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**Privatization in a Small Open Economy with  
Imperfect Competition**

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# Privatization in a Small Open Economy with Imperfect Competition

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## Abstract

We look at privatization in a general equilibrium model of a small, tariff-distorted, open economy. There is a differentiated good produced by both private and public sector enterprises. A reduction in government production in order to cut losses from such production raises the returns to capital and increases the tariff revenue, which are welfare improving. However, privatization also leads to lower wages and possibly fewer private brands. This lowers workers' welfare, which may make privatization politically infeasible. Privatization can improve workers' welfare with complementary reforms, e.g., attracting foreign investment or trade liberalization.

**JEL Classification:** H41, F12, L32

**Keywords:** public sector enterprise, privatization, foreign investment, trade liberalization, monopolistic competition.

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# 1 Introduction

Discouraged by the poor performance of public sector enterprises (PSEs), governments in several developing market economies—e.g., India, Chile, Egypt, Mexico, Philippines, Turkey—have attempted to withdraw from the production of “private” goods.<sup>1</sup> Does the withdrawal of government from production—which we refer to as privatization in the remainder of the paper—improve welfare?

The proponents of privatization argue that the loss-making PSE should either contract or exit and pave the way for efficient private firms, which would increase welfare. The opponents, on the other hand, argue that privatization leads to lower wages and increased unemployment, which in turn lowers welfare. We assess the validity of these claims in a simple two-factor, two-sector, general equilibrium, open economy framework where the sector comprising public enterprises and private firms is imperfectly competitive.<sup>2</sup>

On examination, both arguments hold an element of truth. We find that privatization, if pursued alone, reduces the welfare of the workers. This might make privatization politically infeasible in democratic developing economies since workers often constitute a majority or the support base of the ruling party. Privatization can, however, be politically feasible (i.e., welfare-improving for workers) with complementary reforms. For example, an increase in foreign investment in conjunction with privatization improves the workers’ welfare. Trade liberalization, pursued along with privatization, can improve workers’ welfare under certain conditions.<sup>3</sup>

Our analysis, a brief sketch of which is given in section 1.1, contributes to the ongoing debate on privatization in developing countries in at least three important ways, which we discuss below. Specific contributions are discussed in section 1.2.

First, although the existing literature on privatization based on a partial equilibrium

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<sup>1</sup> Various explanations have been offered for the lackluster performance of public enterprises, e.g., a distorted incentive structure, the plurality of principals and objectives which often results in inefficient utilization of resources, over-employment, and low productivity. There is a vast body of empirical literature confirming the inefficiency of public enterprises in developed as well as developing countries. See, e.g., Galal et al. (1994) and Majumdar (1998). For a survey of the empirical findings, see Megginson and Netter (2001).

<sup>2</sup> The presence of imperfect competition together with increasing returns to scale provide a meaningful role of firms. The imperfectly competitive structure is a good description of markets in the less developed countries (see Nellis and Kikeri, 1989, p. 663).

<sup>3</sup> It is important to note that in an imperfectly competitive model such as ours, trade liberalization alone does not necessarily improve welfare. Nor, for that matter, does capital inflow.

framework (see section 1.2 below for a review of this literature) offers some insights into the debate, the effect of privatization on workers' wages, and more generally on factor returns—which lie at the heart of the privatization debate—is missing. By explicitly incorporating factor markets for labor and capital into our general equilibrium open economy framework, we offer a richer analysis and show that indeed, privatization can reduce wages, which in turn can lower welfare.

Second, most studies on privatization referred to in section 1.2 focus on a short-run set up with a fixed number of firms. Hence, they are not well suited to addressing another important concern—the effect of privatization on the domestic market structure. By explicitly incorporating entry–exit considerations into our framework we address this concern and find that a reduction in public sector production does not necessarily encourage the entry of private producers. In other words, private producers, rather than entering to fill the void created by the contraction of PSEs, might exit, which can reinforce (partial) deindustrialization.

Third, focusing on a tariff-distorted open economy (instead of a closed economy) allows us to examine the effect of a combination of policies—e.g., privatization and foreign investment, privatization and trade liberalization—which typically comes with a reform package. Apart from generating a rich set of possibilities, the open economy description is also more realistic. Over the last two decades, developing countries embarking on privatization were also usually the ones lowering their tariffs (see Sachs and Warner, 1995).<sup>4</sup> By analyzing trade liberalization, privatization, and capital inflows in a unified general equilibrium framework, we hope to contribute to a better understanding of the complementarities (or the lack thereof) between these policies.

## **1.1 A Preview of the Model and Results**

Adapting a monopolistic competitive model along the lines of Venables (1982) and Helpman and Krugman (1985), we focus on a small tariff-ridden open economy. It produces (and consumes) a homogenous good and a number of differentiated brands, and imports a range of foreign brands. The homogenous good, produced under

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<sup>4</sup> Sachs and Warner (1995) label a country as closed or open based on a combination of criteria (e.g., tariff rate, exports to GDP ratio, black market premium etc.). They also provide timings for liberalization, i.e., when the countries switched from being closed to open. Their classification shows that among the countries (mentioned earlier in the Introduction) which embarked on privatization, Chile opened up in 1970s, Mexico, Philippines and Turkey in late 1980s. India qualified as open in the mid-1990s. Egypt was the only one never considered as open.

constant returns to scale, is exported whereas the differentiated domestic brands, exhibiting increasing returns, are non-traded and are produced by private and public sector firms.

Drawing from the evidence on PSEs, we assume that they differ from their private counterparts in terms of the production techniques as well as profit considerations. In particular, we assume that a PSE uses the most labor-intensive techniques and can remain in the market even if it makes losses. The use of labor-intensive techniques as well as excessive employment is a well-known feature of PSEs not only in developing countries but also in developed countries. As Boycko et al. (1996) write: “While excess employment is not the only politically demanded inefficiency of state firms it is surely the most commonly noted one.” Also, for most of the paper, we consider only loss-making PSEs, as this argument—that these enterprises make losses and still remain in the market—seems to be a critical one leveled against PSEs. Our focus on the loss-making PSE is also motivated by the finding in Anderson et al. (1997) that privatization improves welfare if PSEs make losses prior to privatization. In our framework, although losses are reduced under privatization, this reduction may not be enough to offset the loss to welfare from reduced wages.

Our findings indeed suggest, as the proponents of privatization argue, that privatization lowers the losses incurred by public firms, and this is welfare improving. However, the opponents of privatization are not wrong either. *Ceteris paribus*, the contraction of the PSE, due to its use of labor-intensive techniques, gives rise to an excess supply of labor, which in our full employment model lowers wages. Indeed, the situation can be even worse. The excess supply of labor can lead to the contraction of the relatively less labor-intensive production, i.e., the production of private differentiated goods. In particular, domestic private producers might exit from the differentiated goods sector and thus privatization may fail to encourage the entry of more private producers—something it was implicitly expected to do. The reduction in the number of available varieties (i.e., fewer private brands), combined with lower wages implies that unless accompanied by other policies, the privatization program will generally reduce the welfare of workers.

The immiserization of workers poses a problem in terms of political viability of the privatization program since in a large number of democratic developing countries, workers constitute the majority and/or the support base of the ruling parties. So, even if privatization is welfare improving in overall terms (which may not be the case), it

might not be politically viable in the absence of complementary reforms.<sup>5</sup> Are there complementary reforms which can be pursued in conjunction with privatization to prevent a reduction in workers' welfare? Given that ours is an open economy model, two policy choices seem natural—lowering of trade restrictions and/or encouraging foreign investment. Increased capital inflows lead to an increase in the number of brands (via the entry of private producers) as well as an increase in wages, which in turn improves welfare. Although trade liberalization, by expanding the relatively labor-intensive homogenous goods sector, increases wages, it comes at the expense of reduced variety. Thus trade liberalization, if pursued along with privatization, improves welfare only if the effect of a decline in variety on welfare is not too strong.

## 1.2 Related Literature

Our paper is manifestly related to the trade literature on imperfect competition in general, and on monopolistic competition in particular. Though some particular aspects of the model—e.g., optimal tariffs (see Venables, 1982) and the welfare effects of capital inflows—have been analyzed (see, e.g., Sen et al., 1997; Chakraborty, 2001), the introduction of government production in a tractable fashion is novel. More importantly, incorporating government production allows us to conduct a simultaneous investigation of three important issues—privatization, trade liberalization, and foreign investment—which are often mentioned in the same breath in the financial press but rarely analyzed in a rigorous unified framework.

The public economics literature on mixed oligopoly, which typically uses a partial equilibrium set up, asks the same question as we do—namely, when does privatization improve welfare?<sup>6</sup> This literature offers several reasons why privatization might improve welfare. DeFraja and Delbono (1989) show that in the

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<sup>5</sup> For discussions on the importance of political viability in privatization programs, see World Bank (1995). Also see Clarke and Cull (2005) in this regard.

