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Market Liberalization Policies in a Reforming Socialist Economy

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Abstract

This paper presents a model of a socialist economy, incorporating bargaining over wages and employment in the socialized sector, efficiency wages in the non-socialized sector, and shortages which are reflected in the black market. The model is used to analyze the implications of liberalization policies, including trade liberalization, an administered price increase, and permission for increased direct foreign investment. The results suggest, among other things, that reforms may have different effects under different trade regimes; that small price reforms may have perverse effects; and that foreign investment in a shortage economy may be immiserizing.

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Summary

Reforming socialist economies have dismantled or weakened central planning but have not yet replaced it with an effective market mechanism. State enterprises are often dominated by workers' councils. Prices are frequently subject to administrative controls, producing price distortions that result in shortages, which, in turn, often give rise to extensive black market trading. Although the nonsocialized, or private, sector often accounts for a large share of production, the absence of efficient capital markets limits the flow of capital into this sector.

This paper presents a model of a reforming socialist economy, using a variant of the sector-specific trade model. In the socialized sector, the state enterprise, which is labor dominated, bargains with the government over wages and employment. The output of the socialized sector, the price of which is assumed to be administratively fixed at a level resulting in shortages, is rationed through queuing. Because workers are free to join the queue, their reservation wage is the income they could earn by acting as arbitrageurs--that is, by queuing to purchase goods for resale in the black market. In the nonsocialized sector, the absence of job security enables firms to use an efficiency wage mechanism, by which they elicit more effort from their workers by paying them more than their reservation wage. The model considers two alternative trade regimes: a tariff and a quota.

This model is used to analyze the effects of liberalization policies. First, the paper examines trade liberalization, which directly eases shortages and, therefore, reduces the resources employed in the black market and increases output and employment in both productive sectors--but only up to the point at which the shortage is eliminated. Beyond that point, further trade liberalization would cause the socialized sector to contract.

Next, administered price adjustment is considered. The model demonstrates that a small adjustment may have perverse effects. An administered price increase enables the state enterprise to raise both wages and employment, so it may result in an increase in black market revenues if the initial price distortion is large enough. If this occurs, the nonsocialized sector contracts, and national income may actually fall. This suggests an additional argument for rapid rather than gradual adjustment of prices.

Finally, the implications of liberalizing foreign investment are considered. The model shows that, if imports are limited by a quota, foreign investment in the nonsocialized sector may lead to a reduction in employment and output in the socialized sector, which would exacerbate the shortage of the good produced there and might actually lower national income. The liberalization of prices or the abolition of quantitative trade restrictions may therefore be a precondition if foreign investment is to benefit a reforming socialist economy.

I. Introduction

The economic transformation currently being undertaken by many countries in Eastern Europe, and contemplated for the Soviet Union, is often portrayed as a "leap to the market" (e.g., Sachs, 1990). It is widely recognized, however, that this metaphor exaggerates the speed with which a switch to a full-fledged market economy can be made: building new institutions simply takes time. In many countries, including Hungary, Poland, and Yugoslavia in the 1980s, and the Soviet Union in the early 1990s, reforms have been undertaken gradually, while preserving the basic structures of a socialist economy. As a result, in the interim, there has existed a situation of "neither plan nor market", in which no central economic plan is implemented but in which the state continues nominally to own a substantial part of state enterprises. A reforming socialist economy may also have a substantial non-socialized sector, consisting of industries that were never nationalized to begin with, newly established private firms and, in some cases, privatized formerly-state-owned enterprises.1/ The aim of this paper is to develop a model of such a reforming socialist economy (RSE), and to explore the consequences of market-oriented policies in the context of such an economy.

In a RSE, the employees often dominate the enterprises' management, through worker-led enterprise councils; workers in such labor-dominated enterprises thus implicitly have some property rights over the enterprise that employs them. Despite the absence (or irrelevance) of a central plan, the state frequently continues to influence enterprises' wage, employment and output decisions through a variety of other channels. The vagueness of property rights over the state enterprise, together with the "soft budget constraints" which arise from the state's propensity to tax away exceptional profits while accommodating any losses through subsidies and easy credit, as well as the substantial domestic market power enjoyed by many state enterprises, imply that the enterprise's wage and employment decisions may be viewed as the outcome of bargaining between the government and the enterprise's employees over their shares of the enterprise's earnings. In most socialist economies, moreover, the importance of this bargaining is enhanced by the fact that the state enterprises are the primary source of revenues for the state budget (Tanzi, 1991; Lane and Dinopoulos, 1991). 2/

1/ For example, in Poland in the late 1980s, the officially recognized private sector accounted for about 25 percent of total output; this is likely to be an underestimate, as it omits production in the "shadow economy" (Kalicki, 1989).

2/ For instance, in Poland in 1989 taxes and dividends on socialized enterprises constituted 80 percent of the total revenues of the state budget, and transfers from financial institutions (also state-owned) another 10 percent; only 5 percent of total revenues came from taxation of non-socialized enterprises.

Another feature of the state enterprises is the weakness of the link between wages and effort. For employees of state enterprises, the general perception is that "they pretend to pay us and we pretend to work": low wages are associated with low levels of effort. In contrast is the widespread impression that workers in the private sector are paid more and work harder. The theory of efficiency wages is based on the notion that higher wages could create an incentive for workers not to shirk if coupled with the possibility that shirking could cost a worker his job (e.g., Stiglitz, 1974; Shapiro and Stiglitz, 1984; Summers, 1988); the incentive mechanism depends on the possibility of dismissal and on the existence of a wage differential in relation to workers' income if dismissed. 1/ Efficiency wages are more likely to be relevant in the private sector, since in state enterprises, there is perhaps too much job security to make such an incentive mechanism operational.

A transitional socialist economy may also be characterized by shortages. The government may continue to exert an influence over prices, and price controls may be associated with shortages, queues, and black market activity. In many socialist economies, the "shadow economy" is highly developed. A convenient, and probably not unrealistic assumption is that black-market activity exhausts the rents associated with the controlled price (e.g., Barzel, 1974; Lipton and Sachs, 1990).

In this paper, a model that combines these features of a socialist economy will be presented. The paper proceeds as follows. In section II, the model will be presented. In section III, the equilibrium of the model is characterized. In section IV, the model will be used to analyze the consequences of price reform and trade liberalization. In section V, the implications of permitting an increase in direct foreign investment in this setting will be examined. Section VI concludes the paper.

II. A Model of a Reforming Socialist Economy

In this section, we present a simple model of a reforming socialist economy. The model is a "real" one, so we abstract from the macroeconomic features of a socialist economy which are important for stabilization policies. The model is static, and thus disregards the role of expectations and adjustment in the reform process. 2/ The labor market, as discussed in the introduction, is central to the analysis; we examine the structure of

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1/ We disregard an alternative rationale for efficiency wages, related to workers' health and nutrition (see Katz, 1986): this may be relevant in some developing countries, but probably not in Eastern Europe--not, for example, in Poland, whose residents had an average daily intake of 3300 calories per day in 1988--between that of Germany and France (World Bank, 1991).

2/ See Calvo and Frenkel (1991) for a model of how expectations about reform influence the behavior of agents during the transition process.

wages and the allocation of labor between the socialized (SS) and non-socialized sectors (NSS) and the shadow economy or black market.

We assume that output in each sector utilizes labor and sector-specific capital. This assumption seems particularly appropriate, not only because of central allocation of capital, but especially because of the absence of well functioning capital markets in socialist economies, which may limit the mobility of capital across sectors (see e.g., Calvo and Coricelli, 1991).

The SS consists of a state enterprise. As discussed in the introduction, the wage, output and employment decisions of the state enterprise are viewed as the outcome of bargaining between the enterprise's management (dominated by its employees) and the state, which is the enterprise's nominal owner. It sells its output at a price that is administratively fixed below the market clearing level and gives rise to excess demand. In this model, the shortage is associated with a relative price imbalance, not an aggregate liquidity overhang. This assumption is made largely for the convenience of using a "real" model, but is also consistent with evidence adduced by Portes (1980) and others, which has cast doubt on the empirical relevance of a liquidity overhang as an explanation of shortages. The difference between official and market clearing prices of the SS output gives rise to black market activity, which we model as directly unproductive profit seeking (DUP) activity (Bhagwati, 1982). We assume that the rationing mechanism consists of queues formed by arbitrageurs who buy output at the official price and sell it at the black market price. Workers who cannot find a job either in the private sector or in the socialized sector become arbitrageurs; this implies that the income received by those engaging in black market activity (the "black market wage") is the reservation wage.

The NSS is perfectly competitive and produces an output that is different from that of the SS. It has a neoclassical production function using a sector specific input (say capital) and labor measured in efficiency units. As discussed in the introduction, private firms have the right to fire workers and consequently each worker's effort depends on the differential between the NSS wage and the wage in the black market. The incorporation of efficiency wages allow us to examine how various market-oriented policies affect the effort of workers in the NSS. The effort of workers in the SS is assumed to be unaffected by wage differentials (and normalized to unity) because of the inability of the state enterprise to fire workers who shirk. 1/

1/ cf. Lipton and Sachs (1990), who mention anecdotal evidence suggesting that the widespread absenteeism which had been prevalent in state enterprises in Poland before 1990 decreased dramatically as the 1990 reform program increased the threat of unemployment.

The trade regime is modeled by assuming that the economy exports the good produced in the NSS and imports the SS good. 1/ The latter is subject to either a binding quantitative restriction or a tariff, such that the domestic market clearing price exceeds both the world price and administered domestic price.

The next three subsections introduce the state enterprise, the black market, and the private sector, respectively.

1. The socialized sector

The model of the SS is similar to that presented in Lane and Dinopoulos (1991). The SS is modeled as a labor-dominated firm whose objectives can be represented by a utility function that depends positively on the employment level and on the difference between the wage in the socialized sector and the workers' reservation wage. We adopt a modified Stone-Geary form for this utility function 2/:

$$U(w_x, L_x; w_b) = (w_x - w_b)^{\theta} L_x^{\gamma} \qquad (1)$$

where w_x is the wage in the socialized sector, L_x is the employment level in the socialized sector and w_b is the reservation wage --i.e. the income that may be earned by queuing for scarce goods which are then re-sold at black market prices. The parameters θ and γ correspond to the excess wage and employment elasticities of U (.); we will use the term "wage (employment) oriented" if $\theta>\gamma$ ($\theta<\gamma$); the intermediate case, in which $\theta = \gamma = 1$, corresponds to maximization of excess labor income. For the sake of clarity, we will assume, unless we state otherwise, that the state enterprise is employment oriented.

1/ In practice, this assumption may not be realistic; many of the exports of Eastern European countries are from state enterprises. However, the alternative -- to have the SS exporting -- would be less satisfactory as it would imply that goods were being exported in the face of domestic shortages; this would require a more complex explanation (or an arbitrary assumption) to determine the level of exports. The alternative would be to disaggregate the SS into exporting and import-competing subsectors, but that would make the model intractable.

2/ This utility function has been used extensively in the literature to represent the objectives of labor unions; see McDonald and Solow (1981), Brander and Spencer (1988), Mezzetti and Dinopoulos (1991); Pemberton (1988); Lane (1991b); and Dinopoulos (1991) among others. The excess wage is defined in terms of the black market wage because the latter represents the opportunity cost of labor. The wage in the private sector might be higher than w_b due to efficiency considerations.

Output is produced through a neoclassical production function

$$X = F(L_X, K_X) \tag{2}$$

where K_X is sector-specific capital which is assumed to be fixed. 1/

The state enterprise is owned by the government which is interested in maximizing total tax revenues collected from the enterprise. This formulation of the government's objective is designed to capture the heavy dependence of government revenues on enterprise taxation, as discussed in the introduction. These tax revenues are equivalent to the enterprise's profits.

$$\Pi_X = P_X F(L_X, K_X) - r_X K_X - w_X L_X \tag{3}$$

where P_X is the official price, r_X is the opportunity cost of the government's capital K_X, and w_X is the wage in the socialized sector. All prices are expressed in units of the good produced in the NSS, which is assumed to be the exportable.

