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State owned enterprises, shirking and trade liberalization ☆

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ABSTRACT

We explore the implications of trade liberalization in economies with State Owned enterprises (SOEs) both theoretically and through simulation analysis. SOEs are modelled as controlled by the members of the enterprise who determine output and effort levels, while facing output prices and wage rates set by government. Enterprise members must collectively meet a budget constraint that the value of sales equals the enterprise wage bill plus an exogenous enterprise commitment to the state budget. Labour can shirk either through low on the job effort (leisure), or through moonlighting to second jobs in the private sector. Three alternative formulations of equilibria in SOE economies are explored, and in these trade liberalization can produce effects opposite from conventional competitive models. In particular, the output of import competing SOEs increases rather than falls, and negative effects on imports can also occur. We also explore the implications of these models using data on Vietnam. Firm empirical estimates are not available for all model parameters, but when calibrated to 1995 data for Vietnam these models suggest quantitatively much larger impacts from trade liberalization than is the case for comparable conventional competitive models. This is because departures from Pareto optimality in SOE economies can be large and trade liberalization acts to discipline shirking associated with these inefficiencies. The implication we draw from our analyses is that to evaluate policy initiatives, such as trade liberalization, in developing and transition economies without explicitly recognizing the role that SOEs can play may be misleading. This is especially the case where SOEs account for a significant fraction of economic activity and shirking occurs.

1. Introduction

Even though developing and transition economies have undergone extensive policy reform over the last 10–15 years, a persistent feature of many of these economies is a significance presence for state-owned enterprises (SOEs) (see World Bank, 1995, p. 29). Depending upon the economy under consideration, these often provide the dominant mode of organization in large scale and heavy manufacturing (steel, power, cement), as well as in financial and distribution sectors. In 1995 in Vietnam, for instance, SOEs were estimated to still account for around 30% of non-agricultural employment, and 43% of non-agricultural value added.[1]

Despite a large SOE presence in such economies, there has been relatively little analytical work done on them; including what objective function should be specified for them, what their optimizing behaviour is; and, more specifically, how they change

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[1] These are estimates from the General Statistical Office of Vietnam (1996a,b,c). See also the cross country data in Schmitz (1996).

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conventional analyses of policy reform, such as trade liberalization. Much of the available literature either documents their extent (Jefferson and Singh (1999) provide a recent discussion of the SOE reform in China, largely providing data on their performance), empirically evaluates the relative performance of public and private enterprises (Caves and Christensen, 1980; Boardman and Vining, 1989; Bennett and Johnson, 1979), or evaluates the impact of incentive structures on SOE performance (Groves et al., 1994). Bai, Li, Tao and Wang (2000) analyze the ways in which governments maintain state owned enterprises as a second best way of maintaining social stability. However, little or none of this literature discusses the impact that SOEs have on the comparative statics of policy reform within an economy wide analytical framework.

Here we use three related formulations of economies with state owned enterprises to analyze the implications for trade related policy reform. Our purpose is to show how different the analysis of the impacts of trade liberalization can become in the presence of SOEs, both quantitatively and qualitatively, more so than to claim we have a universal SOE formulation to be used everywhere, since SOEs operate in different ways in different economies. In our formulations employees are assumed to run the enterprise with their collective interest in mind, but to do so within government set rules. Thus, output prices and wage rates are set by government (a common practice), but employees determine output levels, effort levels, and can also regulate entry into the enterprise work force. We thus assume that, given output prices and wage rates, enterprise members jointly meet a budget constraint which requires that the value of sales cover material costs and state obligations (including interest), but once they have met this constraint they can shirk. They do this either by taking part-time jobs outside the enterprise (again common in transition economies), or through reduced effort.[2] Shirked labour may either be consumed as leisure, or be deployed (via part-time jobs) in the private sector. In the open economy case, trade quotas are needed to support a SOE equilibrium, since the prices set by government will typically depart from world prices.

Our first formulation assumes as a simplification that in all sectors of the economy there are only SOE enterprises. The membership of all enterprises is fixed, as are wage rates by sector. The government sets domestic prices for enterprise products and supports these through a series of trade quotas since the country involved is assumed to be price taker on world markets. Households (labourers) in each sector have preferences defined over goods and leisure (shirked labour). In equilibrium, both output levels by enterprise and the degree of shirking in each sector is endogenously determined.

In our second formulation, SOEs and private enterprises coexist in each sector. In contrast to the first formulation, shirked labour from SOEs can now be used in the private sector which sells separate and distinctive products and offers part-time jobs. Instead of shirking simply yielding leisure, shirked labour can now be redeployed in the private sector. Trade liberalization which disciplines SOEs will thus transfer shirked labour back from the private sector to the SOEs.

Our third formulation, we use a mobility treatment in which SOE membership is no longer fixed, but endogenously determined to reflect migration decisions based on comparisons of the wage in the private sector and the combined return from working (including the monetary value of the marginal utility of shirking) in the SOE sector. In this formulation, equilibrium conditions link wage rates across the two sectors via the marginal benefit of shirking in the SOE sector.