<sup>6</sup> Apart from the mixed oligopoly literature, there are at least three distinct strands of literature on privatization. See Roland (2000) for a comprehensive analysis of privatization in transition economies. Despite providing insights that are generally applicable, the absence of markets in the pre-transition period makes it difficult to compare the findings across periods, and hence we refrain from discussing this literature. We also abstract from the incomplete contract-based literature (see Hart et al., 1997; Schmidt 1996) of privatization, which focuses on the incentives arising from ownership (private versus public). This brings a new angle to the privatization debate (i.e., ownership), which has traditionally focused on market competition. Nevertheless, it is fair to say that this is probably more appropriate in the context of the provision of privatization of public goods in developed countries (e.g., schools, hospitals, prisons etc.). Finally, there is a third strand of literature based on a principal-agent model which focuses on managerial incentives and monitoring problems. See, e.g., Barros (1994), De Fraja (1993).

presence of increasing marginal costs (i.e., decreasing returns to scale), privatization, by reducing the scale of production of former PSEs, improves production efficiency, which can improve welfare. Using a spatial model of product differentiation, Cremer et al. (1991) show that the presence of a public firm could result in product configuration which is too concentrated. Privatization, by reducing concentration, can improve welfare. Building on a Hotelling-duopoly framework and introducing endogenous cost differentials between public and private enterprises, Matsumura and Matsushima (2004) show that private firms are indeed more efficient than public ones. However, the increased efficiency comes at the expense of excessive investment in cost-reducing activities. Privatization in their framework improves welfare by mitigating the loss arising from excessive cost-reducing investments.

Anderson et al. (1997) provide an important potential benefit of privatization, which only manifests itself in the long run (i.e., with free entry). In the short run, with a fixed number of firms, the presence of a public sector firm lowers prices, which increases welfare. However, in the long run, the lower prices of public firms act as entry deterrent and, consequently, fewer varieties are offered in the market. Anderson et al. show that privatization, by increasing the number of varieties, can lead to higher welfare provided the public firm was incurring losses (before privatization).<sup>7</sup> Free entry of private producers has also been discussed in the context of partial privatization in Matsumura and Kanda (2005) and Fujiwara (2007). Both these works show that in the presence of free entry, the results with a fixed number of private firms might no longer hold.

Entry considerations play an important role in our framework as well. But because of the absence of factor markets, the framework used in the abovementioned papers cannot be used to explore some of the key issues and concerns—e.g., fall in wages and/or a rise in unemployment, deindustrialization, conflicts across factor owners—associated with the privatization programs, especially in developing countries. Our two-factor, two-sector, general equilibrium framework, to which we turn now, exploits an important channel through which the contraction of the public sector works—the economy-wide reallocation of resources and subsequent effects on factor returns, entry, and production.

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<sup>7</sup> The papers on mixed oligopoly discussed here are mainly theoretical in nature. For empirical analysis on mixed oligopoly, see Barros and Modesto (1999). They investigate the regulatory role of public firm in the Portuguese banking sector, which consists of private as well as public firms.

As far as we are aware, Beladi and Chao (2006)'s is the only paper that considers labor market issues in the context of privatization. In considering a dual economy (but a closed one), they show that an increase in private ownership leads to an increase in urban employment in the short run. In the long run, the unemployment problem becomes less severe as capital moves to the rural sector. Unlike their framework, ours is a full employment general equilibrium setting. The key difference, however, is that ours is an open economy set up in contrast to the closed economy setting considered in Beladi and Chao (2006). Considering an open economy allows us to examine the role of complementary reforms—trade liberalization and freer capital inflows—in generating political support for privatization.

## 2 The Model

Consider a small tariff-ridden open economy comprising of  $\bar{L}$  workers and  $\bar{K}_d$  capitalists. Each worker has one unit of labor while each capitalist has one unit of capital.<sup>8</sup> The workers and the capitalists have identical preferences.

### 2.1 Consumers

Each individual  $i$  maximizes an upper-tier Cobb-Douglas utility function given by

$$U_i = X_i^\alpha y_i^{1-\alpha}, \quad (1)$$

subject to the budget constraint

$$y_i + PX_i = z_i, \quad (2)$$

where,  $y_i$ ,  $X_i$ , and  $z_i$  denote, respectively, the amount of individual  $i$ 's (i) consumption of the (numeraire) homogenous good  $y$ , (ii) consumption of an aggregate quantity index of differentiated goods  $X$  (whose price is  $P$ ), and (iii) income. Apart from factor earnings,  $z_i$  includes a share of tariff revenues (which is rebated to individual  $i$ ) and is net of lump-sum taxes that are used to cover losses (if any) of PSEs.<sup>9</sup>

The quantity index (or alternatively the sub-utility function of the Dixit-Stiglitz type)  $X_i$ , defined below, captures consumers' love for variety:

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<sup>8</sup> The assumption that each capitalist owns one unit of capital captures the fact that each capitalist is small. However, this assumption is only for simplification and nothing substantial hinges on it.

<sup>9</sup> Since proponents of privatization strongly criticize the existence of loss-making public enterprises, we focus on loss-making PSEs and assume that these losses are covered by taxes. In case the public enterprises make profits, we assume that profits are rebated to the consumers.



$$X_i = \left( \sum_{k=1}^n x_{ki}^{\frac{\sigma-1}{\sigma}} + \sum_{j=1}^{n^*} x_{ji}^*{}^{\frac{\sigma-1}{\sigma}} + \sum_{g=1}^{n_g} s_{gi}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}, \quad (3)$$

where  $x_{ki}$ ,  $x_{ji}^*$ , and  $s_{gi}$  denote, respectively, the amount of individual  $i$ 's consumption of a domestic private brand  $k$ , a foreign brand  $j$ , and a public brand  $g$ , and  $\sigma > 1$  is the elasticity of substitution between brands (below in equations (7) to (9) it is the elasticity of demand facing each producer). The number of domestic private brands, foreign brands, and public brands are given by  $n$ ,  $n^*$  and  $n_g$  respectively. The price index corresponding to  $X$  is

$$P = \left( \sum_{k=1}^n p_k^{1-\sigma} + \sum_{j=1}^{n^*} p_j^{f1-\sigma} + \sum_{g=1}^{n_g} q_g^{1-\sigma} \right)^{\frac{1}{1-\sigma}}, \quad (4)$$

where  $p_k$ ,  $p_j^f$ , and  $q_g$  are, respectively, prices of a domestic private brand  $k$ , an imported brand  $j$ , and a government brand  $g$ . Note that the price of an imported brand,  $p_j^f$ , is inclusive of tariffs, i.e.,  $p_j^f = (1+t)p_j^*$  where  $p_j^*$  is the international price of the  $j$ th foreign brand and  $t > 0$  is the ad-valorem tariff rate.

The utility maximization exercise (maximizing (1) subject to (2)) followed by aggregation across  $\bar{L} + \bar{K}_d$  consumers yields the expenditure shares of the homogenous goods and the differentiated goods as follows:

$$y = (1 - \alpha)z, \quad (5)$$

$$PX = \alpha z, \quad (6)$$

where  $y$ ,  $X$ , and  $z$  denote, respectively, the aggregate consumption of homogeneous good, aggregate quantity index of differentiated good, and national income. Next, maximizing the sub-utility function  $X_i$ , given by (3), subject to the constraint that the sum of expenditure on all brands has to be less than or equal to  $PX_i$ , yields the demands for individual brands by each consumer  $i$ . Adding all consumers' demands yields the aggregate demand for these brands as follows:

$$x_k = p_k^{-\sigma} P^{\sigma-1} \alpha z, \quad (7)$$

$$x_j^* = ((1+t)p_j^*)^{-\sigma} P^{\sigma-1} \alpha z, \quad (8)$$

$$s_g = q_g^{-\sigma} P^{\sigma-1} \alpha z. \quad (9)$$

Hereafter we will focus on a symmetric equilibrium where each private firm sets the same price  $p_k = p$ , and produces the same amount of output  $x_k = x$ . The same is

true for foreign varieties, i.e.,  $x_j^* = x^*$  and we assume that government sets  $s_g = s$  for all public brands, which in turn implies  $q_g = q$  for all  $g$ . Following the standard practice in the small open economy literature with imperfect competition (see, e.g., Venables, 1982; Sen et al., 1997; Chakraborty 2001), we assume that the price and the number of foreign brands are exogenously given. In addition, we also assume that the number of public brands  $n_g$  is given.

## 2.2 Firms

The homogenous good, whose output is denoted by  $Y$ , is produced under constant returns to scale using labor and capital. Competition, together with the constant returns to scale technology, implies the equality between price (unity for the numeraire) and marginal cost:

$$a_{LY}w + a_{KY}r = 1, \quad (10)$$

where  $a_{ij}$  denotes the amount of factor  $i$  ( $= L, K$ ) utilized in producing a unit of good  $j$ , and  $w$  and  $r$  are, respectively, wages and returns to capital.