The labor-dominated firm and the government bargain over the wage w_X and employment L_X taking the centrally controlled price, P_X, and the reservation wage as given. This is intended to capture the extensive bargaining over wages, taxes and other aspects of enterprise's decisions that characterizes reformed socialist economies. The fixed official price P_X is consistent with the observation that many relative prices in socialist economies have been historically fixed below market clearing levels. Bargaining is assumed to follow the generalized Nash bargaining model (Nash, 1950). The Nash solution is obtained by maximizing the generalized Nash product:

$$H(w_X, L_X; P_X, w_b) = [P_X F(L_X, K_X) - w_X L_X]^{1-\alpha} [(w_X - w_b)^{\theta} L_X^{\gamma}]^{\alpha} \tag{4}$$

where $0 \leq \alpha \leq 1$ is a parameter capturing the relative bargaining power of the enterprise vis-à-vis the government. The threat points of the bargaining game correspond to a possible shutdown of production; this would imply that L_X would be zero, so that, the government's revenues would be $-r_X K_X$ (because K_X is fixed) and the utility of the enterprise would be zero. The Nash bargaining solution implies, however, that agreement is reached at an efficient combination of wage and employment, so that these threats are not realized.

1/ In Lane and Dinopoulos (1991) we assumed a linear production function, such that $X=L_X$.

Maximizing H(.) with respect to the negotiated wage, w_x, and employment, L_x, we obtain the following first order conditions: 1/

$$H_1(w_x, L_x) = H\left[\frac{\alpha\theta}{w_x - w_b} - \frac{(1-\alpha)\, L_x}{P_x F(L_x) - w_x L_x} \right] = 0 \tag{5a}$$

$$H_2(w_x, L_x) = H\left[\frac{\alpha\gamma}{L_x} - \frac{(1-\alpha)\,(w_x - P_x F_1)}{P_x F(L_x) - w_x L_x} \right] = 0 \tag{5b}$$

These two equations determine the negotiated wage and employment in the SS for a given price level P_x and black market wage w_b. These conditions may further be expressed as follows:

$$w_x = w_b \frac{\gamma}{\gamma-\theta} - \frac{\theta}{\gamma-\theta} P_x F_1(L_x) \quad \text{(contract curve)} \tag{6a}$$

$$w_x = \lambda P_x \frac{F(L_x)}{L_x} + (1-\lambda) P_x F_1(L_x) \quad \text{(Nash bargaining curve)} \tag{6b}$$

where $\lambda = \alpha\gamma/(1-\alpha+\alpha\gamma)$ with $0 \leq \lambda \leq 1$. Equation (6a) defines the contract curve (CC) and expresses the negotiated wage w_x as a function of employment in the SS. The CC is the locus of tangencies between the state enterprise indifference curves and the iso-tax-revenue contours. 2/ The CC passes through the intersection of a wage line $w_x = w_b$ and the value of the marginal product of labor, $P_x F_1(L_x)$. The slope of the CC has the same sign as $\gamma-\theta$: if the firm is employment oriented, the CC is positively sloped; if the firm is wage oriented the CC is negatively sloped; and if the firm cares equally for wages and employment, seeking to maximize its employees' total excess wage income, the CC is vertical.

Equation (6b) defines the Nash bargaining curve (NBC) in wage-employment space. It is downward sloping and expresses the negotiated wage, w_x, as a convex combination of sales revenue per worker $P_x F(L_x)/L_x$ and the value of the marginal product of labor $P_x F_1(L_x)$. The coefficient λ increases in the bargaining power of the firm, α. The NBC determines the fraction of labor negotiated compensation for each level of employment.

1/ Arab numeral subscripts denote derivatives of a function with respect to the relevant argument. For example:

$$H_1(w_x, L_x) = \partial H/\partial w_x \text{ ; and } H_{11}(w_x, L_x) = \partial^2 H/\partial^2 w_x$$

2/ To see this property consider the slope of an iso-tax curve $dw_x/dL_x = -(w_x - P_x F_1(L_x))/L_x$ and the slope of an indifference curve $dw_x/dL_x = -\gamma(w_x - w_b)/\theta L_s$. Equality of these two expressions gives equation (6a).

Figure 1 illustrates the determination of the negotiated wage, w_x, and employment, L_x, in the socialized sector, for a fixed price, P_x, and reservation wage, w_b. Figure 1A shows the case of an employment oriented firm and Figure 1B depicts the equilibrium in the case of a wage oriented firm. The intersection at point E of the contract curve, CC, and the Nash bargaining curve, NBC, determines the negotiated wage, w_x^*, and the level of employment, L_x^*. Figure 1 also depicts a typical iso-tax curve Π_x^o and a typical indifference curve U^o which are tangent at a point on the CC. As we move towards the origin of the CC, taxes increase and the firm obtains lower utility levels.

In Figure 1, total revenue of the state enterprise, $P_xF(L_x^*)$, equals the area OL_x^*AG. This revenue is divided between the workers, who get $w_x^* L_x^*$, which is equal to area $OL_x^*Ew_x^*$ and tax revenues, $P_xF(L_x^*) - w_x^*L_x^* - r_xK_x$, which are equal to area w_x^* EAG. The location of the NBC, which depends on relative bargaining power, determines the division of total revenue between the government and the enterprise. Note that as long as the enterprise has positive bargaining power, the negotiated wage, w_x^* exceeds the value of marginal product of labor, $P_xF_1(L_x^*)$, which is given by distance L_x^* B in Figure 1. Constant returns to scale in F() imply that profit plus returns to capital per unit of capital, Π/K_x+r_x, is less than $P_xF_2(L_x^*, K_x)$, the value of the marginal product of capital. Bargaining over the wage creates a capital market distortion by reducing the rental of capital below its productivity: this is essentially because labor is able, through bargaining, to appropriate some of the returns to capital in the socialized sector.

A useful comparative statics exercise is to trace the effects of an increase in the reservation wage w_b. It is obvious from Figure 1 that an increase in w_b reduces employment and output and increases the negotiated wage. It can be shown that the negotiated wage increases by less than the reservation wage and the excess wage in the socialized sector is consequently a decreasing function of the reservation wage.

By eliminating the negotiated wage from equations (6a) and (6b) we can express the relationship between the reservation wage, w_b, and the negotiated employment level, L_x:

$$w_b = \beta P_x \frac{F(L_x, K_x)}{L_x} + (1-\beta) P_xF_1(L_x, K_x) \qquad (7)$$

where $\beta = (\gamma-\theta)\alpha/(1-\alpha+\alpha\gamma)$. Equation (7) can be thought of as the inverse demand for labor curve for the socialized sector (expressed as a function of the reservation wage, rather than the actual wage, which is negotiated simultaneously with employment). Notice that equation (7) implies that if the state enterprise does not have any bargaining power, (α=0) then $w_b = P_xF_1(L_x,K_x)$, that is the reservation wage equals the value of marginal product of labor. In general equation (7) defines a downward sloping curve

in wage employment space which will later be used to determine graphically the intersectoral allocation of labor.

2. The Non-Socialized Sector (NSS)

In contrast to the socialized sector, the private sector is characterized by competition and the absence of job security. In a previous paper (Lane and Dinopoulos, 1991), we have modeled the NSS as a perfectly competitive one. Here, we introduce endogenous efficiency considerations by adopting a variant of the efficiency wage model. 1/

The technology of the NSS is described by a neoclassical production function:

$$Z = Z(E, K_z) \tag{8}$$

where E is total labor measured in units of efficiency $E = eL_z$ and K_z is the sector specific capital in that sector. A worker fired from the NSS can enter the black market and earn the reservation wage, w_b. Following the spirit of the efficiency-wage theory, we postulate that the effort of an individual worker in the NSS is an increasing concave function of the difference between the wage in the NSS and the reservation wage,

$$e = e(w_z - w_b) \ , \tag{9}$$

where w_z is the NSS wage.

The representative firm in the NSS maximizes profits with respect to its wage w_z and employment L_z, given the reservation wage, w_b. The details of this optimization are presented in Appendix A. The result is that both employment and output in the NSS are decreasing functions of the reservation wage. A higher reservation wage w_b is also associated with a greater wage differential $(w_z - w_b)$ and thus (by (9)) with a higher level of efficiency e.

The efficiency wage framework allows for the possibility of a wage structure in which the wage in the NSS may either exceed or fall short of that in the SS. It thus provides a rationale for the widespread perception in some Eastern European countries that workers in the private sector are paid more than those in state enterprises, but also work harder.

To complete the analysis of intersectoral labor allocation, we shall proceed in the next section to model the use of labor in the black market.

1/ See the literature cited in the introduction. Efficiency wages have been incorporated into a two-sector general equilibrium model by Brecher (1990).

Figure 1: Wage and Employment Determination in the SS

Figure 1A: Employment Oriented Firm $(\gamma > \theta)$

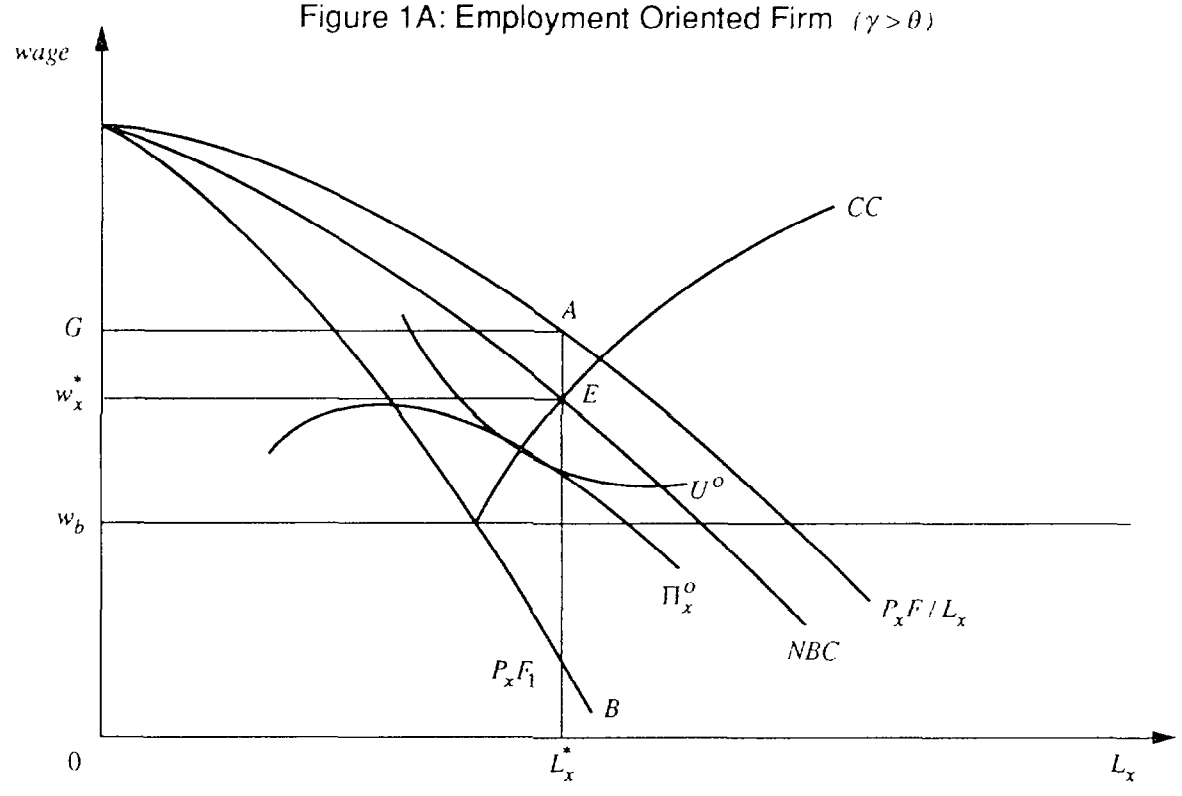
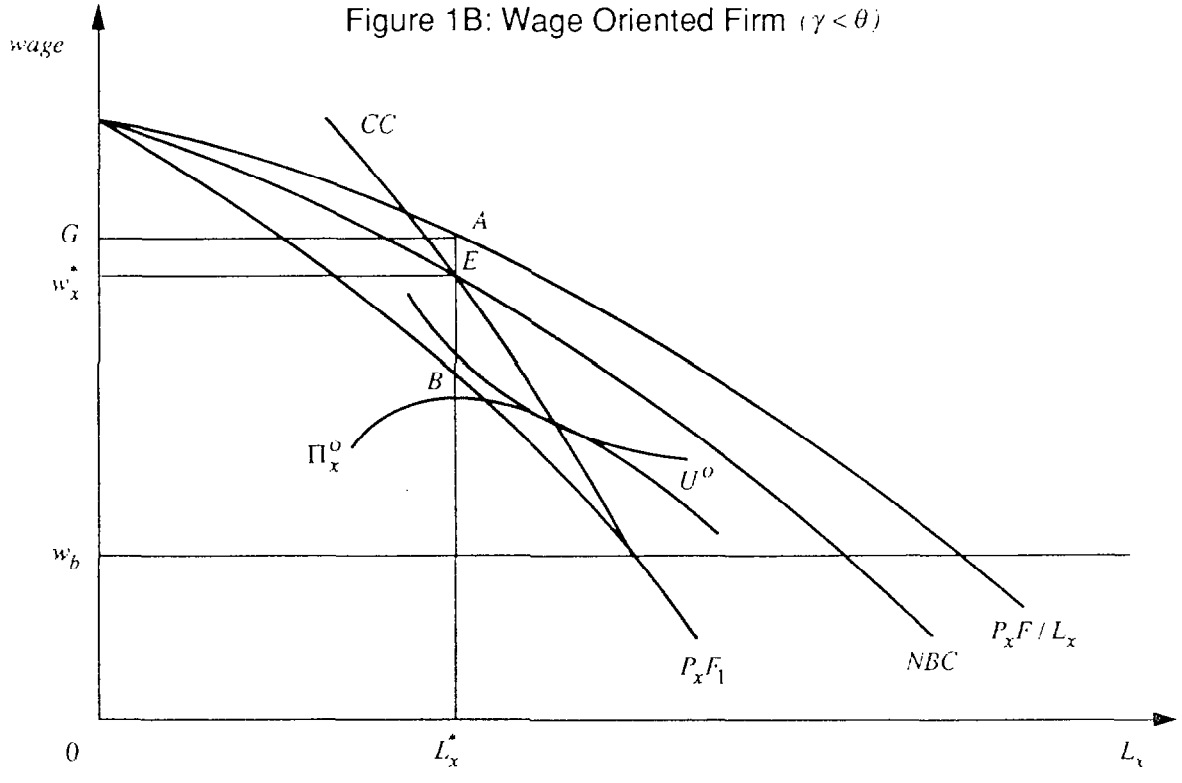


