (1986), for instance, focuses on the potential short-run contractionary effect of trade liberalization in the presence of economy-wide nominal and real wage rigidity. Edwards (1988), by contrast, considers in his analysis of tariff reform an economy in which wages are rigid in only one sector. Both authors consider the case of absolute, rather than relative, wage rigidity – thus excluding potential interactions between wage formation in different sectors of the economy – and do not account for impediments to labour mobility in the short run.[4] As shown in a related context by Agénor and Aizenman (1994), labour market imperfections of this type may have significant implications for evaluating the wage and employment effects of adjustment policies.

Accordingly, the purpose of this paper is to examine the impact of trade reform on wages, the composition of employment and aggregate unemployment in the presence of a variety of labour market distortions. In contrast to the existing literature, we explicitly model interactions between wage formation mechanisms across sectors. Section 2 presents the basic framework. Section 3 examines the short- and medium-run effects of a permanent reduction in tariffs (coupled with an adjustment in lump-sum taxes to equilibrate the government budget) in this setting. Section 4 provides an intuitive discussion of our results, emphasizing the role of the production structure and the modelling of labour market imperfections. Finally, Section 5 summarizes the main implications of the paper.

2. THE FRAMEWORK

Consider a small open economy in which there are three types of agents: producers, households and the government. All firms and households are identical. The economy produces two goods, a non-traded good which is used only for final domestic consumption, and an export good, whose output is entirely sold abroad and whose price is determined on world markets.[5] The capital stock in each sector is fixed during the time frame of the analysis. Labour is homogeneous and imperfectly mobile across sectors. Firms in the export sector determine both wages and the level of employment. Workers employed in that sector are paid an above-equilibrium real wage in order to reduce turnover costs – which include recruitment, hiring, training and firing costs – while the wage earned by workers employed in the non-traded goods sector is fully flexible. Although workers who are not hired in the export

sector could find job opportunities at the going wage in the non-traded goods sector, imperfect labour mobility prevents an instantaneous reallocation of the labour force. Households consume non-traded and imported goods, supply labour inelastically and hold a traded bond, which bears a constant rate of return determined on world capital markets. The government consumes only non-traded goods, and collects lump-sum taxes as well as taxes on imported goods. Finally, wage and employment expectations are assumed to depend on prevailing conditions in the labour market.

2.1 Output, turnover costs and wages

Production in the export sector takes place under a Cobb–Douglas technology and is given by

$$Q_E = L_E^{\alpha_E} \qquad 0 < \alpha_E < 1 \tag{1}$$

where Q_E denotes output and L_E employment.

In addition to normal costs associated with the use of labour in the production process, firms in the export sector incur a total cost of $\theta q L_E$ in hiring and training new workers, where q is the quit rate, and θ the cost incurred in recruiting and training each worker. Following Stiglitz (1974), the quit rate could be specified as depending on the product wage in the sector producing exported goods relative to the wage that workers could earn in the non-traded goods sector, as well as the aggregate unemployment rate u, which measures the degree of tightness of the labour market:[6]

$$q = q\left(\frac{\omega_E}{\omega_N}, u\right), \qquad q_\omega < 0,\ q_{\omega\omega} > 0,\ q_u < 0 \tag{2}$$

where ω_E denotes the product wage in the export sector, ω_N the real wage in the non-traded goods sector measured in terms of exported goods, and $\omega = \omega_E/\omega_N$ the wage ratio. If quits become less responsive to the wage ratio (so that q_ω becomes less negative) as the unemployment rate increases, the quit function specified in Equation (2) will also satisfy the condition $q_{\omega u} > 0$.

The export good is used as the numéraire, and is set to unity. Firms in the export sector maximize their real profits, given by

$$\Pi_E = L_E^{\alpha_E} - \omega_E L_E - \Theta q(\omega_E/\omega_N, u) L_E$$

with respect to ω_E and L_E, for ω_N given. First-order conditions are

$$-\Theta q_\omega[\,.\,] = \omega_N \tag{3a}$$

$$\alpha L_E^{\alpha_E - 1} = \Omega_E \tag{3b}$$

where $\Omega_E = \omega_E + \Theta_q$ is unit labour costs in the export sector. To simplify the exposition, we assume that $q_u = 0$. Equations (3a) and (3b) imply that unit

labour costs in the export sector increase with the level of wages in the non-traded goods sector:

$$d\Omega_E/d\omega_N = \omega_E/\omega_N \tag{4}$$

Logarithmic differentiation of (3a) implies that

$$d\log\omega_E = \left[\frac{1}{\eta} - 1\right] d\log\omega_N \qquad \eta \equiv -q_{\omega\omega}\omega/q_\omega > 0 \tag{5}$$

which indicates that an increase in the real wage in the non-traded good sector has in general an ambiguous effect on wages in the export sector. To understand this result, note that Equation (3a) can be written in the form $1 = -\Theta q_\omega[\ .\ ]/\omega_N$, which can be interpreted as equating the marginal unit labour cost in the exportable sector (which is unity) to the marginal unit labour benefit, which results from a reduction in labour turnover costs. This equation indicates that an increase in the market-clearing wage ω_N has an ambiguous effect on the marginal benefit: it increases the quit rate on the one hand, thus raising the marginal benefit resulting from an increase in the wage in the export sector. On the other hand, it reduces the marginal benefit associated with a rise in the efficiency wage because a unit increase in that wage represents now a smaller percentage improvement in the relative wage (this is captured by $1/\omega_N$). For low values of the market-clearing wage the first effect dominates, while for large values of ω_N the second effect dominates.

To gain further perspective, further structure must be imposed on the model. For example, suppose that the quit function takes the logistic form, $q = 1/(1+\delta\omega)$, where $\delta > 0$ depends positively on the net non-pecuniary benefit – such as the proximity of activities from family and friends, and their physical location – associated with employment in the export sector.[7] It can be shown that as long as the quit rate is below one half, $0 < \eta < 0.5$ and the elasticity of the efficiency wage in the export sector with respect to the market-clearing wage will be less than unity ($0 < d\log\omega_E/d\log\omega_N < 1$) (see Agénor and Aizenman, 1995). Henceforth we assume that this condition holds.[8] Further discussion of the case where $\eta < 0.5$ is provided below.