The production of each private brand consists of two components—a variable cost and a fixed cost. Both components use a CRS technology (different from the ones used in the homogenous goods sector) employing labor and capital. Profit maximization for each private brand implies the mark-up pricing rule:

$$a_{Lx}w + a_{Kx}r = p\left(1 - \frac{1}{\sigma}\right). \quad (11)$$

Free entry of private firms in the differentiated goods sector implies that private profits are zero in equilibrium. Thus for each private brand, the excess of revenue over total variable cost (as reflected in (11)) exactly covers the fixed costs incurred. This gives

$$a_{LF}w + a_{KF}r = \frac{px}{\sigma}, \quad (12)$$

where  $a_{iF}$  denotes the amount of factor  $i$  ( $= L, K$ ) used as fixed input. Though each component—variable or fixed—exhibits CRS, the presence of the fixed cost itself implies the presence of increasing returns to scale in the differentiated goods sector. We assume that the capital intensities for the fixed and the variable components are the same, i.e.,  $\frac{a_{Kx}}{a_{Lx}} = \frac{a_{KF}}{a_{LF}}$ . This assumption used elsewhere in the literature (see e.g.,

Antras 2003, p. 1382) makes the total cost function homothetic. In particular, using

(11) and (12), this assumption implies that  $x$  is constant.

The profit of a PSE  $g$  is given by

$$\pi_g = (q - wa_{Ls} - ra_{Ks})s, \quad (13)$$

where  $a_{is}$  denotes the amount of input  $i$  ( $= L, K$ ) employed in the variable cost component of  $s$ . We make some simplifying assumptions regarding production by the PSE for reasons of tractability. First, we omit the fixed cost component in the production of public brands. The PSE is not disciplined by the zero profits condition and hence the presence of the fixed cost component, although realistic, complicates matters unnecessarily. Second, we assume that the PSE uses a Leontief technology, i.e., the elasticity of substitution between labor and capital is zero (i.e., the  $a_{is}$ 's are constant). Neither the absence of the fixed cost component in public brand production nor the Leontief specifications are crucial for our analysis. However, these assumptions simplify the algebra. Finally, we assume that each PSE produces a fixed amount  $s$ , and following the observation that PSEs make losses more often than not, we assume in the remainder of the paper that  $q - wa_{Ls} - ra_{Ks} < 0$ .<sup>10</sup>

One of the most commonly noted features of PSEs is excessive employment. Due to the influence of vote-seeking politicians and, in some cases, close ties between the union and political parties, labor retrenchment from these enterprises is difficult, if not impossible.<sup>11</sup> Following the commonplace observation that PSEs employ a very labor-intensive technique, we assume that capital intensity of a public brand is lower than that in its private counterpart. Also, since the differentiated goods sector is presumably the manufacturing sector of the economy, the capital-intensity of the

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<sup>10</sup> Two features are worth noting. First, the assumption of fixed  $s$ , when interpreted as fixed capacities of the PSEs, sounds quite plausible. In fact, under this capacity interpretation, privatization not only implies a withdrawal of government production but a credible one. Second, these assumptions—constancy of  $s$ , existence of loss-making PSEs in equilibrium etc.—could be generated from a model where each PSE (i) maximizes a weighted average of profit and wage bill and (ii) the factor-intensities are the same for the fixed cost and the variable cost component. For analytical tractability, we treat those features as primitive rather than deriving them from explicit models. On this account, the version of our model presented here is probably weaker than the partial equilibrium models where PSEs are endowed with an explicit objective function—welfare maximization. Even in those models the number of PSEs is typically restricted to one and privatization is modeled as a switch from welfare maximization to profit maximization for that single firm. This weakness, however, is more than offset by the incorporation of some other important aspects (e.g., difference in factor intensities between public and private firms, entry considerations), which shed a new light on the analysis of privatization.

<sup>11</sup> The higher labor intensity of PSEs is observed in the developing as well as developed countries. Testing for labor intensity of state-owned enterprises listed among the 500 largest non-US firms in 1975, 1985, and 1995, Dewenter and Malatesta (2001) find that the private firms use significantly less labor-intensive processes than state-owned enterprises.

private brands is higher than the capital-intensity of the homogenous good. More formally, we assume that for all  $w, r > 0$ —which entails positive production in all sectors—the capital–labor ratios in different lines of production satisfy the following:

$$\frac{a_{Ks}}{a_{Ls}} < \frac{a_{KY}}{a_{LY}} < \frac{a_{Kx}}{a_{Lx}} .$$

Note that although domestic public brands are least capital

intensive, unless the share of those brands in total differentiated goods production is large, the manufacturing sector still remains more capital intensive compared to the exportable sector—a feature that accords well with the trade pattern of developing countries.

Relaxing the assumptions regarding technologies in different sectors—e.g., same capital intensities for the fixed and variable cost components in production of private brands, Leontief technology in public brands—is not necessary to derive some of the main results; neither is the factor-intensity ranking. Under the current factor-intensity ranking, wages are lower with privatization and the number of varieties can be lower as well—see sections 3.1 and 3.2, respectively. Under an alternative factor-intensity ranking, where a homogenous good is most labor intensive and private brands continue to be least labor intensive, privatization can still lower wages, but the number of private brands increases following privatization. However, unless  $\sigma$  is too close to unity, the central results of the paper—e.g., a worker’s welfare is lower with privatization, an increased capital inflow (along with privatization) leads to improvement in a worker’s welfare—can continue to hold.

### 2.3 Market Clearing Equations

The market clearing equations for labor and capital, respectively, are given by

$$a_{LY}Y + a_{Lx}nx + a_{LF}n + a_{Ls}n_g s = \bar{L} \quad (14)$$

$$a_{KY}Y + a_{Kx}nx + a_{KF}n + a_{Ks}n_g s = \bar{K}_d + \bar{K}_f, \quad (15)$$

where  $\bar{L}$  and  $\bar{K}_d$  are aggregate labor and domestic capital respectively in the economy.

Given the paucity of domestic capital in small, tariff-ridden, developing economies, we assume, quite realistically, that the economy also employs foreign capital ( $\bar{K}_f$ ).<sup>12</sup>

In addition to the factor-market clearing equations, we have conditions (7), (8), and

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<sup>12</sup> We think of the amount of foreign capital as being exogenously given—it is more like a policy parameter. While this can be relaxed (e.g., by making it responsive to  $r$ ), it is arguably a feature of the countries that pursued an inward-looking industrialization policy.

(9) which are the market clearing conditions for the private domestic brands, foreign brands, and public brands, respectively. Together, equations (7)–(9), (14), and (15) imply that trade is balanced,<sup>13</sup> i.e.,

$$Y - y = n^* p^* x^* . \quad (16)$$

The national income for this small open economy, denoted by  $z$ , is given by  $z = w\bar{L} + r\bar{K}_d + n_g \pi_g + tn^* p^* x^*$ , or equivalently by

$$z = w(\bar{L} - a_{Ls} n_g s) + r(\bar{K}_d - a_{Ks} n_g s) + n_g q s + tn^* p^* x^* . \quad (17)$$

Hereafter, we use  $L$  and  $K$  to denote the amount of labor and domestic capital employed in non-public production,<sup>14</sup> i.e.,  $L = \bar{L} - a_{Ls} n_g s$  and  $K = \bar{K}_d - a_{Ks} n_g s$ , respectively. This completes the specification of the model.

### 3 Privatization

We model privatization<sup>15</sup> as a reduction in the production of public brands, and explore its welfare consequences. Since both  $n_g$  and  $s$  are fixed in our model, privatization, i.e., reduction of government production, can be modeled either as a reduction in  $n_g$  or a reduction in  $s$ . Qualitatively, both exercises give similar results and here we report the findings for the latter (i.e., reduction in  $s$ ).<sup>16</sup>

To facilitate the analysis, we express the equations as well as the comparative statics results in terms of proportionate changes (e.g.,  $\hat{x} = d \ln x = dx/x$ ). Differentiation of (10), (11), and (12) gives, respectively,

$$\theta_{LY} \hat{w} + \theta_{KY} \hat{r} = 0 , \quad (18)$$

$$\theta_{Lx} \hat{w} + \theta_{Kx} \hat{r} = \hat{p} , \quad (19)$$

and

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<sup>13</sup> Thus this country produces some brands of the differentiated good but these are non-traded. This we believe is also a feature of countries that followed an inward-looking industrialization policy.

<sup>14</sup> We assume that  $K$  is strictly positive. This implies that private firms produce domestic brands even in the absence of foreign capital.

<sup>15</sup> The term “privatization” has been used to describe a variety of situations, with the common theme being reduced government intervention in production, or a complete sale of state-owned enterprises. See Megginson and Netter (2001) for a comprehensive discussion on this issue.