Figure 1B: Wage Oriented Firm $(\gamma < \theta)$



3. Supply shortages and queues

We assume that at the official price P_x, there is an excess demand for good X which needs to be rationed. We consider a very simple rationing mechanism which consists of waiting lines outside the official stores. In principle, the queue may consist of employed consumers, as well as professional middlemen who queue to purchase goods at the official price and resell at the black market price P_b. In our model all queuing is done by persons who are otherwise unemployed and who queue for goods for purchase and resale; Appendix B establishes conditions under which this will be the case.

Black market services do not enter directly into either sector's production function or into the social welfare function; this implies that queuing is modeled as a directly-unproductive profit-seeking (DUP) activity, as characterized by Krueger (1974), Bhagwati and Srinivasan (1980), and others. We assume (as in Dinopoulos (1984)) that black market activity uses only labor and is characterized by constant returns to scale. We assume that all goods sold in the black market are produced in the SS, and vice versa.

Free entry into the black market, together with the linearity of the queuing technology, then implies the following zero-profit condition:

$$(P_b - P_x)X = w_b L_b \tag{10}$$

where $P_b - P_x$ is the difference between the black market and the official price, w_b is the black market wage and L_b is the amount of labor in the sector. Condition (10) simply states that net revenues from selling X units in the black market are equal to total labor costs.

4. Consumer tastes and international trade

We close the model by describing the behavior of consumers and the trade regime which determine the black market price P_b. The black market price P_b establishes equilibrium in the black market, and thus, by Walras's law, clears the market for both goods. The price of imported goods must also equal P_b; with a quota, this occurs through an adjustment of the price, while with a tariff it results from an adjustment of the quantity of imports consistent with maintaining the black market price at the world price plus the tariff.

All consumers in the economy are identical and their tastes are represented by the following utility function:

$$V(D_X, D_Z, \ell) = S(D_X, D_Z) + \phi(\ell) \tag{11}$$

where D_x and D_z are quantities consumed of the two goods and ℓ is leisure. The utility function V(.) is increasing and concave in its three arguments, and separable in leisure. The function S(.) is assumed to be homothetic in D_x and D_z; and the marginal utility of leisure is positive and decreases in leisure (i.e., $\partial\phi/\partial\ell > 0$, $\partial^2\phi/\partial\ell^2 < 0$).

The pattern of trade of this small open economy is, for analytical convenience, assumed to be such that the socialized sector imports and the private sector exports. Denoting with P_x^* the world relative price of the importable, the balanced trade condition is:

$$Q_z = Q_x \, P_x^* \tag{12}$$

where Q_x is the quantity of imports of the good produced in the SS and Q_z is the quantity of exports of the good produced by the NSS. Under free trade, the black market price P_b and the official price P_x must both be less than or equal to the international price P_x^*. We assume that $P_x^* < P_x$ which means that with price decontrol and free trade, the SS would still be import competing; we assume, however, that the socialized sector is protected by either a quota or a tariff. First the case of a quota and then that of a tariff will be examined. Q_x denotes the quota level of imports which is fixed by the government and is binding. The quota revenues $(P_b - P_x^*)Q_x$ (as well as the enterprise tax revenues), are collected by the government.

III. Equilibrium in a Shortage Economy

In this section, we shall analyze the equilibrium of the model. To determine the intersectoral labor allocation, we need first to express the amount of labor devoted to queuing as a function of the reservation wage w_b. The utility function $\phi(.)$ implies that the black market price P_b is a decreasing function of the ratio D_x/D_z because tastes are assumed to be homothetic. We can therefore write

$$P_b = h\,(X + Q_x,\; Z - Q_x/P_x^*) \;,\; h_1 < 0 \;,\; h_2 > 0 \tag{13}$$

where $D_x = X + Q_x$ is the consumption of the importable and $D_z = Z - Q_z = Z - Q_x/P_x^*$ is consumption of the exportable. Because Q_x is the binding quota, and both X and Z depend on the black market wage (see equations (7) and (A5)), the black market price is a function of the reservation wage for a given import quota. Consequently, we can express the black market price as a function of the wage w_b and the import quota.

$$P_b = P_b(w_b,\; Q_x) \tag{14}$$

where $\partial P_b/\partial w_b = h_1\,(\partial X/\partial w_b) + h_2\,(\partial Z/\partial w_b) \gtrless 0$ and $\partial P_b/\partial Q_x = h_1 - h_2/P_x^* < 0$. Substituting (14) into the zero profit condition (10), the amount of labor devoted to black market activity, L_b, can be expressed as a function of the reservation wage w_b for any given quota level Q_x.

$$L_b = \frac{[P_b(w_b, Q_x) - P_x]X(w_b)}{w_b} \qquad (15)$$

Labor employed in the black market, L_b, is thus not necessarily a monotonic function of w_b over the relevant range. For instance, if there exists a reservation wage $\bar{w}_b$ such that the state enterprise shuts down, i.e., $X(\bar{w}_b) = 0$, total revenues from queuing and thus L_b must equal zero at this wage, and domestic consumption of good X must then equal imports, Q_x. As the reservation wage is reduced, the numerator in (15) increases, reaches a maximum (which need not be unique) and then decreases to zero again. Consider a wage $\underline{w}_b$ such that the output of the state enterprise together with imports is such that the market clears at the official price; at this wage, $P_b = P_x$ and $L_b = 0$. Thus, under an import quota regime the amount of labor in the black market bears a non-monotonic relationship to the reservation wage, as dictated by the non-monotonicity of the revenue associated with the shortage. 1/

Figure 2 shows the intersectoral allocation of labor and the determination of the reservation wage in a reforming socialist economy. The length of the horizontal segment O_xO_z measures the total endowment of labor in the economy $\bar{L}$. The two vertical axes express the reservation wage in units of good Z. Point O_x corresponds to the origin of the socialized sector and point O_z denotes the origin of the non-socialized sector. The downward sloping curve labelled L_x is a graph of equation (7) and expresses the relationship between the reservation wage and the negotiated employment in the socialized sector L_x. The curve labelled $L_x + L_b$ is the demand for labor in both the state enterprise and the black market. It is obtained by adding horizontally the graph of equation (15) to the graph L_x. At $L_x = 0$ the revenue available for DUP activities is zero and $L_s + L_b = 0$; in addition at $w_b = \underline{w}_b$, $P_b = P_x$ and $L_x + L_b = L_x$. The curve labelled L_z, which is downward sloping in relation to the NSS origin O_z, expresses the demand for labor in the non-socialized sector as a function of the reservation wage (as discussed in section II.2). The intersection of curves L_z and $L_x + L_b$ at point A determines the equilibrium reservation wage w_b^* and intersectoral allocation of labor. In Figure 4, $O_xL_x^*$ is the equilibrium employment in the state enterprise, $L_x^*L_z^*$ is labor devoted to DUP activity in the black market, and $O_zL_z^*$ is private sector employment.

The fact that the labor employed in the SS and the black market may not be a monotonic function of the reservation wage introduces the possibility of multiple equilibria. Figure 3 shows the case of two equilibria, one of

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1/ If imports were restrained by a tariff instead, the difference between the black market and official price would depend only on the tariff; in that case the amount of labor L_b would necessarily be a decreasing function of the reservation wage w_b. The difference between the two trade regimes is developed in the next section.

which involves a lower level of output of both sectors, a higher reservation wage, a higher level of black market employment, and a higher black market price than the other; this "bad" equilibrium which is associated with point A, however, turns out to be stable, and the other one which corresponds to point A' is unstable. The possibility of non-uniqueness of equilibrium is explored further in Appendix C.

Once the reservation wage, w_b, and the intersectoral labor allocation are determined, the remaining endogenous variables in the model are determined. In addition to the reservation wage, the labor market is characterized by sectoral wage differentials, and the negotiated wage in the socialized sector w_x cannot be ranked vis-à-vis the efficiency wage w_z in the non-socialized sector. Both w_x and w_z, however, exceed the reservation wage w_b -- the former because the SS excess wage (w_x - w_b) is an argument in the enterprise's utility function, and the latter because the NSS excess wage (w_z - w_b) is used to create an incentive for the workers in that sector to exert effort.

IV. Market Liberalization Policies

Market-oriented reform, beginning with the liberalization of trade and the adjustment of administered prices, has been particularly important in socialist economies in recent years. 1/ The model that has been developed in sections II and III can readily be used to analyze the effects of two major types of market liberalization policy: liberalizing trade flows, and moving administered prices toward levels that would clear domestic markets. Both of these types of policy would alter the allocation of labor across the different sectors of the economy, including the resources devoted to DUP activity in the black market. They would also affect the structure of wages, affecting the endogenous level of efficiency in the private sector. The implications of each of these aspects of liberalization will be examined in turn.

1. Trade liberalization

In the analysis so far, it has been assumed that trade is restricted to protect the SS from import competition; as this is also the sector whose output is subject to a shortage, liberalizing trade would alleviate the

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1/ Some Eastern European countries, notably Hungary, Yugoslavia, and Poland, undertook market liberalization measures during the 1970s and 1980s; these efforts were greatly intensified in the radical reform programs initiated in 1989 and 1990 (see e.g., Lane, 1991a, and Boote and Somogi, 1991), and similar programs were pursued by other countries in the region. By mid-1991, the Soviet Union had yet to decide whether, and at what pace, to undertake extensive market liberalization in order to alleviate shortages and provide the basis for a move toward a market economy.