We model trade liberalization in all three formulations as eliminating trade quotas and lowering domestic prices of previously protected products.[3] Given both the fixed membership of enterprises producing such products and the enterprise budget constraint, this implies that in our first two formulations, shirking will fall and the output in the import competing sector must increase (not fall as is conventionally the case when protection is removed). Imports can thus fall rather than rise under trade liberalization due to increased domestic production of import substituting state enterprise sector products. Trade liberalization may or may not be welfare improving, depending upon whether the marginal product of labour in any SOE impacted by the change is higher or lower than the marginal value of leisure (or the marginal product of labour employed in the private sector formulation two). Typically, and as our results show, the quantitative effects on welfare (via changes in shirking) of trade liberalization in such models will swamp those generated by conventional competitive models.

We parameterize versions of all these models using data for Vietnam for 1995 and use counterfactual experiments to provide illustrative calculations of the impacts of trade liberalization in the presence of SOEs. Results reemphasize the themes for the paper set out above; output responses under liberalization are perverse compared to traditional competitive models; imports can fall; liberalization can be either welfare worsening or welfare improving; and quantitatively the effects are typically much larger in models with SOEs than in competitive models. The conclusion we draw is that when looking at trade and other policy reform in developing and transition economies in the presence of SOEs, their potential impacts need to be more widely acknowledged and explicitly incorporated than at present, since the analysis can be quite different from the competitive case.

2. Models of state owned enterprise behaviour with shirking

2.1. A basic model

We begin with a simple model of a economy with SOEs, into which we incorporate shirking behaviour by members of the enterprise. We assume each SOE produces a distinct product, that labour is the sole variable input for each SOE, and there are

[2] There is wide spread anecdotal evidence to support these characterizations. As the World Bank (1995) publication "Bureaucrats in Business" puts it, "Government employees operate a casino in Ghana, bake cookies in Egypt, assemble watches in India, mine salt in Mexico, make matches in Mali, and bottle cooking oil in Senegal." (p.1).

[3] Although, typically, more general SOE reform precedes other policy reforms, such as in the trade sector. See the discussion of the experience in Vietnam in O'Connor (1996).

decreasing returns to scale (reflecting the presence of fixed capital). Each enterprise has a fixed work force $\bar{L}_i$, but only a portion, λ_i, of the labour available to it enters production due to shirking.[4]

Shirking arises in the model because each SOE has both a fixed membership and faces a fixed (government determined) wage which is paid independently of the effort of employees. Once minimum conditions for each worker's effort level are met, the remaining effort can be shirked. Shirking, in practice, will be reflected in limited effort being applied when at work, early departure from and/or late arrival at work, labour supplied to second jobs, and other such phenomena. For simplicity, we assume that shirking occurs at a similar level across all members of the enterprise. This could be because members of the enterprise are able to monitor what all other members do, and any deviation from common behaviour can be penalized by others in some way (social penalties (displays of disapproval), for instance). Under this treatment, λ_i becomes the variable input in production for the enterprise.

We write each enterprise production function as

$$Y_i = A_i\left(\lambda_i \bar{L}_i\right)^{\alpha_i} \quad (i = 1, \ldots N) \tag{1}$$

where Y_i denotes enterprise output; A_i is a unit term; λ_i is the fraction of the potential labour input actually applied to production in the enterprise; and $\alpha_i < 1$ since we assume decreasing returns to scale[5].

The budget constraint[6] collectively faced by members of the enterprise is

$$\bar{P}_i Y_i = \overline{W}_i \bar{L}_i + \bar{S}_i \quad (i = 1, \ldots N). \tag{2}$$

We assume that all workers in the enterprise receive a fixed wage $\overline{W}_i$ independently of their effort; the government controls the price of the output of the enterprise at $\bar{P}_i$(a common although not always uniform practice in developing/transition economies); and $\bar{S}_i$ is the level of contribution to the state budget required from the enterprise, which we take to be exogenous. In this case, simple substitution of Eq. (1) into Eq. (2) determines λ_i, given A_i and α_i.

We assume that the government uses a set of binding quotas on net trades, (import and export quotas,) to support the government controlled output prices, $\bar{P}_i$. These allow domestic prices to differ from given world prices, P_i^w[7]. The removal of these quotas under trade liberalization forces domestic prices to equal world prices.

On the demand side of the economy, a representative household is assumed to reflect the preferences of workers employed in each enterprise. This representative household maximizes a utility function

$$U^i\left(G_j^i, (1-\lambda_i)\bar{L}_i\right) \quad (\mathrm{i} = 1 \ldots N); (j = 1, \ldots N) \tag{3}$$

subject to the budget constraint

$$\sum_{j=1}^{N} \bar{P}_j G_j^i = \overline{W}_i \bar{L}_i \quad (i = 1, \ldots \ldots N) \tag{4}$$

where G_j^i is to the consumption of good $_j$ by labour (enterprise) type i, and U_i is the utility of the representative worker in enterprise i.