<sup>16</sup> Thus privatization means the government is “vacating space” for private production by reducing its sales and by releasing factors of production. Modeling privatization as a reduction in  $n_g$  would imply additional losses to the consumers due to fewer public brands. By treating a reduction in  $s$  as privatization, we abstract from this source of welfare loss. However, as our analysis shows, privatization can reduce workers’ welfare even if  $n_g$  does not decline.

$$\theta_{LF}\hat{w} + \theta_{KF}\hat{r} = \hat{p} + \hat{x}, \quad (20)$$

where  $\theta_{ij}$  is the share of the factor  $i$  in production of output  $j$  as a proportion of marginal cost.

Recall that we assumed the capital intensities in the fixed and the variable components of the production are identical (i.e.,  $\theta_{ix} = \theta_{iF}$ ,  $i = L, K$ ), which implies  $\hat{x} = 0$  (from (19) and (20)). Thus the scale of the private firm's production does not change with privatization, which implies that any change in aggregate production of the private brands is determined solely by entry–exit considerations. Solving for  $\hat{w}$  and  $\hat{r}$  from (18) and (19), in terms of  $\hat{p}$ , together with the factor-intensity ranking, yields the Stolper-Samuelson effects: an increase in price of the private domestic brands raises the returns to capital—the factor intensively employed in the production of private brands:

$$\frac{\hat{w}}{\hat{p}} = -\frac{\theta_{KY}}{\theta_{LY} - \theta_{Lx}} < 0, \quad \frac{\hat{r}}{\hat{p}} = \frac{\theta_{LY}}{\theta_{LY} - \theta_{Lx}} > 0. \quad (21)$$

Logarithmic differentiation of the factor-market clearing equations, followed by suitable substitutions from (21) gives:

$$\gamma_{LY}\hat{Y} + (\gamma_{Lx} + \gamma_{LF})\hat{n} + \gamma_{Ls}\hat{s} = -\frac{\sum_j \gamma_{Lj}\theta_{Kj}\varepsilon_j}{\theta_{LY} - \theta_{Lx}}\hat{p}, \quad (22)$$

$$\gamma_{KY}\hat{Y} + (\gamma_{Kx} + \gamma_{KF})\hat{n} + \gamma_{Ks}\hat{s} = \frac{\sum_j \gamma_{Kj}\theta_{Lj}\varepsilon_j}{\theta_{LY} - \theta_{Lx}}\hat{p}, \quad (23)$$

where  $\gamma_{ij}$  is the physical share of factor  $i$  in  $j \in \{Y, x, F, s\}$  and  $\varepsilon_j$  is the elasticity of substitution in production line  $j$ .

Further, differentiation of the price index (equation 4) and national income identity (equation 17) gives:

$$\hat{P} = \frac{1}{1-\sigma}\beta_1\hat{n} + \beta_1\hat{p} + \beta_2\hat{q}, \quad (24)$$

$$\hat{z} = \lambda_w(\hat{w} + \hat{L}) + \lambda_r(\hat{r} + \hat{K}) + \lambda_i\hat{x}^* + \lambda_{pub}(\hat{s} + \hat{q}), \quad (25)$$

where  $\beta_1$ ,  $\beta_2$  and  $(1-\beta_1 - \beta_2)$  are the shares of domestic brands, public brands, and foreign brands, respectively, in total expenditure on the differentiated good ( $PX$ ), and

$\lambda_w, \lambda_r, \lambda_{pub}, \lambda_t$  respectively denote the shares of (i) wage income ( $wL$ ), (ii) domestic capital income ( $rK$ ), (iii) revenues earned by the public sector ( $n_{gsq}$ ), and (iv) tariff revenue ( $tn^*p^*x^*$ ), in national income. Note that the factor shares  $\lambda_w$  and  $\lambda_r$  correspond to the earnings from the factors employed in the production of the non-public sector (comprising private differentiated goods and the homogenous good sector).

Differentiation of the goods-market clearing conditions with suitable substitutions from (21), (24), and (25), in the resultant expressions yield

$$A\hat{p} - \beta_1\hat{n} = B\hat{s}. \quad (26)$$

The expressions for  $A$  and  $B$  are given in (A10) and (A11) respectively in the Appendix. When the public sector makes losses—as we assume in our analysis— $B$  is positive. Exploiting the fact that the share of foreign brands in total domestic expenditure on differentiated goods ( $1 - \beta_1 - \beta_2 \equiv n^*p^*(1+t)x^*/\alpha z$ ) is higher than the share of tariff revenue in national income ( $\lambda_t \equiv tn^*p^*x^*/z$ ), we also show that  $A$  is negative.

### 3.1 Product and Factor Prices

How does privatization, modeled as a reduction in  $s$ , affect the prices in our framework? Proposition 1 discusses the effect of privatization on product prices and Proposition 2 examines the effect of privatization on wages and returns to capital.

**Proposition 1:** *Privatization raises the prices of domestic brands—private as well as public.*

**Proof:** Solving equations (22), (23), and (26) (see Appendix) gives

$$\frac{\hat{p}}{\hat{s}} = \frac{B[\gamma_{LY}(\gamma_{Kx} + \gamma_{KF}) - \gamma_{KY}(\gamma_{Lx} + \gamma_{LF})] + \beta_1[\gamma_{Ls}\gamma_{KY} - \gamma_{LY}\gamma_{Ks}]}{\Delta}, \quad (27)$$

where

$$\Delta = A[\gamma_{LY}(\gamma_{Kx} + \gamma_{KF}) - \gamma_{KY}(\gamma_{Lx} + \gamma_{LF})] - \beta_1\left[\frac{\gamma_{LY} \sum_j \gamma_{Kj} \theta_{Lj} \varepsilon_j}{\theta_{LY} - \theta_{Lx}} + \frac{\gamma_{KY} \sum_j \gamma_{Lj} \theta_{Kj} \varepsilon_j}{\theta_{LY} - \theta_{Lx}}\right].$$

First, consider the sign of  $\Delta$ . As mentioned earlier, (i)  $A < 0$ . Also since the production of homogenous good  $Y$  is relatively more labor intensive compared to  $x$  (and  $F$ ), we have (ii)  $\theta_{LY} - \theta_{Lx} > 0$  and (iii)  $\gamma_{LY}(\gamma_{Kx} + \gamma_{KF}) - \gamma_{KY}(\gamma_{Lx} + \gamma_{LF}) > 0$ . Together, (i), (ii), and (iii) imply  $\Delta < 0$ . Now, consider the numerator. The labor intensity in  $s$  is higher than that in  $Y$ , which gives (iv)  $\gamma_{Ls}\gamma_{KY} - \gamma_{Ks}\gamma_{LY} > 0$ . Using (iii),

(iv), and the fact that  $B > 0$  implies that the numerator in (27) is positive. Thus we have  $\frac{\hat{p}}{\hat{s}} < 0$ .

Now consider the effect of privatization on the price of public brands. Log differentiating (7) and (9) and rearranging gives

$$\frac{\hat{q}}{\hat{s}} = \frac{\hat{p}}{\hat{s}} - \frac{1}{\sigma}. \quad (28)$$

Since  $\frac{\hat{p}}{\hat{s}} < 0$ , we have  $\frac{\hat{q}}{\hat{s}} < 0$ . Q.E.D.

A reduction in  $s$  affects the price of the public brand  $q$  through in two ways. First, there is a direct effect of a reduction in the supply of  $s$ , which increases its price ( $q$ ). In addition, an increase in price of the private brands ( $p$ ) due to privatization induces consumers to demand more of the public brand—an imperfect substitute of the private ones. This creates an excess demand for the public brand, which in turn puts an upward pressure on  $q$ . Thus, on both counts—reduced supply of public brands and increased price of private brands—privatization leads to an increase in the price of the public brand.

**Proposition 2:** *Privatization lowers wages and increases the returns to capital.*

**Proof:** By Proposition 1, (i)  $\frac{\hat{p}}{\hat{s}} < 0$ . From (21) we have (ii)  $\frac{\hat{w}}{\hat{p}} < 0$ , and (iii)  $\frac{\hat{r}}{\hat{p}} > 0$ .

Together (i) and (ii) imply privatization lowers wages (i.e.,  $\frac{\hat{w}}{\hat{s}} > 0$ ) while (i) and (iii) imply that privatization raises the returns to capital (i.e.,  $\frac{\hat{r}}{\hat{s}} < 0$ ). Q.E.D.

The public sector uses the most labor-intensive (least capital-intensive) techniques. Hence, a contraction in the public sector creates an excess supply of labor and excess demand for capital, which in turn puts downward pressure on wages and upward pressure on the returns to capital. Thus wages decline and the returns to capital increase due to privatization.

### 3.2 Number of Varieties

Ours is a small open economy model, and, accordingly, the number of foreign brands is exogenously given (see Venables, 1982 and Sen et al., 1997 for a rationalization of



the assumption). Hence, to determine the effects of privatization on the number of varieties available to consumers, it is sufficient to examine the effect of privatization on the number of domestic brands produced.