Figure 2: Intersectoral Labor Allocation under a Quota

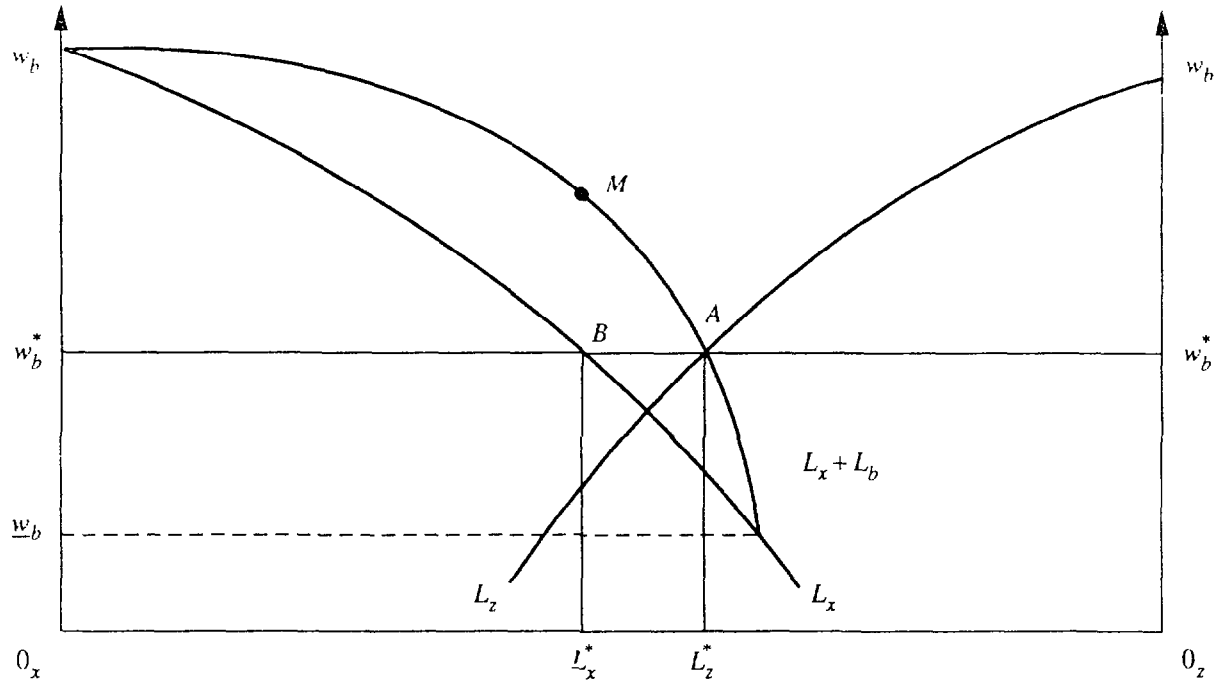
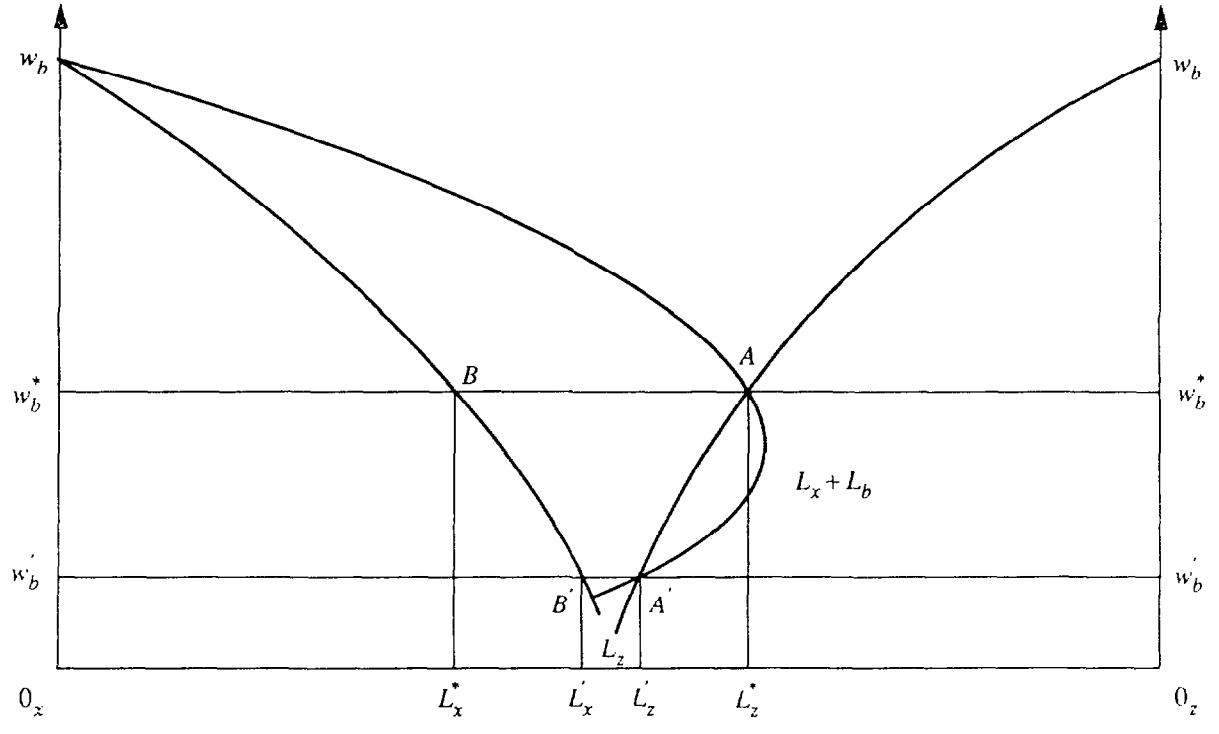


Figure 3: Multiple Equilibria under a Quota



shortage and thus reduce the distortionary effect of the DUP activity that arises in connection with this shortage.

Trade enters the model through the market for the SS good, in a way that depends on the instrument used to establish protection. We will start by discussing the implication of trade liberalization when the trade restriction takes the form of a quota. 1/ Later in the section, the case of a tariff will be examined.

The implications of liberalizing an import quota are explored graphically in Figure 4. Here, the exercise is an increase in the fixed quota level Q_x. Equations (7), (A4), and (A3b) imply that the L_x and L_z curves remain unchanged. An increase in Q_x reduces the black market price P_b and the black market employment, L_b, at each wage level, w_b. Thus the L_b curve shifts to the left and so does the $L_x + L_b$ curve. The new equilibrium is determined by point A' which implies a lower reservation wage, w_b'. The amount of labor devoted to the black market sector, L_b, decreases from $L_x^* L_z^*$ to $L_x' L_z'$, and employment in the productive sectors increases.

The analysis in the previous section allows us to follow the changes in the rest of the endogenous variables of the model. The discussion in II. 2 and Appendix A implies that a reduction in w_b, increases output, Z, in the NSS and decreases the efficiency wage, w_z, the wage differential $w_z - w_b$, and the efficiency index, e. In other words, a decrease in the reservation wage induces firms in the NSS to hire more workers at a lower wage differential and effort.

The SS's response to trade liberalization reflects the special structural elements of the model. The increase in employment results in an increase in output X because the official price P_x is fixed. In addition, the reduction in the reservation wage lowers the negotiated wage, w_x, by less than the reduction in w_b. Consequently the wage differential $w_x - w_b$ increases. Higher output, X, and lower negotiated wage, w_x, imply that the tax revenues from the state enterprise increase. Finally, note that shortages are reduced because an increase in imports and domestic production reduces the black market price and the profitability of DUP activities.

Is the small reforming socialist economy better off as a result of trade liberalization? If the social welfare function depends only on consumption of the two goods X and Z the answer is yes. Trade liberalization results in output expansion of both sectors and augments the

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1/ The case of quotas is particularly relevant due to the prevalence of non-tariff barriers in socialist economies, including not only formal quantitative restrictions but also the implicit restrictions that have historically been associated with the dominant role of government-owned Foreign Trade Organizations and with the centralization of the distribution system. Tariffs have replaced such quantitative restrictions in the countries that have proceeded furthest with market-oriented reforms.

productive capacity of the economy. Because the international price is fixed, the economy's income measured at international prices expands. Trade liberalization increases the efficiency of the economy and reduces shortages and DUP activities. In the present model, however, changes in welfare should also take changes in leisure and effort into account. Consider, for example, the NSS, which expands as a result of trade liberalization. The effort of workers already employed decreases and this increases social welfare ceteris paribus, but the effort of newly hired workers may be higher than when they were ostensibly unemployed, and this effect will, ceteris paribus, reduce welfare. Since the welfare consequences of effort have not been modelled explicitly, we will not attempt to consider welfare changes, focusing instead a changes in GNP evaluated at world prices; this is admittedly an imperfect measure of welfare but deserves special attention because it can be measured.

The effects of trade liberalization under a tariff regime are qualitatively the same as those resulting from an increase in the quota. Consider Figure 5 which illustrates the employment effects of a reduction in an ad valorem tariff τ. The black market price is $P_b = P_x^*(1 + \tau)$ where τ is a binding ad valorem tariff. Substituting P_b into the zero profit condition which determines employment in the black market we get

$$L_b = (P_x^*(1+\tau) - P_x)X/w_b \tag{16}$$

so that the amount of labor employed in the black market is a monotonically decreasing function of the reservation wage. 1/ Figure 5 shows the initial equilibrium which is given by the intersection of curves $L_x + L_b$ and L_z at point A. Trade liberalization in the form of a tariff reduction lowers the black market employment L_b for every level of the reservation wage, w_b, and results in a leftward rotation of curve $L_x + L_b$ to $L_x + L_b'$. The new equilibrium is depicted by point A' and corresponds to a lower reservation wage w_b. Consequently the analysis of a tariff reduction is qualitatively the same as that of a quota relaxation.

These results, which predict that trade liberalization--be it a reduction of a tariff or an increase in a quota--leads to an expansion of both sectors, appears counter-factual in the light of recent experience in Central and Eastern Europe. In Poland and in East Germany, to give two examples, trade liberalization was followed by a sharp decline in output of the socialist sector. This is not inconsistent with the model, however; the results presented in this section are local ones, pertaining to a small liberalization of trade in the presence of shortages. Once trade liberalization brings the market price down to the point at which $P_b = P_x$, the shortage is eliminated, and the model reverts to the standard sector-specific model; any further liberalization leads to a decline in output and employment in the SS--as has been observed in Poland and East Germany.

1/ Notice that this property excludes the possibility of multiple equilibria; see Appendix C.