Substituting the optimal value of ω_E from Equation (3a) in Equation (3b) determines the demand for labour in the export sector, L_E^d. Substituting this result in Equation (1) yields

$$Q_E^s = Q_E^s(\omega_N) \qquad Q_E^s < 0 \tag{6}$$

which indicates that a rise in the real wage in the non-traded goods sector lowers output in the export sector.[9]

Production in the non-traded goods sector also takes place under decreasing returns to labour, and can be written as

$$Q_N = L_N^{\alpha_N} \qquad 0 < \alpha_N < 0 \tag{7}$$

and real profits (in terms of the price of exports) are given by

$$\Pi_N = z_t^{-1} L_N^{\alpha_N} - \omega_N L_N \tag{8}$$

where $z = 1/P_N$ denotes the real exchange rate (that is, the relative price of exports over non-traded goods), and P_N the domestic price of non-traded goods. Profit maximization yields the familiar equality between marginal revenue and marginal cost:

$$\omega_N = z_t^{-1} Q_N'(L_N) \tag{9}$$

from which labour demand can be derived as $L_N^d = Q'^{-1}_N(z\omega_N)$. Substituting this result in (7) implies

$$Q_N^s = Q_N^s(z\omega_N) \qquad Q_N^s < 0 \tag{10}$$

where $z\omega_N$ measures the product wage in the non-traded goods sector. From Equations (6) and (10), real factor income – measured in terms of the price of exported goods – is given by

$$y = z^{-1} Q_N^s(z\omega_N) + Q_E^s(\omega_N) \tag{11}$$

The determination of the equilibrium wage in the non-traded goods sector is discussed below.

2.2 Consumption and the market for non-traded goods

Households supply a fixed quantity of labour inelastically and consume imported and non-traded goods. Total consumption c (measured in terms of the price of exportables) is given by

$$c = \lambda(i^* b + y) + (1 - \lambda)(i^* \bar{b} + \bar{y}) - \tau \qquad 0 < \lambda < 1 \tag{12}$$

where i^* denotes the world interest rate (assumed constant), b the real stock of traded bonds, τ real lump-sum taxes (both measured in terms of the price of exported goods), and $\bar{y}$ and $\bar{b}$ the steady-state values of net factor income and bond holdings. Equation (12) indicates that aggregate consumption depends on disposable income, which is given by substracting lump-sum taxes from 'expected' gross income – measured as a weighted average of current resources (net factor income and interest payments) and long-term (or permanent) income.[10] This specification allows us to capture, in a relatively simple and tractable manner, the forward-looking component of consumption behaviour that has been emphasized in intertemporal optimizing models of economic adjustment (see, for instance, Agénor and Aizenman, 1994).

Setting the world price of imports to unity implies that the domestic price of imported goods is given by

$$P_I = \iota \tag{13}$$

where $0 < \iota - 1 < 1$ denotes the *ad valorem* tariff rate on imports.

Assuming that the household's instantaneous utility function in terms of

domestic and foreign goods is Cobb–Douglas, the optimal allocation of aggregate consumption expenditure is given by

$$c_I = \alpha c/\iota \qquad c_N = (1-\alpha)zc \tag{14}$$

where c_I denotes consumption of imports, c_N consumption of non-traded goods, and $0 < \alpha < 1$ the utility weight attached to imported goods.

The flow budget constraint of the household is thus given by

$$\dot{b} = i^*b + y - z^{-1}c_N - \iota c_I - \tau \tag{15}$$

To close the system we should specify the long-term demand for bonds, $\bar{b}$. A fully optimizing model that derives the demand for bonds endogenously would lead to a dynamic system with three variables. To avoid the analytical complications involved in this case, we assume that the long-term demand for bonds is proportional to long-term income ($\bar{b} = h\bar{y}$), and to simplify further we assume that $h = 0$.

Using equations (10) and (14), the equilibrium condition of the market for non-traded goods can be written as

$$Q_N^s(z\omega_N) = (1-\alpha)zc + g_N \tag{16}$$

where g_N is the constant level of public spending on non-traded goods.

2.3 The government

The government, as indicated earlier, consumes non-traded goods and collects taxes on imported goods as well as lump-sum taxes on households. Its budget constraint can be written as:

$$(\iota - 1)c_I + \tau = z^{-1}g_N \tag{17}$$

which indicates that proceeds from tariffs on imported goods are returned to households as lump-sum transfers or tax rebates as long as they exceed government spending on non-traded goods.

The initial equilibrium (which prevails until an instant before $t = 0$) is assumed to be such that lump-sum taxes are zero ($\tau_{0-} = 0$), and that the import tax rate is high enough to equilibrate the budget.[11] Using (14), the initial budget constraint is thus

$$\alpha\rho c = z^{-1}g_N \qquad t < 0 \tag{17'}$$

where $\rho = (\iota - 1)/\iota$ is the percentage tariff rate.

Substituting (11), (12), (14), (16) and (17′) in (15) yields

$$\dot{b} = i^*b + Q_E^s - \alpha c/\iota \tag{15'}$$

2.4 Labour market adjustment

In the labour market, available workers queue up continuously to seek employment in the export sector. As indicated earlier, firms in that sector determine the wage so as to minimize total labour costs. They hire randomly from the queue, up to the point where their optimal demand for labour is satisfied. Although workers who cannot find a job in the export sector could obtain one in the non-traded goods sector, reallocation of the labour force cannot occur instantaneously – owing to, say, relocation and congestion costs.[12] Imperfect labour mobility implies therefore that the distribution of the workforce across sectors is predetermined at any moment in time.

Formally, let $\bar{L}$ be the size of the total labour force in the economy. The equilibrium condition that equates supply and demand for workers in the non-traded goods sector is given by

$$\bar{L} - L_E^s = L_N^d(z\omega_N) \tag{18}$$

where L_E^s denotes the supply of labour in the export sector.