**Proposition 3:** *Privatization reduces the number of domestic varieties for low elasticities of substitution in production.*

**Proof:** Solving (22), (23), and (26) yields

$$\frac{\hat{n}}{\hat{s}} = \frac{A[\gamma_{Ls}\gamma_{KY} - \gamma_{Ks}\gamma_{LY}] + B\left[\frac{\gamma_{LY} \sum_j \gamma_{Kj} \theta_{Lj} \varepsilon_j}{\theta_{LY} - \theta_{Lx}} + \frac{\gamma_{KY} \sum_j \gamma_{Lj} \theta_{Kj} \varepsilon_j}{\theta_{LY} - \theta_{Lx}}\right]}{\Delta}. \quad (29)$$

From the proof of Proposition 1 we already know that  $\Delta < 0$ ,  $A < 0$ , and  $\gamma_{Ls}\gamma_{KY} - \gamma_{Ks}\gamma_{LY} > 0$ . If  $\varepsilon_j \cong 0$  for  $j \in \{Y, x, F, s\}$ , then  $\frac{\hat{n}}{\hat{s}} > 0$ . Q.E.D.

There are two effects at work here. Given that the public sector uses the least capital-intensive techniques, the decline of the public sector means that the ratio of available capital to available labor for the non-public sectors declines as well. At given prices, this implies that the capital-intensive sector among the non-public ones, i.e., the differentiated goods sector, contracts. Thus, at given prices, a reduction in government production induces an exit of private domestic firms. However, prices are not fixed. Proposition 1 showed that privatization raises the price of the domestic private brand which encourages entry into the differentiated goods sector, suggesting that the differentiated goods sector would expand following privatization. For low elasticities of substitution (in production), the effect operating through the price channel is weak, which in turn gives the result (mentioned in Proposition 3).

Anderson et al. (1997) show that privatization of a public firm—modeled as a switch from welfare maximization to profit maximization as the objective function—increases not only the number of private brands but also the total number of brands. In contrast, we find that when private and public firms use different technologies (as they often do in reality), privatization can lead to the exit of private firms from the differentiated goods sector. In addition to increased product prices and lower wages, now there is one more source of welfare loss from privatization —fewer domestic

varieties.<sup>17</sup>

### 3.3 Tariff Revenues and Public Sector Losses

According to the proponents of privatization, an important benefit of privatization comes from the reduced losses of PSEs (which translates into lower taxes). Our analysis lends support to that view. In addition, by increasing imports, privatization leads to an increase in tariff revenue.

**Proposition 4:** *Privatization increases the tariff revenues and lowers the losses incurred by PSEs.*

**Proof:** Log differentiating (7) and (8), and rearranging subsequently gives (see derivation of A5 in the Appendix)

$$\frac{\hat{x}^*}{\hat{s}} = \sigma \frac{\hat{p}}{\hat{s}} < 0.$$

Thus imports (i.e.,  $x^*$ ) increase with privatization, which in turn implies that the tariff revenues increase with privatization.

Recall that the profit of a PSE producing a fixed amount  $s$  is  $\pi_g = (q - wa_{Ls} - ra_{Ks})s$ . Given that the PSE makes losses prior to privatization (i.e.,  $q - wa_{Ls} - ra_{Ks} < 0$ ), a reduction in  $s$  directly increases  $\pi_g$ . Privatization increases  $q$  (Proposition 1), which increases  $\pi_g$ . Using (21) and Proposition 1, it is easy to show that  $wa_{Ls} + ra_{Ks}$  declines with privatization. This also increases  $\pi_g$ . Q.E.D

## 4 Political Support for Privatization

Support for any reform comes from those who stand to gain from the reforms. Our analysis suggests that the capitalists—both domestic and foreign—benefit from higher returns to capital following privatization (see Proposition 2). Thus capitalists are likely to support privatization unless the loss from the reduction in the number of varieties is large.

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<sup>17</sup> A reduction in the number of brands from the free entry level can improve welfare by economizing on entry costs and lowering the average cost (if there are economies of scale). In a homogenous product oligopoly, Mankiw and Whinston (1986) and Suzumura and Kiyono (1987) have shown that entry regulation can indeed improve welfare. However, under Dixit-Stiglitz preferences (capturing love for variety) and a reduction in the number of brands lowers welfare.

Since imports increase with privatization, foreign firms will support privatization as well. In addition, the revenue-constrained governments—a feature that we abstract from but which is often the case in developing countries—are likely to be supportive of privatization as it raises tariff revenues.<sup>18</sup> If foreign firms are influential in domestic policies or if the political scenario is such that governments can ignore the wishes of the majority (i.e., workers in this case), then, once again, privatization can be successfully implemented.

However, in several countries undertaking or willing to undertake privatization, workers, due to their sheer numbers, play an important role. This suggests that at least in democracies with a significant involvement of PSEs (e.g., India, Turkey), a precondition for privatization to be politically viable is that the workers are not worse off.<sup>19</sup>

**Remarks:** Although we focus on the welfare effects of privatization on workers, except when we consider factor returns, the interests of capitalists and workers are aligned. For example, both capitalists and workers are adversely affected by an increase in domestic brand prices (see Proposition 1) and a possible decline in the number of varieties consumed (see Proposition 2). Indeed, if workers are better off with privatization, capitalists are also better off, although the reverse is not true. Second, one might ask why improvement in workers' welfare is considered in isolation. After all, if privatization improves welfare, then surely some transfers can be arranged so that the workers are as well off as without privatization. However, it is precisely because those transfers are highly costly and distortionary that the governments in these countries resort to direct production of manufacturing output in the first place. Third, the standard political economy models assume that each individual is endowed with one unit of labor and differential amounts of capital. Political support depends on whether the median voter's welfare improves with privatization. Here we assume that workers are identical and have no capital. While it might seem extreme, the assumption is not far from reality in the developing

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<sup>18</sup> There is a direct increase in government revenues from the sale of PSEs, which we do not focus on here. Our analysis shows that there is also an indirect channel through which the government's revenues could increase—through increased imports subject to tariffs.

<sup>19</sup> Although we focus on the welfare of workers alone, the fact that these workers are considered identical places our model somewhere between a political economy model (with differential endowments among individuals) and the canonical welfare maximizing social planner who puts equal weights on utilities of all individuals. See Dutt and Mitra (2002) for a simple political economy model in an open economy context. Baland and Francois (2005) look at privatization in the presence of a commons and find that privatization may increase efficiency but reduce welfare.

economies—the median individual in these countries has little or no capital.

Now we turn to the effect of privatization on workers' welfare. Let  $V_w$  denote the indirect utility of the representative worker. For simplicity, we assume now that the tariff revenues are returned to the workers while taxes (if any) are paid by the capitalists.

**Proposition 5:** *If (i) the share of tariff revenue in workers' income and (ii) the elasticities of substitution production are low, privatization reduces workers' welfare.*

**Proof:** The utility maximization exercise in (1), together with the fact that the workers' income consists of wages and tariff revenues alone, gives

$$V_w = \alpha^\alpha (1-\alpha)^{1-\alpha} \left( w + \frac{tn^* p^* x^*}{L} \right) P^{-\alpha}.$$

Differentiating logarithmically and rearranging yields

$$\frac{\hat{V}_w}{\hat{s}} = \mu \frac{\hat{w}}{\hat{s}} + (1-\mu) \frac{\hat{x}^*}{\hat{s}} - \alpha\beta_1 \frac{\hat{p}}{\hat{s}} - \alpha\beta_2 \frac{\hat{q}}{\hat{s}} + \frac{\alpha\beta_1}{\sigma-1} \frac{\hat{n}}{\hat{s}}, \quad (30)$$

where  $\mu$  denotes the share of wages in a worker's income.

By Proposition 1,  $\frac{\hat{p}}{\hat{s}} < 0$  and  $\frac{\hat{q}}{\hat{s}} < 0$ . Proposition 2 says that privatization lowers wages, i.e.,  $\frac{\hat{w}}{\hat{s}} > 0$ . In addition, if elasticities of substitution are low in production,

privatization lowers the number of varieties (i.e.,  $\frac{\hat{n}}{\hat{s}} > 0$ ). Then, from (30) it follows

that if there are no tariff revenues ( $\mu = 1$ ),  $\frac{\hat{V}_w}{\hat{s}} > 0$ . Privatization benefits workers only

through increased tariff revenues resulting from higher imports ( $\frac{\hat{x}^*}{\hat{s}} < 0$ ). If the share

of tariff revenue in workers' income (i.e.,  $1-\mu$ ) is small, then the conclusion obtained

with  $\mu = 1$  continues to hold. That is,  $\frac{\hat{V}_w}{\hat{s}} > 0$ . Q.E.D

Though the wages are lower and the prices (of domestic brands) are higher with privatization, the number of varieties might be more or less depending on the elasticities of substitution in production—see the discussion in section 3.3. The low elasticities (e.g., Leontief technology) ensure that the number of varieties decline with privatization, which adds to the welfare loss arising from lower wages and higher

prices. Even if the elasticity of substitutions are large and consequently the number of varieties increases following privatization, the workers' welfare will still generally be lower with privatization due to lower wages and higher prices. However, for low values of  $\sigma$  (the elasticity of substitution between the various brands), which implies a very strong love for variety, it is possible that the welfare gains from the increased number of varieties outweigh the welfare losses from the other sources.