Figure 4: Trade Liberalization under a Quota Regime

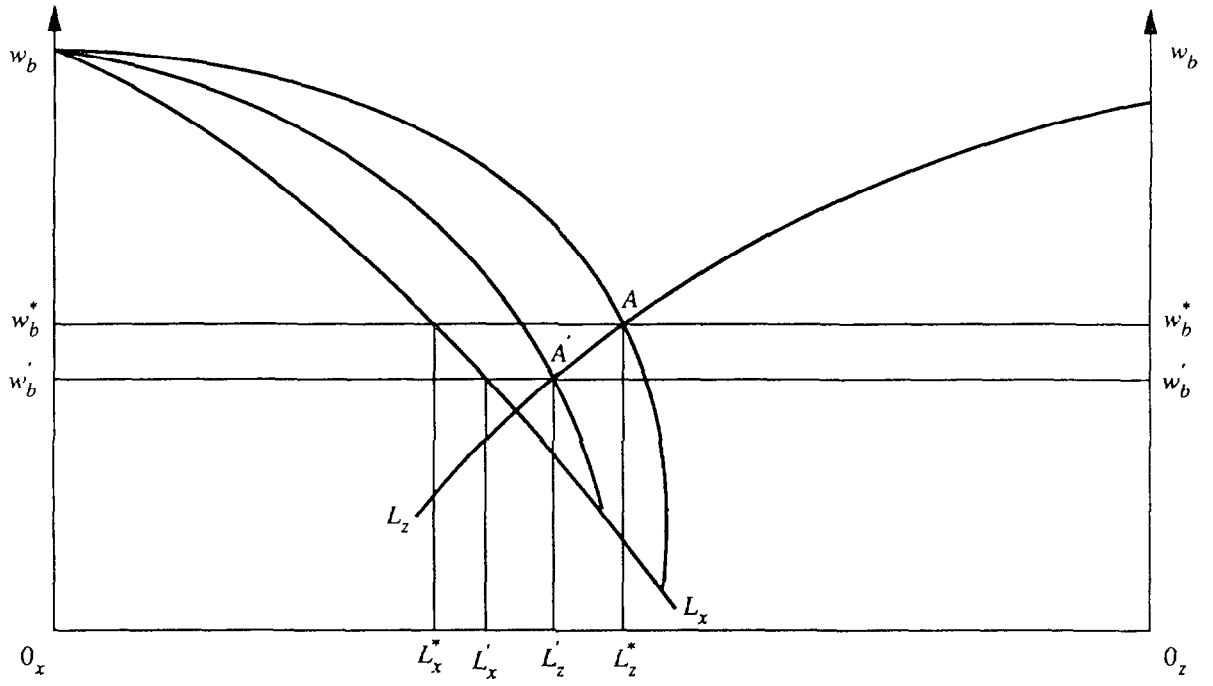
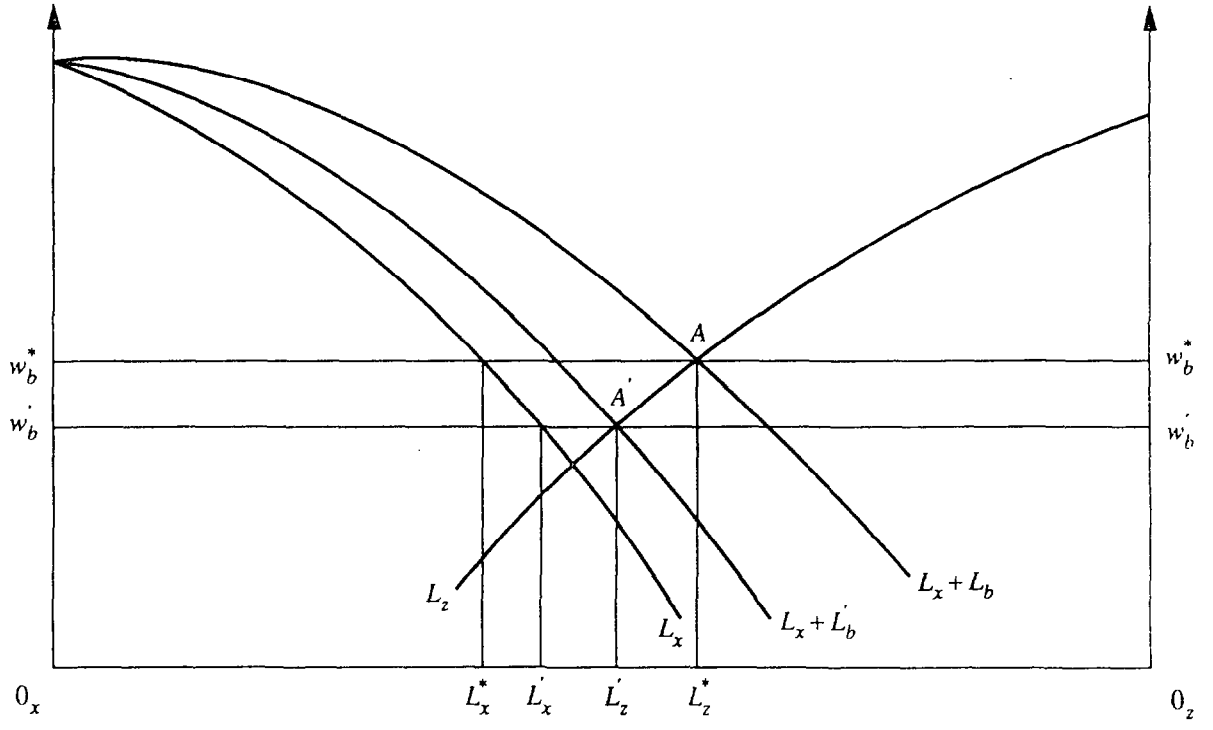


Figure 5: Trade Liberalization under a Tariff Regime



2. Price reform

Adjustments of administered prices and price liberalization have played an important part in reforming socialist economies. In some cases, prices have simply been freed and allowed to adjust to market-clearing levels. 1/ In other cases, the authorities have adjusted administered prices while maintaining some degree of control or restriction over these prices. 2/

Price reforms have typically been undertaken for several purposes: to alleviate shortages associated with queues, to correct relative price imbalances which lead to a less efficient allocation of resources, and to eliminate or reduce commodity subsidies. The model that has been developed in this paper permits an analysis of all these issues: the effects of price adjustments on the queues, on government revenues, on output in the two sectors, and on real wages.

Consider the effect of a small increase in the administered price of the good produced in the SS, P_x. This increase will in general induce the state enterprise to expand its output, for a given reservation wage. The reservation wage will also change, however, since price liberalization affects the black market in four ways. First, the rise in administered price squeezes the margin between the official and black market price $(P_b - P_x)$, tending to lower black market revenues. Second, the rise in output of good X increases the volume of sales on which the black marketeers earn this margin. Third, if imports are limited by a quota, the increased output of good X depresses that good's price in the black market, P_b; under a tariff, increased domestic output is reflected in a pari passu reduction in imports. Fourth, labor absorbed by the socialized sector may come from the black market. The net effect on the reservation wage is:

$$\frac{dw_b}{dP_x} = \frac{1}{\Delta}\left\{\left[(P_b - P_x) - P_b\epsilon\right]\frac{F_1 L_x}{P_x \eta_x} + \frac{w_b L_x}{P_x \eta_x} - X\right\} \tag{17}$$

where

$$\Delta = \left[(P_b - P_x) - P_b\epsilon\right]\frac{F_1 L_x}{w_b \eta_x} + \frac{L_x}{\eta_x} + L_b + \frac{L_z}{\eta_z} \tag{18}$$

Here, we make use of the following elasticities: $\eta_x = -(L_x/w_b)(\partial w_b/\partial L_x)$, and $\eta_z = -(L_z/w_b)(\partial w_b/\partial L_z)$, the inverse elasticities of labor demand in the

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1/ An example is the freeing of agricultural prices in Poland in August 1989.

2/ An example is the Polish authorities' decision to raise coal prices by 400 percent for industrial users (and 600 percent for households) in January 1990, which still left these prices below world levels.

SS and NSS, respectively, and $\epsilon = -(X/P_b)(\partial P_b/\partial X)$, the inverse elasticity of demand in the black market. 1/ The determinant Δ can be signed using the stability condition presented in Appendix C: it is positive if and only if the initial equilibrium is stable (which implies that an increase in the reservation wage generates an excess supply of labor in the economy).

The overall expression given in (17) is ambiguous in sign. It is unambiguously negative when prices are close to their equilibrium levels, since then w_b and $(P_b - P_x)$ are close to zero, leaving the two negative terms $-P_b \epsilon F_1 L_x / P_x \eta_x$, reflecting the effect of additional output in depressing the black market price, and -X, reflecting the direct effect of price adjustment in reducing the black market's buy-sell spread. Price reform is more likely to lower the reservation wage under a quota than under a tariff, since under a quota $\epsilon > 0$ and price reform lowers the black market price; under a tariff, $\epsilon = 0$, so price reform leaves the black market price unaffected.

The ambiguity of the effect of price reform on the reservation wage is mirrored in ambiguity of its effects on the labor force devoted to black market activity:

$$\frac{dL_b}{dP_x} = -\frac{1}{\Delta}\left\{\frac{XL_z}{w_b\eta_z} + \frac{L_bL_x}{P_x\eta_x} + \frac{XL_x}{w_b\eta_x} - \frac{L_xL_z}{P_xw_b\eta_x\eta_z}\left[(P_b - P_x) - P_b\epsilon\right]F_1\right\} \qquad (19)$$

Expression (19) has four terms. The first three are positive, while the fourth is ambiguous in sign, making the whole expression ambiguous. The fourth term again reflects the mutually opposing effects of increased output being channelled through the black market but at a reduced price. When the official price is close to its equilibrium level, the expression is unambiguously negative, indicating that adjusting official prices reduces the distortion due to shortages, i.e. reduces the labor that is "wasted" in the black market. On the other hand, when prices are far from market-clearing levels, one cannot rule out the possibility that a small price adjustment would actually increase the impact of the shortages, i.e., increase the amount of black market activity. 2/ However, as can be seen by comparing (17) and (19), the conditions required for black market employment to increase are more restrictive than those needed for the black market wage to rise.

1/ Geometric analysis is inadequate for examining the effects of a change in P_x since the direction and magnitude of shift in the $L_x + L_b$ curve is in general ambiguous.

2/ It should be emphasized that this refers to a small change in prices: even if official prices are initially far below their market-clearing levels, full price adjustment in this model must reduce black market activity (to zero).

The change in the reservation wage affects the level of employment in both socialized and non-socialized sectors. In the NSS, the result is

$$\frac{dL_z}{dP_x} = \frac{L_z}{w_b \eta_z} \frac{dw_b}{dP_x} \tag{20}$$

The sign of (20) is the same as that of $\partial w_b / \partial P_x$. Thus, if price reform lowers the reservation wage, it allows an expansion of employment in the NSS, and conversely, if it raises the reservation wage it squeezes employment in the NSS. The discussion in section II.2 implies that if the reservation wage decreases, so does efficiency in the NSS, but this effect never results in a reduction in output of good Z; the converse is true, mutatis mutandis, for the case in which the reservation wage increases.

The effect of a price increase on state-enterprise employment is the following:

$$\frac{dL_x}{dP_x} = \frac{1}{\Delta} \left\{ \frac{L_x L_z}{P_x \eta_x \eta_z} + \frac{XL_x}{w_b \eta_x} + \frac{L_b L_x}{P_x \eta_x} \right\} > 0 \tag{21}$$

Thus, even if price liberalization raises the reservation wage, the direct effect of the official price increase dominates: the level of employment and output in the SS increases. The intuition for this result is simply that any rise in the reservation wage in general equilibrium itself depends, through equation (17), on a rise in output of good X; this rise in the reservation wage cannot then itself be associated with a decline in output (assuming, as always, that the initial equilibrium is stable).

Let us now put the picture together. Price reform has two possible results. If the initial price distortion is small, an increase in the administered price reduces both the reservation wage w_b and the labor force employed in the black market. In this case, there is an expansion of output and employment in both productive sectors, and an increase in national income evaluated at world prices.

However, if the initial price distortion is large, an alternative result is possible. It is possible that, because the increased output of the socialized sector increases the volume of black-market sales on which traders earn the spread ($P_b - P_x$), the income of black-market participants--i.e. the reservation wage--actually increases; the number of participants in the black market L_b may even increase. In this case, although the price adjustment increases the output of the good that is in short supply, it does so at least partly at the expense of output of the other good: the higher reservation wage resulting from the improved black market opportunities reduces employment in the NSS, and this reduction is less than fully offset by the incentive it provides for increased efficiency in that sector. In the case in which $\partial L_b / \partial P_x > 0$, a small administered price adjustment

actually increases the resources "wasted" on queueing; national income evaluated at world prices may actually fall.

The moral of this story is that small administered price increases are only appropriate if the initial distortion is small. If the distortions are large--as in many of the Eastern European countries before the reforms of 1990, 1/ and in the Soviet Union at the time of writing--a small price adjustment may even draw more labor out of the productive sectors into the black market. 2/ This strengthens a case for a "Big Bang" price adjustment, which allows prices to adjust immediately to their market-clearing levels and thus immediately eliminates the associated black-market activity.

V. Direct Foreign Investment

Direct foreign investment (DFI) is widely believed to have an important role to play in accelerating the market-oriented restructuring of Eastern European countries and the Soviet Union. Capital flows are typically limited by restrictions on the repatriation of investment income, and the liberalization of such restrictions is an important aspect of market-oriented reform. Capital inflows are viewed both as a way of augmenting these economies' productive resources and as vehicles of technology transfer. In this section we will focus on the former consideration, examining the impact of DFI whose productivity is the same as that of the existing sector-specific capital of a RSE.