The mechanism through which workers migrate across sectors follows the formulation of Harris and Todaro (1970), and relates movements of labour to the expected differential between sectoral wages. The expected wage in the export sector is equal to the going wage weighted by the probability of being hired. Since hiring is random, this probability can be approximated by the prevailing employment ratio. The expected wage in the non-traded goods sector is simply the going wage, since the probability of finding employment is unity in that sector. Thus, the supply of labour in the export sector evolves over time according to

$$\dot{L}_E^s = \kappa\{\omega_E L_E^d / L_E^s - \omega_N\} \qquad \kappa > 0 \tag{19}$$

where κ denotes the speed of adjustment. Equation (19) implies that in the steady state, with $\dot{L}_E^s = 0$, the wage ratio $\tilde{\omega}$ is equal to the inverse of the employment rate in the export sector.

3. TARIFFS, REAL WAGES AND EMPLOYMENT

Before examining the effects of tariff reform, it is convenient to examine first the effect of changes in the dynamic variables (the stock of foreign bonds and labour supply in the export sector) on the short-run equilibrium values of the real exchange rate and the real wage in the non-traded goods sector. Noting that from (7) and the labour market equilibrium condition (18) $Q_N^s = (\bar{L} - L_E^s)^{\alpha_N}$, the profit maximization condition (9) and the equilibrium condition of the market for non-traded goods (16) can be written as, together with equations (6), (7) and (12) and $\bar{b} = 0$:

$$\Lambda(\bar{L} - L_E^s)^{\alpha_N} - z(1-\alpha)\{\lambda(i^*b + Q_E^s(\,.\,)) + (1-\lambda)\bar{y}\} - g_N = 0 \tag{20a}$$

$$z\omega_N - \alpha_N(\bar{L} - L_E^s)^{\alpha_N - 1} = 0 \tag{20b}$$

where $\Lambda = 1 - \lambda(1 - \alpha) > 0$. From this system, it can be established that

$$z = z(\bar{b}, \bar{L}_E^s), \qquad \omega_N = \omega_N(\bar{b}, \bar{L}_E^s) \tag{21}$$

Equations (21) indicate that an increase in the stock of bonds raises the market-clearing wage in the non-traded goods sector (since it raises consumption of home goods, and thus output and the demand for labour) and leads to a real exchange rate appreciation – an increase in the relative price of home goods – which helps restore equilibrium between supply and demand. An increase in the labour force in the export sector raises wages in the non-traded goods sector (since it lowers the supply of labour in that sector) but has an ambiguous effect on the real exchange rate. On the one hand, there is a negative supply effect, since the fall in output of non-traded goods induced by the wage increase (initiated in the non-traded goods sector, and then transmitted to the export sector, as a result of efficiency considerations) leads directly to an appreciation of the real exchange rate. On the other, there is a demand effect, which results from the fact that the fall in output in the non-traded goods sector lowers factor income and reduces private expenditure, thus requiring a real depreciation to restore equilibrium in the market for non-traded goods. Formally, we have

$$sg\left\{\frac{\partial z}{\partial L_E^s}\right\} = -sg\left\{\lambda(1-\alpha)\left(\frac{1-\alpha_N}{\bar{L} - L_E^s}\right)Q_E' + \Lambda\right\} \gtrless 0$$

which indicates that if aggregate consumption responds mainly to permanent rather than current income ($\lambda \to 0$) the supply effect will dominate, and the net effect of an increase in the labour force in the export sector will be an appreciation of the real exchange rate.

Since, as indicated above, $Q_N^s(t) \equiv (\bar{L} - L_E^s(t))^{\alpha_N}$, the supply of non-traded goods is independent of changes in the stock of foreign bonds. Equations (6) and (21) imply that output of the export sector is inversely related to holdings of foreign bonds and the size of the labour force in the export sector:

$$Q_E^s = Q_E^s(\bar{b}, \bar{L}_E^s) \tag{22}$$

Substituting equations (11), (12), (14), (16), (17′), (21) and (22) in equation (15′) yields

$$\dot{b} = (1 - \alpha\lambda\iota^{-1})(i^*b + Q_E^s(\,.\,)) - \alpha\iota^{-1}[\lambda z(\,.\,)^{-1}Q_N^s(\,.\,) + (1-\lambda)\bar{y}] \tag{23}$$

which determines the rate of accumulation of foreign assets.

Finally, using equation (5), substituting out the short-run equilibrium solution (21) and using both results in equation (19) yields

$$\dot{L}_E^s = J(b, L_E^s) \tag{24}$$

where, given that the elasticity of $\omega_E(t)$ with respect to $\omega_N(t)$ is assumed to

be less than unity, both derivatives are negative (see the appendix).

Equations (23) and (24) determine the behaviour of foreign assets and the size of the workforce in the export sector over time. Substituting the solution values of this system in equations (21) yields the equilibrium levels of the real wage in the non-traded goods sector and the real exchange rate.

A linear approximation to equations (23) and (24) around the steady state yields

$$\begin{bmatrix} \dot{b}_t \\ \dot{L}_E^s(t) \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ (\partial J/\partial b) & (\partial J/\partial L_E^s) \end{bmatrix} \begin{bmatrix} b_t - \bar{b} \\ L_E^s(t) - \bar{L}_E^s \end{bmatrix} \tag{25}$$

where $\bar{L}_E^s \leq \bar{L}$, where the coefficients a_{11} and a_{12} are given in the appendix. Assuming that ι^* is small, the first coefficient is negative. The second coefficient is in general ambiguous. Given that a_{11} and $(\partial J/\delta L_E^s)$ are both negative, local stability of the system described by (25) requires that its determinant – given by $a_{11}(\partial J/\delta L_E^s) - a_{12}(\partial J/\delta b)$ – be positive. A sufficient (although not necessary) condition for this result to hold is $a_{12} > 0$. We will assume that this is indeed the case in what follows.