**Remark:** Following the literature on small open economy models of monopolistic competition, we have assumed that the number of imported varieties is exogenously given. With an endogenous number of foreign varieties, privatization can lead to an increase in the number of foreign brands since domestic brands become more expensive with privatization. This suggests a reduction in the overall number of varieties and consequently the welfare loss is less when the number of imported varieties is endogenously determined. Although this partially offsets the negative impact of privatization, it is unlikely to outweigh the welfare loss arising from a reduction in wages.

## 5 Complementary Reforms

Since the capitalists and the foreign firms gain from privatization, complementary reforms are not necessary in order to implement privatization if these groups are influential in the policy making. However, if workers' welfare is the central concern, then privatization alone will not be politically viable. Does that mean privatization, as a goal, is unattainable in democratic developing economies? The answer is no according to the analysis in this section. Although privatization, pursued alone, can reduce workers' welfare, there are complementary policies which, if undertaken along with privatization, can offset the welfare loss. Given that ours is a tariff-ridden open economy, we consider two policy interventions, which are absent in a closed economy model—namely, an increase in foreign investment and a reduction in the tariff rate.

### 5.1 Foreign Investment

Recall from section 4 that the workers are better off with privatization if and only if the following holds (see equation 30):

$$\frac{\hat{V}_w}{\hat{s}} \leq 0 \Leftrightarrow \mu \frac{\hat{w}}{\hat{s}} + (1-\mu) \frac{\hat{x}^*}{\hat{s}} - \alpha\beta_1 \frac{\hat{p}}{\hat{s}} - \alpha\beta_2 \frac{\hat{q}}{\hat{s}} + \frac{\alpha\beta_1}{\sigma-1} \frac{\hat{n}}{\hat{s}} \leq 0,$$

which upon simplification yields

$$\frac{\hat{V}_w}{\hat{s}} \leq 0 \Leftrightarrow -\left[ \frac{\mu\theta_{KY}}{\theta_{LY} - \theta_{Lx}} + \alpha(\beta_1 + \beta_2) - (1-\mu)\sigma \right] \frac{\hat{p}}{\hat{s}} + \frac{\alpha\beta_1}{\sigma-1} \frac{\hat{n}}{\hat{s}} + \frac{\alpha\beta_2}{\sigma} \leq 0. \quad (31)$$

Amending (23) to incorporate proportional changes in foreign capital and then solving (22), (23), and (26) gives (see the Appendix)

$$\frac{\hat{n}}{\hat{s}} = \left( \frac{\hat{n}}{\hat{s}} \right)_{prev} + \frac{Af\gamma_{LY} \hat{K}_f}{\Delta \hat{s}}, \quad (32a)$$

$$\frac{\hat{p}}{\hat{s}} = \left( \frac{\hat{p}}{\hat{s}} \right)_{prev} + \frac{\beta_1 f \gamma_{LY} \hat{K}_f}{\Delta \hat{s}}, \quad (32b)$$

where  $f$  denotes the foreign share in the total capital employed in the economy,  $\Delta < 0$  (as mentioned earlier), and  $\left( \frac{\hat{n}}{\hat{s}} \right)_{prev}$  and  $\left( \frac{\hat{p}}{\hat{s}} \right)_{prev}$  denote, respectively, the effect of privatization on the number of varieties and the price, in the absence of other policy interventions—these are given by (29) and (27) in section 3. Substituting (32a) and (32b) in (31), and defining

$$\left( \frac{\hat{V}_w}{\hat{s}} \right)_{prev} = -\left[ \frac{\mu\theta_{KY}}{\theta_{LY} - \theta_{Lx}} + \alpha(\beta_1 + \beta_2) - (1-\mu)\sigma \right] \left( \frac{\hat{p}}{\hat{s}} \right)_{prev} + \frac{\alpha\beta_1}{\sigma-1} \left( \frac{\hat{n}}{\hat{s}} \right)_{prev} + \frac{\alpha\beta_2}{\sigma}$$

we find that

$$\frac{\hat{V}_w}{\hat{s}} \leq 0 \Leftrightarrow \left( \frac{\hat{V}_w}{\hat{s}} \right)_{prev} - \left[ \frac{\mu\theta_{KY}}{\theta_{LY} - \theta_{Lx}} + \alpha(\beta_1 + \beta_2) - (1-\mu)\sigma \right] \frac{\beta_1 f \gamma_{LY} \hat{K}_f}{\Delta \hat{s}} + \frac{\alpha\beta_1}{\sigma-1} \frac{Af\gamma_{LY} \hat{K}_f}{\Delta \hat{s}} \leq 0. \quad (33)$$

Consider a scenario where privatization reduces a worker's welfare, i.e.,  $\left( \frac{\hat{V}_w}{\hat{s}} \right)_{prev} >$

0. Assume that  $\mu$  is large—the share of wages in a worker's overall income is large.

This implies that  $\left[ \frac{\mu\theta_{KY}}{\theta_{LY} - \theta_{Lx}} + \alpha(\beta_1 + \beta_2) - (1-\mu)\sigma \right]$  is positive. Then from (32a) and

(32b) respectively it follows that if foreign investment is increased along with

privatization, the number of domestic varieties increases and prices decline, both of which reduce the welfare losses which arise when privatization alone is implemented. Indeed, given  $A$  and  $\Delta$  are negative, (33) implies that an increase in foreign investment is necessary with privatization (i.e.,  $\frac{\hat{K}_f}{\hat{s}} < 0$ ) for an improvement in workers' welfare.

The precise magnitude of the foreign capital ( $\frac{\hat{K}_f}{\hat{s}}$ ) required to neutralize the welfare loss arising from privatization alone is determined by setting  $\frac{\hat{V}_w}{\hat{s}} = 0$ .

**Proposition 6:** *Privatization, combined with suitable increases in foreign investment, increases workers' welfare.*

**Proof:** Follows from the discussion above.

To understand Proposition 6, note that an increase in foreign investment has two welfare-improving effects. First, it leads to an increase in the number of domestic private brands—the capital-intensive sector in our framework. Second, an increased supply of foreign capital leads to higher wages. Since wages and brand prices are negatively related—via the Stolper-Samuelson effect—prices are also lower. Both these effects raise welfare.

It might seem that an increase in foreign capital is unambiguously welfare improving, with or without privatization. However, that is not necessarily the case. In a small open economy with perfect competition, several authors (including Johnson, 1967 and Bhagwati, 1968) have shown that an inflow of foreign capital could immiserize the recipient economy in the presence of tariffs in a large number of scenarios. Indeed, Brecher and Diaz-Alejandro (1977) showed that an inflow of foreign capital is *necessarily* immiserizing, if the import-competing sector is capital intensive and foreign capital income is repatriated in full.<sup>20</sup> The import-competing differentiated goods sector is indeed capital intensive (ignoring the public firm) in our framework and focusing on workers' welfare alone makes our model akin to a set up where the capital income accrues entirely to foreigners. However, in the presence of

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<sup>20</sup> Grinols (1991) provides an example in a Harris-Todaro framework where immiserization does not occur.

imperfect competition in the import-competing sector—which is true for our framework—the immiserization is unlikely to hold.

## 5.2 Trade Liberalization

Now consider combining trade liberalization with privatization. Note that in a model such as ours, trade liberalization by itself is welfare reducing since it causes an exit from the domestic differentiated goods sector (see, e.g., Venables, 1982). Incorporating trade liberalization (i.e., a reduction in tariff rate  $t$ ) in the presence of privatization, however, improves workers' welfare only if the following holds:

$$\begin{aligned} & \frac{\hat{V}_w}{\hat{s}} \leq 0 \\ \Leftrightarrow & -\left[ \frac{\mu\theta_{KY}}{\theta_{LY} - \theta_{Lx}} + \alpha(\beta_1 + \beta_2) - (1 - \mu)\sigma \right] \frac{\hat{p}}{\hat{s}} + \frac{\alpha\beta_1}{\sigma - 1} \frac{\hat{n}}{\hat{s}} - (\alpha(1 - \beta_1 - \beta_2) - (1 - \mu)(1 + \frac{1}{t})) \frac{\hat{T}}{\hat{s}} + \frac{\alpha\beta_2}{\sigma} \leq 0 \end{aligned} \quad (34)$$

where  $t > 0$ ,  $T = 1 + t$ , and

$$\frac{\hat{n}}{\hat{s}} = \left( \frac{\hat{n}}{\hat{s}} \right)_{prev} - \frac{C(\gamma_{LY} \sum_j \gamma_{Lj} \theta_{Kj} \varepsilon_j + \gamma_{KY} \sum_j \gamma_{Lj} \theta_{Kj} \varepsilon_j)}{\Delta(\theta_{LY} - \theta_{Lx})} \frac{\hat{T}}{\hat{s}}, \quad (35a)$$

$$\frac{\hat{p}}{\hat{s}} = \left( \frac{\hat{p}}{\hat{s}} \right)_{prev} - \frac{C[\gamma_{LY}(\gamma_{Kx} + \gamma_{KF}) - \gamma_{KY}(\gamma_{Lx} + \gamma_{LF})]}{\Delta} \frac{\hat{T}}{\hat{s}}. \quad (35b)$$