In practice, DFI has in most cases entered the socialized sector, in the form of joint ventures between western corporations and state enterprises. Other DFI has taken the form of purchase of shares of privatized enterprises or the establishment of new facilities, and encouraging this type of foreign investment is often regarded as a desirable aim of policy. Joint ventures typically involve a complex set of bargaining between investors and host government which is beyond the scope of this paper; we will therefore focus on examining the effect of a small inflow of DFI to the NSS. Following the standard treatment of DFI in international trade literature, (e.g., Brecher and Bhagwati (1980), and Dinopoulos (1983)), we assume that the sector specific DFI earns the same return as domestic capital, and that this return is repatriated in the form of the exportable commodity. Also, as is common in this literature, we ignore the transitory effect of the inflow itself on the balance of payments; this is dictated by the static nature of the model.

1/ For instance, Tarr (1991) reports that in Poland in 1979, the black market price of color televisions was twice the official price, and the black market price of automobiles three times the official price.

2/ In practice, gradual price adjustment may also be vitiated by the effect of expectations, as anticipated price increases may create increased incentives for hoarding and thereby exacerbate the shortages. Such dynamic effects cannot, of course, be analyzed in our static model.

Figure 6 shows the employment effects of an inflow K^* of foreign capital into the NSS under a tariff regime. Because the efficiency index depends only on the wage differential, $w_z - w_b$, an increase in capital increases employment, L_z at every level of the wage, w_b. Curve L_z in Figure 8 shifts upward and the equilibrium shifts along curve $L_x + L_b$, from point A to point A'. Note that curves L_x and $L_x + L_b$ do not depend on K_z and do not shift. The new equilibrium is associated with a higher reservation wage, higher employment in sector Z and lower employment levels in the black market and the SS.

Because the efficiency index, e, depends only on the excess wage, DFI increases the wage differential $w_z - w_b$, and the efficiency index e. Consequently output in the non-socialized sector increases because the new equilibrium is associated with more capital, more labor and higher efficiency per worker. This suggests a channel by which foreign investment can increase efficiency even if it is not associated with any transfer of technology.

Finally, equation (A3c) implies that DFI reduces r_z, the rental rate of (sector-specific) capital, for a given level of the reservation wage.

The DFI-induced increase in the reservation wage reduces employment and output in the socialized sector. The negotiated wage increases but the wage differential in the SS decreases. The increase in the negotiated wage coupled with the output decrease reduces the tax revenue for the state enterprise. Because the black market price is fixed (due to the tariff regime), imports, exports and tariff revenues increase. The increase in the reservation wage, w_b, results in a reduction in black market activity. Many arbitrageurs move to the NSS and shortages are reduced because the supply of imports increases.

The influx of DFI in the NSS increases the economy's national income evaluated at world (and domestic) prices. To see this result, define the index of national income as:

$$I = P^*F(L_x, K_x) + Z(E, K_z+K^*) - r_zK^* \tag{22}$$

where K_x, K_z is sector-specific capital in the SS and in the NSS respectively, K^* is foreign capital and r_z is the return to capital in sector Z. Equation (22) states that national income equals gross domestic product minus the return to foreign capital, $r_z K^*$. Differentiating expression (22) totally we obtain:

$$\frac{dI}{dK^*} = (P^* F_1 - w_z) \frac{dL_x}{dK^*} - w_z \frac{dL_b}{dK^*} - \frac{\partial r_z}{\partial (K_z+K^*)} K^* \tag{23}$$

To obtain (23) we have used the following equations:

$r_z = Z_2(E, K_z + K^*)$ which is condition (11c); $w_z = Z_1(E, K_z+K^*)e_{11}$ which is condition (11a); and $dL_z = - dL_x - dL_b$ because the net change in labor reallocation is zero. All terms in the right hand side of (23) are positive. Note that $P^*F_1 < P_xF_1 < w_b < w_z$ for an employment oriented firm. Moreover, dL_x/dK^* and dL_b/dK^* are both negative because DFI reduces employment in both the black market and the socialized sector. As a matter of fact, (23) decomposes the change in national income into three sources. The first term is positive and reflects the gain in I due to a transfer of labor from the SS to the NSS. The second term reflects the increase in I due to a decrease in employment in the black market sector. Finally, the last term reflects the standard result that DFI decreases the rental of capital and reduces producer surplus because the inframarginal units of K* receive less than their marginal product.

Figure 7 shows the employment effects of DFI in the NSS under a quota regime. The initial equilibrium is given by point A and the final one by point A'. The reservation wage increases and because the L_x curve is negatively sloped, output and employment in the SS are reduced. If the initial equilibrium A occurs to the left of point M, then the employment effects of DFI under a quota are identical to those under a tariff. However, if points A and A' lie to the right of point M, many of the previous results could be reversed. Figure 9 illustrates the case where the $L_x + L_b$ curve is negatively sloped. An increase in DFI reduces L_x but increases L_b. Employment in the SS is reduced by more than the increase in employment in the black market; this suffices to increase output in the NSS. A reduction in output in the SS increases the black market price and the length of queues. Expression (23) becomes ambiguous, however, because $dL_b/dK^* > 0$. More DFI increases the intensity of DUP activity in this case and drains resources from the SS. If the $L_x + L_b$ curve is positively sloped, then DFI decreases employment in both productive sectors and increases the possibility of a reduction in national income.

The analysis of this section suggests that in a RSE, foreign capital is more beneficial under a tariff regime than under a quota. Under a tariff, DFI necessarily increases national income and reduces shortages. However, under a quota, DFI might lengthen the waiting lines, thus reducing productive employment and national income.

VI. Conclusion

The framework developed in this paper incorporates many important features of a socialist economy in transition, providing a structure within which the effects of market liberalization policies can be traced. The results of the policies analyzed are summarized in Table 1. First, trade liberalization, whether through the expansion of a quota or the reduction of a tariff, leads to an expansion of output and employment in both productive sectors, and thus increases national income evaluated at world prices.

Figure 6: Effects of NSS Direct Foreign Investment under a Tariff

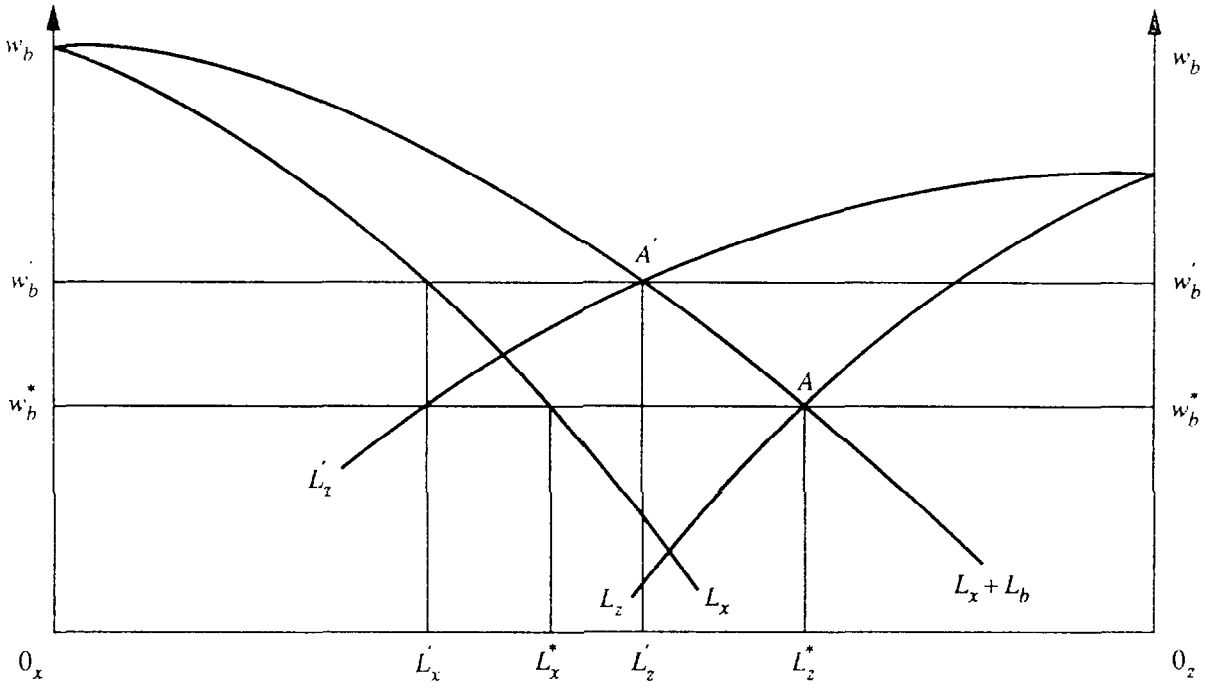
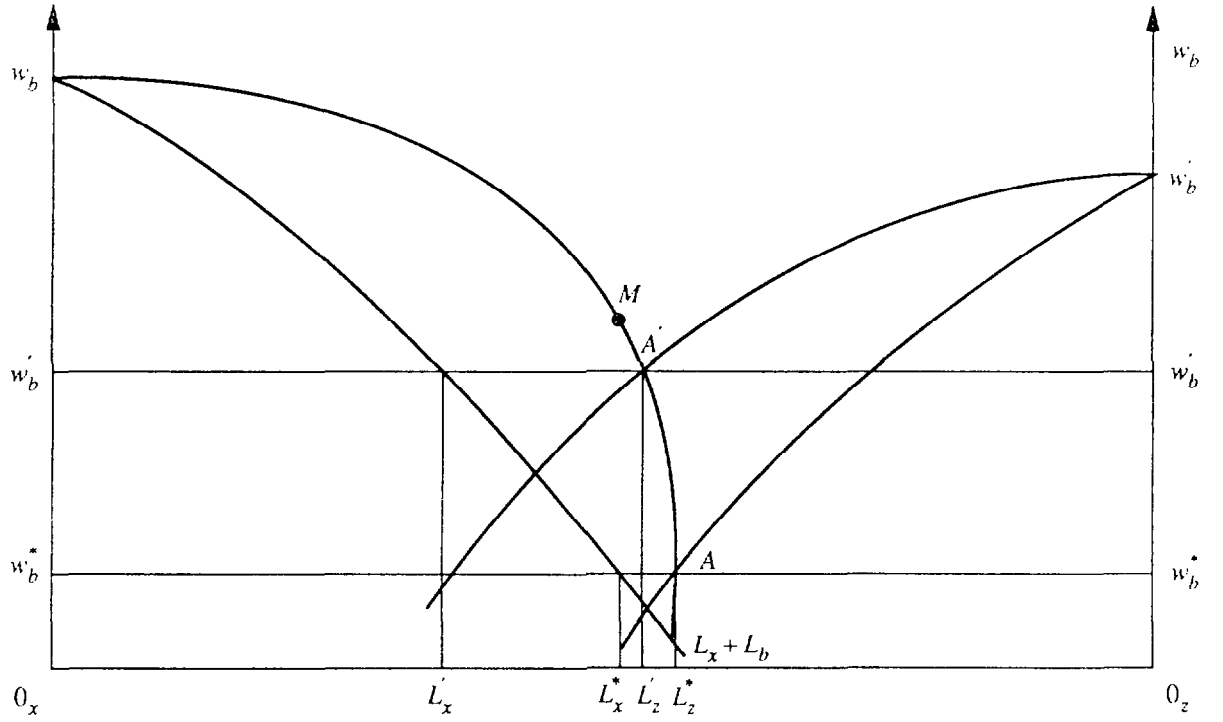


Figure 7: Effects of NSS Direct Foreign Investment under a Quota



Price reform has different consequences: raising the administered price of the product produced by the state enterprise stimulates expansion of that enterprise's output. However, if the official price is initially far from a market-clearing level, a small upward adjustment of the administered price of the good that is in short supply may exacerbate the shortage: it may actually increase the revenue earned in the black market, thus drawing labor out of the non-socialized sector, possibly even leading to an increase in the number of (ostensibly unemployed) workers engaged in black market activity. As a result, if there are substantial initial price distortions, a small administered price increase may actually lead to a decline in national income measured at world prices. These results are consonant with the experience of Eastern European countries in the late 1980s, and of the Soviet Union in the early 1990s: as prices were timidly being adjusted upward, shortages grew worse. The results tend to support the "Big Bang" approach, which (in our model) must lead to a reduction in black market activity and a consequent movement of labor into the productive sectors. They also tend to support the strategy followed in several Eastern European countries, of liberalizing trade in order to alleviate domestic imbalances.