The steady-state equilibrium of the model is depicted in Figure 1. The upward-sloping locus [$\dot{b} = 0$] gives the combinations of b and L_E^s for which the stock of foreign assets remains constant, while the downward-sloping locus [$\dot{L}_E^s = 0$] depicts the combinations of b and L_E^s for which the size of the labour force in the export sector does not change over time.[13] The steady-state equilibrium obtains at point E. If the economy's initial position is at, say, point A – characterized by an excess supply of labour in the export sector and a

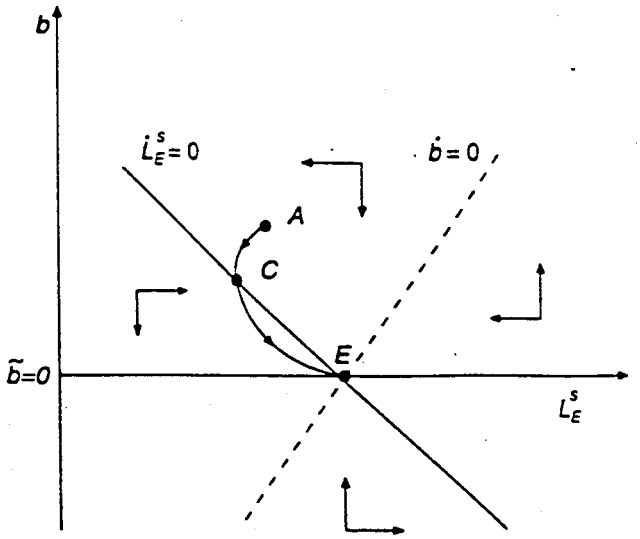

Figure 1 Steady-state equilibrium

current account surplus – the transition towards the steady state will be monotonic and characterized by a continuous reduction in the stock of foreign assets, associated with an initial reduction of the labour force in the export sector (between points A and C) followed by a gradual increase (between points C and E).

3.1 Steady-state effects

Consider now a tariff reform implemented at $t = 0$ starting from a situation in which, as described earlier, lump-sum taxes are zero and the tariff rate is high enough to generate sufficient revenue to cover government spending on non-traded goods. The reform consists in reducing the percentage tariff rate ρ, and simultaneously adjusting lump-sum taxes to equilibrate the government budget.[14]

To study the steady-state effects of the tariff reform, let us first consider the system prevailing before the adjustment. From equation (12), in the steady state, $\tilde{c} = \tilde{y} - \tilde{\tau}$. The government budget constraint (equation (17)) can thus be written as

$$\alpha\rho(\tilde{y} - \tilde{\tau}) + \tilde{\tau} = z^{-1} g_N$$

or, using equation (11):

$$\alpha\rho(\tilde{Q}_E + \tilde{z}^{-1}\tilde{Q}_N) + \tilde{\tau}(1 - \alpha\rho) = \tilde{z}^{-1} g_N \tag{26a}$$

The steady-state equilibrium condition of the labour market is given by, from equations (18) and (19):

$$\tilde{L} = L_N^d(\tilde{z}\tilde{\omega}_N) + \tilde{L}_E^s = L_N^d(\tilde{z}\tilde{\omega}_N) + \tilde{\omega} L_E^d(\tilde{\omega}_N) \tag{26b}$$

where, from equation (5), $\tilde{\omega}_E = \omega_E(\tilde{\omega}_N)$.

Finally, the long-run equilibrium condition of the non-traded goods market can be written as, using equation (16):

$$\alpha\tilde{Q}_N - (1 - \alpha)\tilde{Q}_E\tilde{z} + (1 - \alpha)\tilde{z}\tilde{\tau} = g_N \tag{26c}$$

Equations (26) can be solved in terms of $\tilde{z}$, $\tilde{\omega}_N$, and $\tilde{\tau}$. Tedious but straightforward calculations show that[15]

$$d\tilde{\tau}/d\rho < 0 \qquad d\tilde{\omega}_N/d\rho > 0 \qquad d\tilde{z}/d\rho < 0 \qquad d\tilde{z}\tilde{\omega}_N/d\rho < 0$$

A reduction in the percentage tariff rate raises lump-sum taxes, exerting a negative income effect on total consumption. The induced reduction in private spending on non-traded goods requires a depreciation of the real exchange rate to maintain market equilibrium. The real depreciation tends to increase the product wage in the non-traded goods sector, thereby lowering output and the demand for labour in that sector. The reduction in labour demand puts downward pressure on the market-clearing wage, thus partly offseting the effect of the real depreciation. But because the real exchange rate depreciation

is proportionally larger than the reduction of the real wage in the non-traded goods sector, the product wage rises and lowers output and employment in that sector. By contrast, the reduction in the real wage in the non-traded goods sector leads to a fall in the product wage in the export sector, which stimulates output and employment. The net effect on total employment is in general ambiguous, since employment rises in the export sector, and falls in the non-traded goods sector. Aggregate output measured in terms of traded goods, nevertheless, is likely to rise.

To determine how the relative wage ratio evolves, note that

$$\frac{d}{d\rho}\left(\frac{\tilde{\omega}_N}{\tilde{\omega}_E}\right)=\left(\frac{\tilde{\omega}}{\tilde{\omega}_N}\right)\left(\frac{d\tilde{\omega}_N}{d\rho}\right)\left\{\frac{d\omega_E/\omega_E}{d\omega_N/\omega_N}-1\right\} \tag{27a}$$

which implies that, if the elasticity of the efficiency wage relative to the market clearing wage is less than unity, the wage ratio increases ($d\tilde{\omega}/d\rho < 0$) as a result of tariff reform. Equivalently, wages in the export sector fall proportionally less than the market-clearing wage. From this result, the effect of the tariff reform on the supply of labour in the export sector can also be determined. From equation (19), the steady-state solution for labour supply in the export sector is given by $\tilde{L}^s_E = \tilde{\omega}_E \tilde{L}^d_E/\tilde{\omega}_N$, which implies that

$$\frac{d\tilde{L}^s_E}{d\rho}=\left(\frac{d\tilde{\omega}_N}{d\rho}\right)\left[\tilde{\omega}\frac{d\tilde{L}^d_E}{d\rho}+L^d_E(\tilde{\omega}_N)\left(\frac{\tilde{\omega}}{\tilde{\omega}_N}\right)\left\{\frac{d\omega_E/\omega_E}{d\omega_N/\omega_N}-1\right\}\right] \tag{27b}$$

Given that the demand for labour rises in the export sector ($d\tilde{L}^d_E/d\rho < 0$) and that the wage elasticity is less then unity, equation (27b) indicates that the tariff reform raises the size of the labour force in that sector ($d\tilde{L}^s_E/d\rho < 0$). Moreover, as implied by equation (27a) and the equilibrium condition $\tilde{\omega} = \tilde{L}^s_E/\tilde{L}^d_E$, labour supply rises by more than demand, lowering the employment ratio. To the extent that tariff reform leads to a transfer of labour from the non-traded goods sector (where it earns its marginal product) to the export sector (where it is paid more than its marginal product), the use of production factors becomes less efficient.