We know  $\Delta > 0$  and  $\theta_{LY} - \theta_{Lx} > 0$ . In the Appendix, we derive the expression for  $C$  and show that  $C > 0$ . Substituting (35a) and (35b) in (34) and defining  $\left( \frac{\hat{V}_w}{\hat{s}} \right)_{prev}$  as in

subsection 5.2, we find that

$$\begin{aligned} & \frac{\hat{V}_w}{\hat{s}} \leq 0 \Leftrightarrow \left( \frac{\hat{V}_w}{\hat{s}} \right)_{prev} - (\alpha(1 - \beta_1 - \beta_2) - (1 - \mu)(1 + \frac{1}{t})) \frac{\hat{T}}{\hat{s}} \\ & + \left[ \frac{\mu\theta_{KY}}{\theta_{LY} - \theta_{Lx}} + \alpha(\beta_1 + \beta_2) - (1 - \mu)\sigma \right] \frac{C[\gamma_{LY}(\gamma_{Kx} + \gamma_{KF}) - \gamma_{KY}(\gamma_{Lx} + \gamma_{LF})]}{\Delta} \frac{\hat{T}}{\hat{s}} \\ & - \frac{\alpha\beta_1}{\sigma - 1} \frac{C(\gamma_{LY} \sum_j \gamma_{Kj} \theta_{Lj} \varepsilon_j + \gamma_{KY} \sum_j \gamma_{Lj} \theta_{Kj} \varepsilon_j)}{\Delta(\theta_{LY} - \theta_{Lx})} \frac{\hat{T}}{\hat{s}} \leq 0. \end{aligned} \quad (36)$$

Assume that the tariff barriers are lowered along with privatization, i.e.,  $\frac{\hat{T}}{\hat{s}} > 0$ .



The second term on the right-hand side of (36) captures the direct effect of a reduction in tariff rates. A reduction in tariff rates directly benefits the consumers by lowering the price index. However, tariff reductions also lower tariff revenues. The former beneficial effect (i.e., lower prices) dominates the latter as long as  $\alpha(1 - \beta_1 - \beta_2) - (1 - \mu)(1 + 1/t) > 0$ —which holds if the share of rebated tariff revenue in a worker’s overall income is small (i.e.,  $\mu$  is large). We had assumed this to be the case.

The third term on the RHS of (36) captures the effect of tariffs on the prices of domestic brands and consequently on welfare. Since  $C > 0$ ,  $\Delta < 0$ , from (35b) it follows that an increase in the price of the domestic brand following privatization is less if tariff rates are simultaneously lowered. Also, since  $\gamma_{LY}(\gamma_{Kx} + \gamma_{KF}) - \gamma_{KY}(\gamma_{Lx} + \gamma_{LF}) > 0$  and  $\frac{\mu\theta_{KY}}{\theta_{LY} - \theta_{Lx}} + \alpha(\beta_1 + \beta_2) - (1 - \mu)\sigma > 0$ , (36)

implies that welfare increases because of the drop in the prices of domestic private brands. Note that the lower prices of private brands not only benefit consumers directly, but, as discussed in section 3.1, also through a reduction of prices of public brands, and by raising wages.

Though there are gains from trade liberalization due to higher wages and lower prices of foreign and domestic private brands, the number of varieties is reduced with trade liberalization, i.e.,  $\frac{\hat{n}}{\hat{s}} > \left(\frac{\hat{n}}{\hat{s}}\right)_{prev}$ —see (35a). The reasoning is simple. With trade

liberalization, the exportable sector producing the homogenous good expands whereas the import-competing sector producing differentiated brands contracts, and accordingly the number of domestic private brands decline. The reduction in the number of private brands,  $n$ , raises the price index and lowers welfare. Note that (from (36)) the magnitude of the adverse welfare effect of trade liberalization is large only when (a) elasticities of substitution in production ( $\varepsilon_i$ ) are large or (b) brands are too differentiated ( $\sigma$  close to unity).<sup>21</sup> However, with large elasticities of substitution the number of brands actually increases with privatization alone and hence unless (b)

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<sup>21</sup> Note that for high elasticities of substitution in production, the number of varieties might actually increase with privatization—see Proposition 3. Hence although trade liberalization alone lowers the number of varieties, considering the overall effect, the number of varieties for privatization cum liberalization is likely to increase from the pre-privatization level. This suggests that with high values of elasticities of substitution in production, trade liberalization is likely to improve workers’ welfare.

is violated, the negative impact on welfare is small<sup>22</sup> and consequently the beneficial effects of trade liberalization—lower prices, higher wages—dominate.

**Proposition 7:** *Privatization combined with trade liberalization increases workers' welfare provided the brands are not too differentiated (i.e.,  $\sigma$  is not close to unity).*

**Proof:** Follows from the discussion above.

These two propositions, i.e., Propositions 6 and 7, suggest that the proponents of privatization are not wrong either. In fact, in order to achieve a politically viable privatization, governments need to undertake reforms in other arenas as well—in our case, trade and capital accounts.

## 6 Conclusion

Prompted by poor performance and widespread inefficiencies, governments in several developing countries have attempted to withdraw from the manufacturing sector, in which it used to have a significant share both in terms of output and employment. What are the welfare consequences of such a retreat? We attempted to address this question by embedding public sector production—characterized by labor-intensive techniques and a lack of market discipline (these firms continue to produce even if profits are negative)—in a general equilibrium model with imperfect competition. Although there is a small body of work incorporating the government provision of public goods in the trade literature, direct government production does not seem to have received much attention.

Our findings suggest that privatization may have several benefits. It reduces losses of the PSEs, raises the returns to capital, and increases the tariff revenue—all of which improve welfare. However, due to the use of labor-intensive techniques, a shrinking of the public sector might create unemployment or in a full-employment model like ours, lower wages. More surprisingly, we find that if elasticities of substitution are low in production, private brands producers, rather than filling up the void created through the contraction of the public sector, might actually exit. Fewer

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<sup>22</sup> This is reflected in (34) where  $(\sigma - 1)$  is in the denominator of the coefficient of  $\hat{n} / \hat{s}$ .

brands together with lower wages reduce the welfare of workers. This suggests that pursuing privatization alone might be politically costly.

According to our model, to do it right—i.e., to privatize without immiserizing the workers—requires complementary reforms. In particular, the government needs to provide suitable incentives and an environment to attract foreign investment into the country. This stands in sharp contrast to findings from perfectly competitive trade models where capital inflow in a tariff-distorted economy, with a capital-intensive importable sector, reduces welfare. Trade liberalization (also welfare-reducing by itself in presence of imperfect competition), if pursued along with privatization improves workers' welfare only if there is not much differentiation—which is true if the sector produces relatively basic manufacturing goods.

## Appendix

### 1. Derivation of (26)

Differentiating (7), (8), and (9) respectively yield:

$$0 = -\sigma\hat{p} + (\sigma - 1)\hat{P} + \hat{z}, \quad (\text{A1})$$

$$\hat{x}^* = (\sigma - 1)\hat{P} + \hat{z}, \quad (\text{A2})$$

and

$$\hat{s} = -\sigma\hat{q} + (\sigma - 1)\hat{P} + \hat{z}. \quad (\text{A3})$$

Subtracting (A1) from (A3) gives

$$\hat{s} = \sigma(\hat{p} - \hat{q}), \text{ i.e. } \hat{q} = \hat{p} - \frac{\hat{s}}{\sigma}, \quad (\text{A4})$$

and subtracting (A1) from (A2) yields

$$\hat{x}^* = \sigma\hat{p}. \quad (\text{A5})$$

Recall that  $L$  and  $K$  denote the labor and capital employed in private production (differentiated and homogeneous goods combined). Totally differentiating the two identities— $L \equiv \bar{L} - a_{Ls}n_g s$  and  $K \equiv \bar{K}_d - a_{Ks}n_g s$  respectively—and rearranging gives

$$\hat{L} = -\frac{\phi_2}{\phi_1}\hat{s}, \quad (\text{A6})$$

$$\hat{K} = -\frac{\varphi_2}{\varphi_1} \hat{s}, \quad (\text{A7})$$

where  $\phi_1 = L/\bar{L}$ ,  $\phi_2 = a_{Ls}n_g s/\bar{L}$ ,  $\varphi_1 = K/\bar{K}_d$  and  $\varphi_2 = a_{Ks}n_g s/\bar{K}_d$ . Substituting (21) and (A4) – (A7) in (25) and rearranging yields

$$\hat{z} = \left( \frac{\lambda_r \theta_{LY} - \lambda_w \theta_{KY}}{\theta_{LY} - \theta_{Lx}} + \lambda_t \sigma + \lambda_{pub} \right) \hat{p} + \left( \lambda_{pub} \left(1 - \frac{1}{\sigma}\right) - \frac{\lambda_w \phi_2}{\phi_1} - \frac{\lambda_r \varphi_2}{\varphi_1} \right) \hat{s}. \quad (\text{A8})$$

Note that  $\left( \lambda_{pub} \left(1 - \frac{1}{\sigma}\right) - \frac{\lambda_w \phi_2}{\phi_1} - \frac{\lambda_r \varphi_2}{\varphi_1} \right) = \frac{n_g s}{z} \left( q \left(1 - \frac{1}{\sigma}\right) - wa_{Ls} - ra_{Ks} \right)$ , which is negative, as long as the mark-up for public brands is less than the mark-up for the private brands (i.e.,  $\frac{\sigma}{\sigma-1}$ ). In particular, the expression is negative for loss-making PSEs since  $q < wa_{Ls} + ra_{Ks}$ .