The effects of foreign investment in the private sector is also analyzed; it is shown that under a quota regime such investment may exacerbate the shortage of the good produced by the socialized sector, although it does alleviate the distortion associated with import protection. The lesson is that the completion of domestic price liberalization or the abolition of quantitative import restrictions may be a precondition for foreign investment to benefit a reforming socialist economy.

The framework developed in this paper provides an analytically tractable treatment of an economy with many of the features that are common to reforming socialist economies. It therefore offers the potential of answering many questions concerning the effects of economic policies during this transitional stage.

Table 1. Effects of Market Liberalization Policies

Policy	Trade Regime	Queues/ Black market Employment	Reservation Wage	Output/ Employment in NSS	Output/ Employment in SS	National Income 1/	Black Market Price
Trade Liberalization	Quota	Declines	Declines	Increases	Increases	Increases	Declines
	Tariff	Declines	Declines	Increases	Increases	Increases	Declines
Price Liberalization	Quota/tariff small (P_b-P_x)	Declines	Declines	Increases	Increases	Increases	Declines
	Quota/tariff large (P_b-P_x)	Umbiguous	Umbiguous	Umbiguous	Increases	Umbiguous	Declines
Foreign Investment in NSS	Quota	Umbiguous	Increases	Increases	Declines	Umbiguous	Increases
	Tariff	Declines	Increases	Increases	Declines	Increases	Unchanged

1/ National income is evaluated at international prices. It is equal to GNP in the absence of foreign investment.

APPENDIX A

Efficiency Wages

In this appendix, the implications of the efficiency wage framework discussed in section II.2 will be examined.

It is assumed that the representative firm in the NSS has a neoclassical production functions as given by equation (8).

$$Z = Z\ (E,\ K_z) \tag{8}$$

Efficiency per worker, as given in (9), is

$$e = e(w_z - w_b) \tag{9}$$

The function e is defined over the domain $w_z \geq w_b$, and has the following properties:

$$e(0) = 1;\ \partial e/\partial(w_z - w_b) > 0;\ \partial^2 e/\partial^2(w_z - w_b) < 0. \tag{A1}$$

The first assumption normalizes to unity the effort supplied in the absence of a wage differential between the NSS and the black market; the other two assumptions are standard in the efficiency wage literature. 1/

The NSS's total use of labor in efficiency units equals $E = eL_z$. Each firm maximizes profits by choosing the amount of labor, L_z, wage, w_z, and capital, K_z, for a given price $P_z = 1$ (because good Z is used as a numeraire) and reservation wage, w_b:

$$\max_{L_z,\ w_z,\ K_z} \quad \Pi_z = Z(E,\ K_z) - w_z\ L_z - r_z\ L_z = 0 \tag{A2}$$

where r_z is the rental of the sector-specific capital K_z. The first order conditions for this problem are:

$$\frac{\partial \Pi_z}{\partial L_z} = Z_1(E,\ K_z)e - w_z = 0 \tag{A3a}$$

1/ For simplicity, we disregard the possibility, raised elsewhere in the literature, that the enterprise may also reduce shirking by intensifying its (costly) monitoring of workers' effort.

$$\frac{\partial \Pi_z}{\partial w_z} = [Z_1(E, K_z)e_1 - 1]L_z = 0 \qquad \text{(A3b)}$$

$$\frac{\partial \Pi_z}{\partial K_z} = Z_2(E, K_z) - r_z = 0 \qquad \text{(A3c)}$$

Equations (A3a) and (A3b) determine the employment level, L_z, and the efficiency wage, w_z, for a given reservation wage, w_b. Equation (A3c) determines K_z for a given w_z and L_z. By dividing (A3a) by (A3b) we get the standard condition in the efficiency-wage literature:

$$e_1 w_z = e \qquad \text{(A4)}$$

Thus, at the margin, the increase in effort due to an increase in the wage differential, e_1, should be equal to the effort supplied per dollar paid in wages, so the cost per unit of efficiency w_z/e is minimized.

Figure 8 illustrates the determination of the wage, w_z, and employment, L_z, in the NSS. Consider first the left panel. The vertical axis measures the wage and the horizontal axis the effort per worker which increases as we move away from the origin 0. The curve eBA, is the wage requirements curve which measures the wage required to obtain a given number of effort, e, from an individual worker. It starts at point A which is associated with the reservation wage w_b and the minimum effort $e(0) = 1$. It is increasing in effort, e, because $e_1 (w_z - w_b) > 0$ and it is convex because we assumed that $e_{11}(w_z - w_b) < 0$. The wage cost per efficiency unit w_z/e is constant along any line passing through the origin. The tangency B between the wage requirements curve and the line 0B represents wage cost per efficiency unit determines the equilibrium values of w_z and e, because at point B the wage cost per efficiency unit is minimized. Formally, point B corresponds to equation (A4). We will assume that point B always lies to the left of point A which is consistent with an interior solution and a positive wage differential, $w_z - w_b$. The right panel determines the equilibrium of the employment level L_z^* for a given level of the efficiency wage, w_z. The horizontal axis of this panel measures the level of employment, L_z. Curve ZZ is the graph of equation (A3b) on the wage-employment space for a given reservation wage. The slope of ZZ is negative and equal to:

$$\left.\frac{dw_z}{dL_z}\right|_{ZZ} = -\frac{Z_{11}e_1^2 L_z}{(ee_1Z_{11} + Z_1e_{11})} < 0 \qquad \text{(A5)}$$

Figure 8: Wage and Employment Determination in the NSS

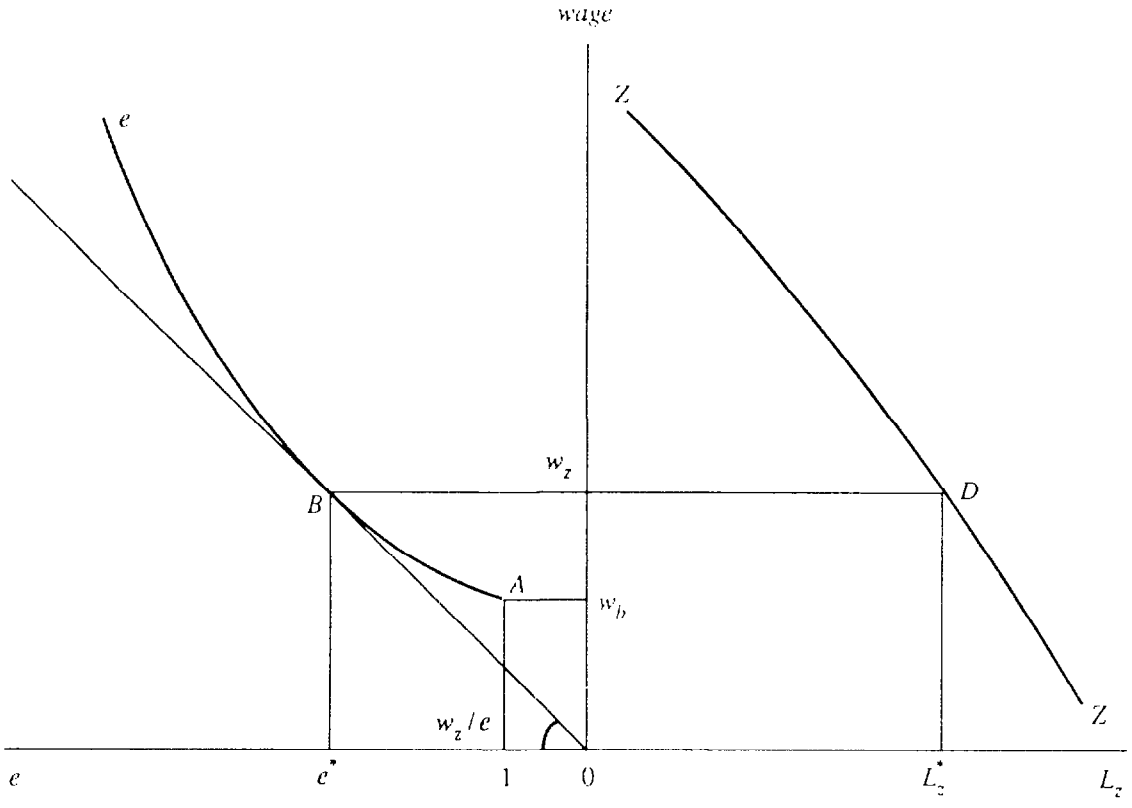
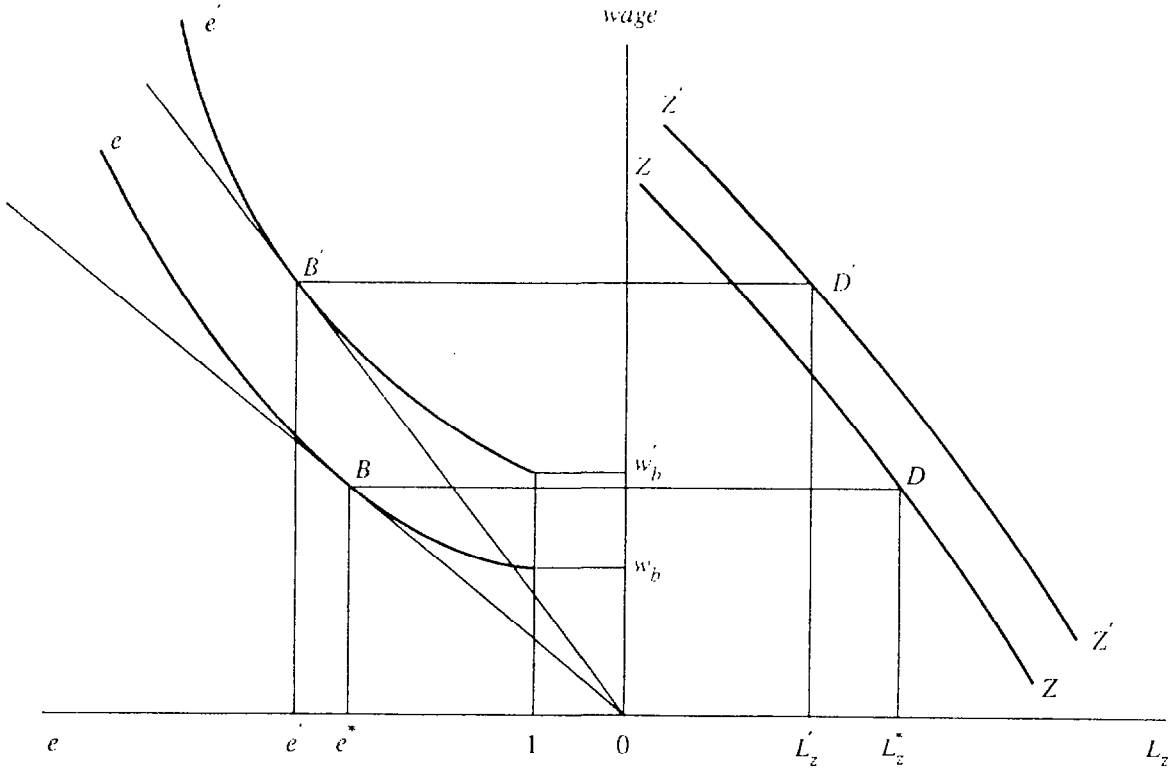


Figure 9: Effects of an Increase in the Reservation Wage



At this point, it is useful to determine the effects of an increase in the reservation wage on the excess wage, employment and output in the NSS. Notice that equation (A3b) implies that L_z depends only on the excess wage, and therefore for a fixed level of employment, L_z, an increase in w_b implies an equal increase in w_z: formally, $dw_z/dw_b = 1$. Totally differentiating equation (A4) we obtain $dw_z/dw_b = 1 - e_l/e_{ll}w_z > 1$.

Figure 9 combines these results and illustrates the effects of an increase in the reservation wage. Prime superscripts denote final equilibrium outcomes. An increase in w_b shifts both the wage requirements curve and the ZZ curve upwards, but the former shifts up by a larger amount. Consequently, an increase in the reservation wage reduces the employment level in the NSS and increases the excess wage, $w_z - w_b$, thus increasing efficiency per worker.