The (sectoral) unemployment rate can be defined as

$$u_E = (L^s_E - L^d_E)/L^s_E$$

so that in the steady state, using equation (19):[16]

$$\tilde{u}_E = 1 - (\tilde{\omega}_N/\tilde{\omega}_E)$$

Using the results derived earlier, it can be established that

$$\frac{d\tilde{u}_E}{d\rho}=\tilde{\omega}_E^{-1}\frac{d\tilde{\omega}_N}{d\rho}\left\{\frac{d\omega_E/\omega_E}{d\omega_N/\omega_N}-1\right\} \tag{27c}$$

which shows that a reduction in tariffs raises the unemployment rate in the steady state ($d\tilde{u}_E < 0$) if the elasticity of the efficiency wage with respect to

the market-clearing wage is less than unity. In such a case, the increase in labour demand and actual employment in that sector is more than offset by the rise in the size of the labour force seeking employment in the export sector.

Finally, it can be shown that the purchasing power of workers' earnings in both sectors rises in terms of non-traded goods. However, the net welfare effect of tariff reform is in general ambiguous and depends on the magnitude of the wage differential across sectors.

3.2 Short-run dynamics

To examine the short-run dynamic behaviour of the model after reform, note that equation (23′) becomes, after implementation of the tariff/fiscal adjustment:

$$\dot{b} = i^*b + Q_E^s(\,.\,) - \alpha\iota^{-1}\left[\lambda\left\{i^*b_t + Q_E^s(\,.\,) + z(\,.\,)^{-1}Q_N^s(\,.\,)\right\} - \tau + (1-\lambda)\bar{\tau}\right] \tag{28}$$

with $\tau = z^{-1}g_N$ from equation (17). The dynamic system consists now of (24) and (28), and can be linearized to study its properties.

The impact effect of the trade liberalization programme on wages, employment and output (given that the stock of bonds and the labour force in the export sector cannot change instantaneously) is in general indeterminate and depends on the degree to which consumption responds to long-run income or transitory income. Regardless of the value of λ, however, since labour reallocation across sectors cannot occur instantaneously, the product wage in the non-traded goods sector must remain constant on impact as a result of offsetting movements in the real wage and the real exchange rate:

$$dz_0\omega_N(0)/d\rho = 0 \tag{29a}$$

This result implies therefore (see equation (10)) that output and employment in the non-traded goods sector do not change on impact. The instantaneous effect on total factor income – measured in terms of the price of exports – thus depends only on the direction of the initial effect on output of exported goods:

$$sg\left(\frac{dy_0}{d\rho}\right) = sg\left(\frac{dQ_E^s(0)}{d\rho}\right) = Q_E^{s\prime}sg\left(\frac{d\omega_N(0)}{d\rho}\right) \tag{29b}$$

For instance, if the consumption behaviour of households responds essentially to changes in current resources ($\lambda \to 1$), we have

$$dz_0/d\rho < 0 \qquad d\omega_N(0)/d\rho > 0$$

which indicate that the reduction in tariffs lowers wages in the non-traded goods sector (and thus in the export sector as well) and leads to a depreciation

of the real exchange rate. This result obtains because the impact effect of tariff reform is an increase in lump-sum taxes and a reduction in consumption of both domestic and imported goods. As a result, the real exchange rate must depreciate to maintain equilibrium in the market for non-traded goods. Since, as shown in equation (29a), the product wage cannot change on impact in the non-traded goods sector, the market-clearing wage measured in terms of export goods must fall – thereby reducing the efficiency wage and raising the demand for labour and output in the export sector. The increase in exports – which translates, as shown in equation (29b), into an equivalent increase in net factor income – dampens the initial adverse effect of taxes on private expenditure. The short-run effect on the unemployment rate is

$$\frac{du_E(0)}{d\rho} = -\frac{L^d_{E'}}{L^s_E(0)}\left(\frac{d\omega_N(0)}{d\rho}\right) > 0 \tag{29c}$$

which shows that, as a result of the increase in labour demand and employment in the export sector, the unemployment rate in that sector falls on impact. Thus, while the steady-state effect of tariff reform on unemployment may be negative (if the elasticity of the efficiency wage relative to the market-clearing wage is less than unity), the short-run effect may be positive – assuming that consumption depends mostly on current income.

The dynamic adjustment path is shown in Figure 2. Suppose that the economy is initially located at the steady-state point E. The reduction in the

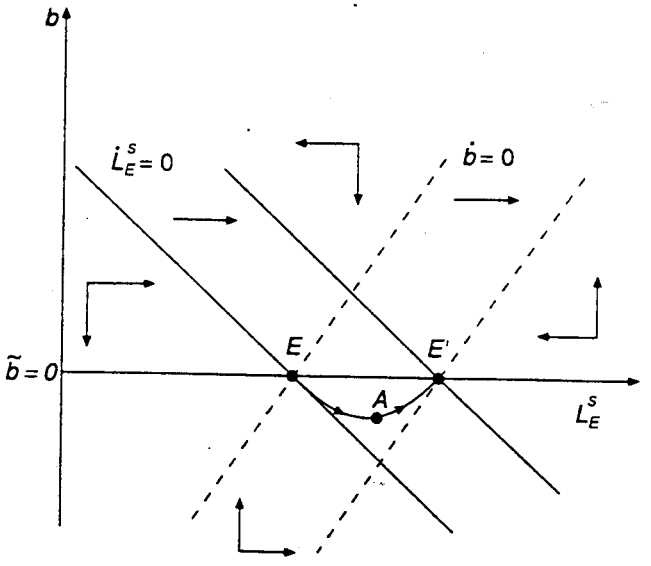

Figure 2 Adjustment to tariff reform

tariff rate shifts both curves [$L_E^s = 0$] and [$\dot{b} = 0$] to the right. In the case shown in the figure, the reduction in the percentage tariff rate raises consumption of imported goods during the transition period. The economy runs a current account deficit during the first stage of the adjustment process (between points E and A) and accumulates foreign debt ($\dot{b} < 0$), whereas in a second stage (between points A and E') it generates a current account surplus which reduces foreign debt ($\dot{b} > 0$).[17] The new equilibrium, which obtains at E', is again characterized by a zero steady-state level of foreign bonds and an increase in the size of the labour force in the export sector.