Substituting (A4) into (24) and multiplying both sides by  $\sigma - 1$  gives

$$(\sigma - 1)\hat{P} = -\beta_1 \hat{n} + (\sigma - 1)(\beta_1 + \beta_2)\hat{p} - \beta_2 \left(1 - \frac{1}{\sigma}\right) \hat{s}. \quad (\text{A9})$$

Substituting (A8) and (A9) into (A1) and rearranging gives equation (26)

$$A\hat{p} - \beta_1 \hat{n} = B\hat{s},$$

where

$$A = \frac{\lambda_r \theta_{LY} - \lambda_w \theta_{KY}}{\theta_{LY} - \theta_{Lx}} + ((\sigma - 1)(\beta_1 + \beta_2) - \sigma(1 - \lambda_t)) + \lambda_{pub} \quad (\text{A10})$$

and

$$B = \beta_2 \left(1 - \frac{1}{\sigma}\right) - \left( \lambda_{pub} \left(1 - \frac{1}{\sigma}\right) - \frac{\lambda_w \phi_2}{\phi_1} - \frac{\lambda_r \varphi_2}{\varphi_1} \right). \quad (\text{A11})$$

## 2. Signs of A and B

Rearranging (A10) we find that

$$A = \frac{\lambda_r \theta_{LY} - \lambda_w \theta_{KY}}{\theta_{LY} - \theta_{Lx}} - (1 - \lambda_t - \lambda_{pub}) - ((\sigma - 1)(1 - \beta_1 - \beta_2 - \lambda_t)).$$

Noting that  $1 - \lambda_t - \lambda_{pub} = \lambda_w + \lambda_r$  and simplifying further gives the following:

$$A = \frac{(\lambda_w + \lambda_r) \left( \frac{\theta_{Lx}}{\theta_{Lx} + \theta_{Kx}} - \frac{\lambda_w}{\lambda_w + \lambda_r} \right)}{\theta_{Ly} - \theta_{Lx}} - ((\sigma - 1)(1 - \beta_1 - \beta_2 - \lambda_t)). \quad (\text{A12})$$

Since the production of private brands (i.e.,  $x$ ) uses the least labor-intensive techniques, it follows that  $\theta_{LY} - \theta_{Lx} > 0$  and  $\theta_{Lx}/\theta_{Kx} < \lambda_w/\lambda_r$ . These observations, together with the fact that

$$1 - \beta_1 - \beta_2 - \lambda_t = \frac{n^* p^* (1+t)x^*}{\alpha z} - \frac{tn^* p^* x^*}{z} = \frac{n^* p^* x^*}{\alpha z} (1+t(1-\alpha)) > 0$$

imply that  $A$  is negative. That  $B$  is positive follows from noting that  $\lambda_{pub} \left(1 - \frac{1}{\sigma}\right) - \frac{\lambda_w \phi_2}{\phi_1} - \frac{\lambda_r \phi_2}{\phi_1} < 0$ —see the paragraph following (A8).

### 3. Derivations of (27) and (29)

Equations (22), (23), and (26) can be put in the matrix form as follows:

$$\begin{bmatrix} \gamma_{LY} & \gamma_{Lx} + \gamma_{LF} & \frac{\sum_i \gamma_{Li} \theta_{Ki} \varepsilon_i}{\theta_{LY} - \theta_{Lx}} \\ \gamma_{KY} & \gamma_{Kx} + \gamma_{KF} & -\frac{\sum_i \gamma_{Ki} \theta_{Li} \varepsilon_i}{\theta_{LY} - \theta_{Lx}} \\ 0 & -\beta_1 & A \end{bmatrix} \begin{bmatrix} \hat{Y} \\ \hat{n} \\ \hat{p} \end{bmatrix} = \begin{bmatrix} -\gamma_{Ls} \hat{s} \\ -\gamma_{Ks} \hat{s} \\ B \hat{s} \end{bmatrix}$$

Then, applying Cramer's rule (27) and (29) follows.

### 4. Derivations of (32a) and (32b)

Let  $f$  denote the share of foreign capital in the small open economy—i.e.,

$$f = \frac{\bar{K}_f}{\bar{K}_d + \bar{K}_f}. \quad \text{Amending (23) to incorporate proportional changes in foreign}$$

investment (denoted by  $\hat{\bar{K}}_f$ ), the three equations—(22), (23), and (26)—can be put in the matrix form as follows:

$$\begin{bmatrix} \gamma_{LY} & \gamma_{Lx} + \gamma_{LF} & \frac{\sum_i \gamma_{Li} \theta_{Ki} \varepsilon_i}{\theta_{LY} - \theta_{Lx}} \\ \gamma_{KY} & \gamma_{Kx} + \gamma_{KF} & -\frac{\sum_i \gamma_{Ki} \theta_{Li} \varepsilon_i}{\theta_{LY} - \theta_{Lx}} \\ 0 & -\beta_1 & A \end{bmatrix} \begin{bmatrix} \hat{Y} \\ \hat{n} \\ \hat{p} \end{bmatrix} = \begin{bmatrix} -\gamma_{Ls} \hat{s} \\ -\gamma_{Ks} \hat{s} + f \hat{K}_f \\ B \hat{s} \end{bmatrix}$$

Applying Cramer's rule, (32a) and (32b) follows.

### 5. Derivations of (35a) and (35b)

Note that  $T = (1+t)$  where  $t > 0$  is the ad-valorem tariff rate on imports. Let  $\hat{T}$  denote the proportionate change in T (i.e.,  $\hat{T} = d \ln T$ ). Incorporating  $\hat{T}$ , equations (24), (25), and (A2) respectively will be modified as

$$\hat{P} = \frac{\beta_1}{1-\sigma} \hat{n} + \beta_1 \hat{p} + \beta_2 \hat{q} + (1 - \beta_1 - \beta_2) \hat{T}, \quad (\text{A12})$$

$$\hat{z} = \lambda_w (\hat{w} + \hat{L}) + \lambda_r (\hat{r} + \hat{K}) + \lambda_t (\hat{t} + \hat{x}^*) + \lambda_{pub} (\hat{s} + \hat{q}), \quad (\text{A13})$$

and

$$\hat{x}^* = -\sigma \hat{T} + (\sigma - 1) \hat{P} + \hat{z}. \quad (\text{A14})$$

Subtracting (A1) from (A14) yields

$$\hat{x}^* = \sigma(\hat{p} - \hat{T}). \quad (\text{A15})$$

Substituting (A12), (A13), and (A15) into (A1) yields

$$A \hat{p} - \beta_1 \hat{n} + C \hat{T} = B \hat{s} \quad (\text{A16})$$

where  $A$  and  $B$  are as in (A10) and (A11) respectively, while

$$C = \frac{\lambda_t}{t} + (\sigma - 1)(1 - \beta_1 - \beta_2 - \lambda_t). \quad (\text{A17})$$

Since  $1 - \beta_1 - \beta_2 - \lambda_t > 0$  it follows that  $C$  is positive.

Equations (22), (23), and (A16) can be written in the matrix form as follows:

$$\begin{bmatrix} \gamma_{LY} & \gamma_{Lx} + \gamma_{LF} & \frac{\sum_i \gamma_{Li} \theta_{Ki} \varepsilon_i}{\theta_{LY} - \theta_{Lx}} \\ \gamma_{KY} & \gamma_{Kx} + \gamma_{KF} & -\frac{\sum_i \gamma_{Ki} \theta_{Li} \varepsilon_i}{\theta_{LY} - \theta_{Lx}} \\ 0 & -\beta_1 & A \end{bmatrix} \begin{bmatrix} \hat{Y} \\ \hat{n} \\ \hat{p} \end{bmatrix} = \begin{bmatrix} -\gamma_{Ls} \hat{s} \\ -\gamma_{Ks} \hat{s} \\ B\hat{s} - C\hat{T} \end{bmatrix}$$

Then applying Cramer's rule equations (35a) and (35b) follow.

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