A natural question is whether an increase in the reservation wage necessarily decreases output in the NSS, because the latter depends on total efficiency units. Totally differentiating the production function $Z(E, K_z)$ with respect to the reservation wage, we obtain:

$$\frac{dZ(E, K_z)}{dw_b} = \frac{[Z_1(E, K_z)]^2}{w_z Z_{11}(E, K_z)} < 0 \qquad (A6)$$

where dw_z/dw_b and dL_z/dw_b are obtained by differentiating totally equations (A4) and (A3b). Equation (A6) implies that an increase in the reservation wage decreases output in the NSS even though the excess wage and the effort of each worker increase. That is, one can rule out the possibility that a rise in w_b leads to such a large rise in individual effort that output in the sector rises despite the concomitant fall in employment L_z.

The preceding analysis establishes an inverse relationship between the reservation wage and both employment and output in the NSS, given the stock of (sector specific) capital in this sector. This relationship, which can be viewed as a demand for labor curve, is well behaved in the sense that it is downward sloping and that output in the NSS decreases with the reservation wage, w_b. Thus, the inter-sectoral allocation of labor is qualitatively similar to that which would arise in the absence of endogenous efficiency considerations.

APPENDIX B

Consumer Choice and Shortages

In the model presented in Section II.3, it is assumed that all rents associated with the controlled price are dissipated, and that the price that is relevant from the standpoint of consumers is the black market price P^b. We also assume that all DUP activity associated with the controlled price is carried out by individuals who are not otherwise employed, who specialize in standing in the queues to purchase goods for resale in the black market. This is in contrast to models such as those of Weitzman (1991) and Boycko (1991), in which queuing is done by the representative consumer, and in which no resale takes place; it is more similar to the simple model presented in Lipton and Sachs (1990). In this Appendix, we shall derive the circumstances under which there is specialization in queueing.

Consider the following simple framework, similar to Boycko (1991), in which the individual chooses the allocation of time and money. Individual i's utility function is

$$V^i = S(x^i, z^i) + \phi(\ell^i) \tag{B1}$$

where x^i, z^i, and ℓ^i denote the individual's consumption of the two goods and leisure, respectively. The budget constraint is

$$W^i + (p^b - p^c)x^{ci} = p^b x + z^i \tag{B2}$$

indicating that wage income plus income from arbitrage must equal expenditures on the two goods; equivalently,

$$W^i = p^c x^{ci} + p^b(x^i - x^{ci}) + z^i \tag{B2'}$$

indicating that wage income must equal the sum of expenditures in the official shops and in the black market (where the latter would be negative for a specialist arbitrageur).

The individual's time constraint is

$$h^i + tx^{ci} + \ell^i = 1 \tag{B3}$$

where h^i denotes the individual's hours of work in his place of employment (if any), ℓ^i his hours of leisure, and t the time required to purchase one unit of the good; the total amount of time available is normalized to unity. This assumes, as in Boycko (1991) but unlike in Weitzman (1991), that purchasing each unit of the good requires a fixed waiting time, as with a "one to a customer" limit; this assumption is needed because, when resale is permitted, the first customer in line would otherwise buy the entire available stock.

Finally, there is a non-negativity condition on the amount the individual purchases in the official shops:

$$x^{ci} \geq 0 \tag{B4}$$

The first-order conditions for this problem give rise to the following results. First, there is the familiar result that

$$S_1/S_2 = P^b \tag{B5}$$

that is, the marginal rate of substitution between the two goods equals the black market price. This confirms the assumption in the main text of the paper that it is the black market price that is relevant for consumer demand.

Next, there is a condition for time spent queueing:

$$S_2(P^b - P^c) = \phi_1 t - \lambda \tag{B6}$$

where λ is the multiplier on condition (B4); the Kuhn-Tucker conditions state that

$$\lambda, \; x^{ci} \geq 0 \quad \text{and} \quad \lambda x^{ci} = 0 \tag{B7}$$

Note also that one can define the black market wage (per unit of time) as the return per unit purchased and resold, times the number of units that can be purchased per unit of time, or

$$W_b = (P^b - P^c)/t \tag{B8}$$

Thus, a household that participates in the queue ($x^{ci} = 0$), using (A7) and (B8) in (B6), is seen to queue up to the point at which

$$W_b = \phi_1/S_2 \tag{B9}$$

that is the black market wage equals the marginal rate of substitution between leisure and the numeraire good.

Another result follows directly from definition (B8): if it is assumed that the average time required to purchase a unit of the good is equal to the total number of queues divided by the goods available, i.e. $t = L_b/x$, then equation (10), the zero-profit condition for the black market, follows immediately.

For the household that does not participate in the queue, (B6), (B7), and (B8) imply that

$$W_b < \phi_1/S_2 \tag{B9'}$$

that is, the additional consumption to be earned by participating in the black market is less than the marginal evaluation of the leisure that would be lost.

Now in (B9) and (B9'), both ϕ_1 and S_2 will in general be different for households that are otherwise unemployed than for those employed in the productive sectors. First, for employed workers generally have less leisure $\ell^i = 1 - h^i - tx^{ci}$ where $h^i > 0$; for unemployed workers $\ell^i = 1 - tx^{ci}$. 000This implies that (if all workers are otherwise identical) ϕ_1 is higher for employed than for unemployed workers. In addition, the marginal utility of consumption of the numeraire good may be lower for employed workers (if the sub-utility function S(x, z) is strictly concave), as they have higher incomes if (as assumed in the text) W_x, $W_z > W_b$. We can write the marginal utility of the numeraire good as a function of the consumer's wage and the black-market price, $S_2(W, P_b)$.

Then complete specialization in the DUP activity requires that

$$\phi_1(1-tx^{ci})/S_2(W_b,P_b) = W_b < \min_{j=x,z}\{\phi_1(1-h_j)/S_2(W_j,P_b)\} \qquad (B10)$$

That is, the black market wage, which is equal to the marginal rate of substitution for leisure of individuals who specialize only in black market activity, must be less than the marginal rate of substitution of goods for leisure for workers employed in either of the two productive sectors.

If workers in the two productive sectors could voluntarily choose their hours of work for a given wage, condition (B10) would become simply

$$W_b < \min\{W_x, W_z\} \qquad (B11)$$

Condition (B11) is generally satisfied: the bargaining structure for wage determination in the socialized sector presented in section II.1. implies that $W_x > W_b$ provided that the enterprise has any bargaining power; similarly, the efficiency wage structure in the non-socialized sector presented in section II.2., implies that $W_z > W_b$ provided that wage differentials have any effect on efficiency (i.e. provided that $e_1(0) > 0$).

However, the assumption that workers can choose their hours of work for a given wage is not necessarily appropriate. In the NSS, an efficiency wage mechanism would imply a distortion in hours if the worker can choose hours voluntarily; some restriction on hours would be a feature of a cost-minimizing contract, a general feature of agency models as examined by Lazear (1980). Efficiency wage models imply economies of scale in deterring shirking, so there is a tendency for hours to be <u>longer</u> than would be implied by equality of the reservation wage with the marginal rate of substitution of leisure for consumption ϕ_1/S_2; this implies that condition (B10) will generally be met for the NSS. In the SS, hours could be made an additional subject of bargaining between enterprise and government; an employment-oriented enterprise might engage in "feather-bedding," reducing (effective) hours of work in return for higher employment, and this would imply that the individual worker would be subject to restrictions on hours, possibly implying $\phi_1/S_2 < W_b$ -- in effect, "forced leisure." If that were

the case, some workers in the SS would participate in queues after (or during) normal working hours. 1/

It has been demonstrated that the assumption of complete specialization in queueing can be the result of optimal behavior by otherwise identical consumers who differ only in whether they happen to find employment in the SS, the NSS, or nowhere. It has also been argued, however, that the conditions for complete specialization may or may not be met, even if, as is assumed, wages in the two productive sectors exceed the income that can be earned in the black market. The possibility that workers in the SS have "forced leisure" implies that some of these workers may participate in queues; this would be consistent with the observation that in socialist economies some (although not all) of the queueing is in fact done by people who are also employed elsewhere. 2/

In the main text of the paper, it will be assumed that complete specialization does occur. It will also be assumed that hours of work are fixed in both productive sectors and in the black market (the latter being equivalent to assuming, not unrealistically, that the official shops are only open for a limited number of hours). The leisure foregone by black market participants will figure in the welfare results discussed in section VII.

1/ The analysis has assumed that an employed individual who is employed must stay at the work place for the stipulated hours of work. Anecdotal evidence suggests that this is far from the case in many reforming socialist countries; on the contrary, many workers spend time during which they are ostensibly employed to work at other jobs, and to stand in line for goods.

2/ This also abstracts from the possibility of specialization within the family, i.e. the possibility that some members of a family who are unemployed or work shorter hours may do more of the queueing. Anecdotal evidence suggests that this may be an important phenomenon.

APPENDIX C

Multiple Equilibria

The non-monotonicity of the relationship between the reservation wage w_b and the total revenues from black market trading $X(P_b - P_x)$ may also give rise to multiple equilibria. Consider, for example, the possible configuration illustrated in Figure 5, in which the L_x+L_b curve intersects the L_z curve at two points, A and A'. Equilibrium A involves a high reservation wage w_b^* which results in low employment in both productive sectors. In particular, the low employment in the SS, $0_xL_x^*$, implies low output of good X which in turn (given the demand function) gives rise to a high black market price. The high black market price in turn yields high revenues from black market trading, which in turn support the large number of black market participants $L_x^*L_z^*$ at wage w_b^*.

The other equilibrium is at point A'. There, the reservation wage is lower, w_b', permitting higher employment in both productive sectors, $0_xL_x'$ and $0_zL_z'$. The higher employment in the SS yields higher output of good X, which results in a lower black market price and (in this case) in lower black market revenues. As a result, employment in the black market in this case is only $L_x'L_z'$.

Thus, in this model there is the possibility of two (or more) equilibria, one of which entails higher employment in both productive sectors and the other of which entails higher employment in the black market. Whether or not this situation arises depends on the elasticities of demand and of the marginal product of labor schedules in each productive sector. This result is similar to that in Boycko (1991). It arises essentially because a lower black market wage, by inducing higher employment and output in the state enterprise, may actually lower the black market price sufficiently that total revenues from black market activity decrease; if this decrease in revenues is sufficient that, even though there are now fewer participants in the black market (their ranks being depleted by those who find work in the two productive sectors), the income per participant is smaller, so the lower wage may also be consistent with equilibrium. This result holds out the possibility that an economy plagued by shortages could achieve a better situation simply by a coordinated move from A to A'.

However, equilibrium A' is unstable. This can be seen by the fact that for $w_b > w_b'$, the L_x+L_b curve is to the right of the L_z curve, implying excess returns from black market activity. This in turn drives the reservation wage toward w_b^*. Below w_b', the summed reservation wage cannot be sustained by black market activity, moving the reservation wage further downward. The black market dries up as the black market wage falls to $\underline{w}_b$, but at that wage, although it is not worth while for the unemployed to engage in black market activity, there is an excess supply of labor corresponding to an excess demand for goods. Thus, equilibrium at point A' is unstable. By similar reasoning, equilibrium at point A is stable.

The condition required for stability of equilibrium is that if the $L_x + L_b$ curve slopes upward, it must be steeper that the L_z curve. This implies that

$$-\frac{L_x}{\eta} - [(P_b - P_x) - P_b\epsilon]\ \frac{F_1 L_x}{w_b \eta_x} - L_b - \frac{L_z}{\eta_z} < 0 \qquad (C1)$$

Multiple equilibria cannot arise if commercial policy takes the form of a tariff. The reason is that in this case, the black market price is simply equal to the world price plus tariff, so the relationship between wages and employment in the black market is given by $L_b = (P_x^*(1+\tau) - P_x)F(L_x, K_x)/w_b$, where τ is the ad valorem tariff rate; this is a monotonically decreasing function because L_x is a decreasing function of w_b. Thus the $L_x + L_b$ curve is downward sloping and intersects the L_z curve at only one point.

In the rest of the paper, the analysis will focus on the case in which the equilibrium is unique and stable.

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