4. INTUITIVE DISCUSSION OF THE RESULTS

Because several of our results appear to differ markedly from the conventional view of trade reform, it is worth discussing in a more intuitive manner than previously the mechanisms through which an adjustment in tariffs operates in our model. A convenient starting point for this discussion is a brief summary of the standard, trade-theoretic view of the effects of trade liberalization in a small open economy. We then attempt to highlight how the assumptions underlying our analytical framework depart from conventional ones, and how general these alternative assumptions are.

The 'orthodox' or neoclassical view of trade liberalization rests on the assumptions of perfect flexibility of wages and prices, and perfect labour mobility across sectors. The absence of market imperfections implies that (as noted in the introduction) a reduction in tariff protection leads to changes in relative prices that affect both supply and demand, and to a full and instantaneous reallocation of resources across sectors. The reduction in tariffs is associated with an overall transfer of labour from sectors producing non-tradables towards those producing tradables, thus reducing employment in the home goods sector and mitigating the fall in employment in the import-competing industries. However, unemployment cannot emerge in this setting, since workers are perfectly mobile across sectors and wages adjust continuously to clear the labour market.[18]

To address the possibility of unemployment – the main task of the present study – requires taking a stand on the nature of possible deviations from the frictionless, neoclassical world characterized above. Our model departs from the 'orthodox' approach in two major respects: the modelling of the labour market, and the specification of the production structure.

Regarding the modelling of the labour market, there are three major assumptions underlying our results: turnover costs are significant only in the export sector; the elasticity of the wage in the export sector relative to the wage in the non-traded goods sector is less than unity; and labour reallocation across sectors is gradual and follows a Harris–Todaro migration mechanism. Although we are unable to support the assumption that turnover costs matter only in the export sector by detailed empirical evidence, we view our

approach as a plausible way of modelling wage formation in modern industries subject to world competition. The introduction of an intersectoral wage differential in equilibrium serves in our model as a necessary (although not sufficient) condition for unemployment to emerge.[19] We view our assumptions regarding the quit function and the labour migration process as more debatable than the assumption of turnover costs.

The Harris–Todaro migration mechanism embedded in our model plays a critical role in deriving the short-run and steady-state effects of trade liberalization. It prevents an instantaneous reallocation of the labour force across sectors, and requires the wage ratio to be equal in the steady state to the inverse of the employment rate in the export sector. It is precisely the equilibrium condition imposed by the Harris–Todaro migration function that helps determine the steady-state effect of tariff reform on the wage ratio (and consequently on the employment rate in the export sector), the allocation of the labour force, and the unemployment rate, as shown in equations (27). In the general form in which equations (27) are written, they clearly indicate that the steady-state effects of tariff reform on the labour market depend critically on the elasticity of the efficiency wage in the export sector relative to the market-clearing wage in the non-traded goods sector.[20] The quit function specified in our framework – which is derived from underlying micro-economic principles in Agénor and Aizenman (1995) – implies that the wage elasticity is less than unity. As a result, labour supply in the export sector rises by more than labour demand, and the unemployment rate rises. Thus, an alternative (and perhaps equally plausible) specification of the quit function that would yield a wage elasticity higher than unity would imply a *reduction* in steady-state unemployment – as emphasized in the conventional view – whereas an elasticity exactly equal to unity would imply no long-run effect at all. A unit elasticity (or equivalently, a constant relative wage ratio) could be generated in the present framework by modelling efficiency considerations through a wage–productivity link, as rigorously derived by Agénor and Aizenman (1994) in a related context. Overall, therefore, the direction of the effects of tariff reform on the labor market discussed above depends essentially on the plausibility and generality of the Harris–Todaro migration mechanism and on our specification of the quit rate.[21]

The assumption that labour is imperfectly mobile across sectors also implies that the distribution of the labour force cannot change instantaneously. Fixed labour supply in the export sector has important consequences for the short-run effects of trade reform. Although most of these effects are ambiguous in general, we showed that 'perverse' results can be obtained when consumption reacts mostly to changes in current disposable income. A reduction in tariffs in this case lowers wages in the non-traded goods sector – as a result of the real depreciation of the exchange rate induced by the need to offset the initial reduction in consumption spending and maintain equilibrium of the home goods market – and, given the efficiency wage

mechanism embedded in the model, translates into lower wages in the export sector and an increase in labour demand. The employment ratio unambigously rises and the unemployment rate falls (equation (29c)). The assumption that labour is imperfectly mobile across sectors alters fundamentally the conventional transmission mechanism of trade reform, since the reallocation of resources in response to relative price signals can only take place over time. It has, however, considerable appeal from an empirical point of view and has been emphasized by a number of economists (see for instance Mussa, 1986).

Regarding the production structure, the model makes an important assumption: there is no domestic output of importables – or, more precisely, inefficiencies associated with the initial tariff structure are so large that goods that are potentially importable have effectively become non-traded. While our treatment of the production structure may carry some plausibility in the short and medium run, it is clear that a large and sustainable trade reform may significantly alter the composition of production activities over time – for instance, importables that were once non-traded may be traded again. This in turn may lead to a reduction in the opportunity cost faced by workers in the exportable sector, which may stimulate employment and output in that sector. Trade liberalization may also induce the creation of new production activities over time, increasing thereby the demand for labour. Accounting analytically for these types of change in the production structure is beyond the scope of the paper but provides an important caveat to our results. Accordingly, our 'steady-state' results are best characterized as related to the 'medium-run' rather than the 'long-run' effects of trade liberalization on output, wages and unemployment.

5. SUMMARY AND CONCLUSIONS

The role of labour markets in the design of macroeconomic and structural adjustment programmes has been the subject of renewed attention in recent years. This paper has attempted to provide a theoretical framework for understanding the role of a particular set of labour market distortions on the short- and medium-run effects of trade liberalization. The analysis considered a small open economy producing exportable and non-tradable goods, with imperfect labour mobility across sectors. The production process in the export sector was assumed to be characterized by a fixed recruiting and training cost per worker. The quit rate was taken to depend on the wage ratio across sectors. The analysis indicated that the interactions between the process of wage formation and the structure of production activities may lead to an adverse effect of tariff reduction (coupled with an increase in lump-sum taxes to equilibrate the budget) on unemployment in the steady state, despite an increase in output and employment (induced by a fall in real wages) in the exportable sector. The wedge between the efficiency wage and the marginal product of labour in the export sector implies that the sectoral reallocation of

workers reduces production efficiency. Moreover, this adverse effect may not result from labour regulations inhibiting the reallocation of labour and wage flexibility – such as difficulties of firing workers, as argued for instance by Feliciano (1994) and Revenga (1994) in their analysis of the employment effects of trade reform in Mexico – but rather from considerations endogenous to firms. In the short run, trade reform may lead to a reduction in the unemployment rate if households are subject to liquidity constraints. Imperfect labour mobility and the size of the elasticity of wages in the export sector relative to wages in the non-traded goods sector were shown to play a critical role in determining the direction of both the short- and medium-run effects of trade reform on employment and unemployment.

The analysis developed here can (and should) be extended in a variety of directions. We have not examined issues related to intersectoral capital mobility, or those raised by the need to compensate unemployed workers for jobs lost, although this issue bears considerable importance (from a welfare or political-economy point of view) in discussions related to trade liberalization.[22] Introducing wage rigidity in the non-traded goods sector – along the lines of Djajíc and Purvis (1987), for instance – would extent the analysis of unemployment during the transition process. Another important extension would be to account for the existence of worker heterogeneity, along the lines of Agénor and Aizenman (1994). In her study of trade liberalization in Mexico, for instance, Revenga (1994) notes that the observed increase in average manufacturing wages may have reflected a change in the composition of the labour force – a shift towards high-skill, high-wage workers. A similar shift in the composition of the workforce was noted by Currie and Harrison (1994) in their analysis of trade reform in Morocco. Understanding the mechanisms through which tariff reductions affect the skill composition of the workforce is particularly important for studying their distributional effects.

Finally, it is worth reflecting on the gap that appears to exist between the evidence on the employment effects of trade liberalization (which, as discussed in the introduction, provides mixed results) and the favourable evidence on the growth effects of outward orientation, as documented in numerous studies (see, for instance, Edwards, 1993). Analysing such programmes is likely to alter substantially the predictions of our model regarding the impact of trade reform on employment. Even if trade liberalization may entail significant adjustment costs in the short or the medium term, it may still be highly beneficial in the long run. It is, nevertheless, important to weigh carefully potential transitional costs – as emphasized in recent writings on the political economy and the credibility of adjustment programmes – and devise reform strategies so as to minimize them and ensure the sustainability of the adjustment process.

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APPENDIX

In equation (24), we have

$$\frac{\partial J}{\partial b} = \kappa\left(\frac{\partial \omega_N}{\partial b}\right)\left\{\left(\frac{\partial \omega_E}{\partial \omega_N}\right)\left(\frac{\tilde{L}_E^d}{\tilde{L}_E^s}\right)+\left(\frac{\tilde{\omega}_E}{\tilde{L}_E^s}\right)\left(\frac{\partial L_E^d}{\partial \omega_N}\right)-1\right\}$$

$$\frac{\partial J}{\partial L_E^s} = \kappa\left\{\left(\frac{\partial \omega_N}{\partial L_E^s}\right)\left[\left(\frac{\partial \omega_E}{\partial \omega_N}\right)\left(\frac{\tilde{L}_E^d}{\tilde{L}_E^s}\right)+\left(\frac{\tilde{\omega}_E}{\tilde{L}_E^s}\right)\left(\frac{\partial L_E^d}{\partial \omega_N}\right)-1\right]-\frac{\tilde{\omega}_E\tilde{L}_E^d}{(\tilde{L}_E^s)^2}\right\}$$

Equation (5) implies that the elasticity of ω_E with respect to ω_N is less than unity. Using this result and the fact that the wage ratio is equal to the inverse of the employment ratio in the export sector in the vicinity of the steady state (see equation (19)) yields

$$\frac{\partial J}{\partial b} = \kappa\left(\frac{\partial \omega_N}{\partial b}\right)\left\{\left(\frac{\partial \omega_E}{\partial \omega_N}\right)\left(\frac{\tilde{\omega}_N}{\tilde{\omega}_E}\right)-1+\left(\frac{\tilde{\omega}_E}{\tilde{L}_E^s}\right)\left(\frac{\partial L_E^d}{\partial \omega_N}\right)\right\}<0$$

$$\frac{\partial J}{\partial L_E^s} = \kappa\left\{\left(\frac{\partial \omega_N}{\partial L_E^s}\right)\left[\left(\frac{\partial \omega_E}{\partial \omega_N}\right)\left(\frac{\tilde{\omega}_N}{\tilde{\omega}_E}\right)-1+\left(\frac{\tilde{\omega}_E}{\tilde{L}_E^s}\right)\left(\frac{\partial L_E^d}{\partial \omega_N}\right)\right]-\frac{\tilde{\omega}_E\tilde{L}_E^d}{(\tilde{L}_E^s)^2}\right\}<0$$

The coefficients a_{11} and a_{12} in (25) are given by

$$a_{11} = \left\{1-\frac{\alpha\lambda}{\iota}\right\}\left\{i^* + Q_{E^*}^s\left(\frac{\partial \omega_N}{\partial b}\right)\right\}+\frac{\alpha\lambda}{\iota}\left(\frac{\tilde{Q}_N^s}{\tilde{z}^2}\right)\left(\frac{\partial z}{\partial b}\right)$$

$$a_{12} = \left\{1-\frac{\alpha\lambda}{\iota}\right\}Q_{E^*}^s\left(\frac{\partial \omega_N}{\partial L_E^s}\right)-\frac{\alpha\lambda}{\iota}\left\{\left(\frac{\partial Q_N^s}{\partial L_E^s}\right)\tilde{z}^{-1}-\left(\frac{\tilde{Q}_N^s}{\tilde{z}^2}\right)\left(\frac{\partial z}{\partial L_E^s}\right)\right\}$$

NOTES

1 An early review of trade liberalization programmes by Krueger (1983) emphasized the long-run relation between trade orientation and the level of employment, rather than the measurement of the actual, direct effect of trade reform on wages and unemployment during the adjustment process.

2 Although Revenga focuses on the 1985–88 period, trade reform subsequently continued in Mexico. According to estimates provided by Dornbusch and Werner (1994: 261) the average tariff rate fell from 22.6 per cent in 1986 to 13.1 per cent in 1992. For consumer goods alone, the average tariff declined from 60 per cent in 1983–84 to less than 20 per cent. The import quota cover rate (the proportion of the total value of imports subject to quantitative restrictions) fell to 11 per cent in 1992, from 28 per cent in 1986.

3 In the same vein, Feliciano (1994) reports no significant impact of the Mexican trade reform on manufacturing employment. She also finds an increase in wage dispersion across industries, rather than an effect on average manufacturing wages.

4 The models considered by Cox-Edwards and Edwards (1994) are also subject to the first type of limitations, although they do address the issue of intersectoral labour mobility. In addition, their treatment of the dynamics associated with trade liberalization does not allow a full characterization of the adjustment process.

5 There is no domestic import-competing sector in this economy. This assumption can be rationalized by assuming that efficiency losses induced by the initial level of tariff protection are so high that goods once produced in the importable sector have effectively become non-traded goods.

6 Except otherwise indicated, partial derivatives are denoted by corresponding lower-case letters, while the total derivative of a function of a single argument is denoted by a prime.

7 The logistic specification is the proper reduced form if workers' preferences for the location of their work activities are heterogeneous. For further details, see Agénor and Aizeman (1995).

8 This restriction appears quite reasonable in practice, although there exists little systematic evidence on quit rates for developing countries. Authors such as Renard (1984) suggest that the rate of turnover in modern sector jobs (which are relatively more secure) is very low. Relying on the evidence for industrial countries would not contradict the assumption made in the text. For instance, in a recent study of the manufacturing sector in the United States, Anderson and Breyer (1994) estimate the average quarterly turnover rate at 23 per cent (varying from 14 per cent in the industrial public sector to 48 per cent in agro-industries). The quit rates associated with permanent and temporary separations are respectively 17 per cent and 6 per cent.

9 This result holds regardless of the direction in which an increase in the real wage in the non-traded goods sector affects the product wage in the export sector. Formally, we have

$$Q_E' = -\left(\frac{\alpha_E}{1 - \alpha_E}\right)\left(\frac{\tilde{Q}_E}{\tilde{\Omega}_E[\,.\,]}\right)\left(\frac{\tilde{\omega}_E}{\tilde{\omega}_N}\right) < 0$$

where a tilde is used throughout to denote steady-state values.

10 Note that our measure of permanent resources abstracts from discounting considerations. The value of λ may reflect, for instance, the intensity of domestic liquidity constraints faced by households, which may prevent them from smoothing consumption spending in line with the long-run expected stream of income.

11 The assumption that lump-sum taxes are initially zero is made for simplicity only. It allows us to characterize the tariff/fiscal reform discussed below as being a switch from distortionary taxes to a non-distortionary form of taxation.

12 Relocation costs would be particularly important if the production sectors were physically separated – as would happen if the non-traded good were an agricultural commodity produced in rural areas, and traded good a manufactured item produced in urban areas.

13 The locus [$\dot{b} = 0$] is drawn as a hatched line in the figure to highlight the fact that its slope is not necessarily positive. If a_{12} is negative, [$\dot{b} = 0$] will be also downward-sloping. Global stability then requires the [$L_E^s = 0$] locus to be steeper than [$\dot{b} = 0$].

14 As indicated earlier, the assumption that lump-sum taxes are initially zero allows us to capture the case in which the country considered only has access to distortive means of taxation prior to reform. The policy experiment considered here involves therefore an element of fiscal restructuring, in that it consists of switching to less distortive taxation instruments.

15 As appendix providing the exact solutions is available from the authors upon request.

16 Unemployment is thus positive in the steady state. Since the government operates no unemployment benefits scheme in this model, unemployed workers in the steady state are assumed to revert to a 'subsistence' sector or to rely on working relatives.

17 As can be inferred from equation (28), the adjustment path depicted in the figure corresponds to the case where adjustment is monotonic and aggregate consumption depends mostly on long-run income, that is, $\lambda \rightarrow 0$. The rise in expenditure therefore reflects the positive effect of tariff reform on the steady-state value of income. However, it should be noted that the reverse scenario would prevail if instead aggregate consumption were assumed to be mainly a function of current income ($\lambda \rightarrow 1$).

18 To the extent that the income effect associated with trade reform affects the supply of labour, 'secondary' wage and employment effects may occur. Such effects would not, however, lead to an increase in unemployment with perfect wage flexibility.

19 It should be noted that in the absence of any type of frictions in intersectoral labour mobility, involuntary unemployment would not normally emerge in our model since wages in the non-traded goods sector are perfectly flexible. Voluntary unemployment would exist if the disutility associated with working in the non-traded goods sector is perceived to be higher than the cost of remaining unemployed.

20 The elasticity condition was also used in signing the partial derivatives of the function relating changes in employment in the export sector to the expected wage differential (equation (24)).

21 As can be inferred from the results of Arellano (1981) and Renard (1984), alternative specifications of the migration function (equation 19) may affect our results. Stark (1991) provides a thorough criticism of the Harris–Todaro migration mechanism, particularly with regard to the absence of any role played by non-pecuniary elements – such as family and religious ties – in the decision to migrate.

22 Brecher and Choudhri (1994) have recently examined this issue – with a focus on taxation-based compensation schemes – in a static model in which efficiency wages (motivated by a wage–effort link) generate unemployment, as in the model developed here.

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