We assume, for simplicity, that Eq. (3) is additively separable and can be written as

$$U^i\left(G_j^i\right) + v^i\left((1-\lambda_i)\bar{L}_i\right) \quad (i = 1, \ldots N); (j = 1, \ldots N) \tag{5}$$

and thus maximizing the subfunction $U^i(G_j^i)$ subject to the budget constraint (4) yields conventional commodity demand functions for each group of enterprise workers. In the calculations we report later, we assume that the $U^i(G_j^i)$ are CES[8]

Trade quotas in this formulation are set such that, at the controlled domestic prices $\bar{P}_i$, the commodity demands $D_i(\bar{P})$ determined from utility maximizing behaviour (i.e., maximizing Eq. (3) subject to Eq. (4), and summing across workers in all enterprises), along with the quotas, clear the domestic markets, i.e.,

$$D_i(\bar{P}) = N_i + Y_i \quad (i = 1 \ldots N). \tag{6}$$

The N_i also have to satisfy the trade balance condition that at world prices

$$\sum_{i=1}^{N} P_i^w N_i = 0. \tag{7}$$

[4] This differs from the non-shirking approach to modelling state trading in Lloyd (1982).

[5] We can also specify (1) as incorporating a sector specific factor $\bar{K}_i$ (capital), and write (1) as $Y_i = A_i \bar{K}_i^{(1-\alpha_i)}(\lambda_i L_i)^{\alpha_i}$. In this rewritten form, λ_i still remains as the only variable input and decreasing returns to the variable input still applies, even though the production function might appear to be written as constant returns to scale.

[6] We assume a hard budget constraint in contrast to recent literature by Qian and Roland (1998), Bertero and Rondi (2000).

[7] There is no rationing on either side of the goods market.

[8] These yield demands for commodities for workers from enterprise j for good i as , $D_i^j(\bar{P}) = \dfrac{\beta_i^j I^j}{P_i^{\sigma j} \sum_{k \neq 1} \beta_k^j P_k^{(1-\sigma j)}}$ where β_i^j, I, and s_j are share parameters, the cash income and the elasticity of substitution in preferences for enterprise j workers respectively. The market demands $D_i(\bar{P}) = \sum_j D_i^j(\bar{P})$.

In this formulation, the cash income of workers in the enterprise, $\bar{W}_i \bar{L}_i$, is independent of the amount of shirking. Shirking is limited by the budget constraint of the enterprise, which requires sufficient labour be deployed to generate sales to cover costs[9]. Shirking levels will change if the government changes prices, either directly (with accompanying changes in N_i) or as an accompaniment to trade liberalization[10].

Eqs. (1)–(7) thus yield a well defined equilibrium structure in which the level of shirking in each SOE, λ_i, is endogenously determined, while workers are guaranteed jobs in their enterprise at a fixed wage. Product prices are fixed, and enterprises have to satisfy their budget constraint. Trade quotas which meet a trade balance condition support the equilibrium.

Trade liberalization in this framework involves a change in or removal of the trade quotas N_i. Under a move to free trade, N_i increase to the point that they are no longer binding, while with more heavily protected trade N_i decrease. In the case where the N_i are no longer binding, the government must set prices, $\bar{P}_i$, to equal the world prices P_i^w. Unrestricted net trades, T_i, are then endogenously determined such that

$$D_i(P^w) = T_i + Y_i \tag{8}$$

and

$$\sum_{i=1}^{N} P_i^w T_i = 0. \tag{9}$$

From Eqs. (1) and (2) a move to free trade will increase λ_i, reduce shirking, and increase output in industries that were protected against imports i.e. ($\bar{P}_i > P_i^w$)[11]. This is the opposite production response for protected industries usually associated with an elimination of protection in the competitive case. Imports may also fall under trade liberalization due to this production response.

In industries where exports are initially restrained by trade quotas, ($\bar{P}_i < P_i^w$), a move to free trade will lower λ_i (again from Eqs. (1) and (2)) increase shirking, and reduce output; also a further perverse supply response relative to that conventional in the literature. Because of these different effects on shirking and production in export and import industries, and the lack of marginal conditions linking shirked effort and SOE effort at the margin, the net effect of trade liberalization on welfare is also unclear; it can either rise or fall.

2.2. A model with a state owned and private sector

In our second model formulation, we consider shirked labour from SOEs being used in part time private sector (second) jobs instead of going into leisure consumption. We can modify the basic model set out above by adding a private sector to it, recognizing that, typically, state owned enterprises coexist with those in the private sector, although the products produced in each may differ. A common observation is of full time employees of SOEs moonlighting, or taking part time jobs in the private sector (often in services such as tourism, retailing or business services, and light manufacturing (clothing, footwear, furniture)). In many transition economies, one often hears of managers and workers departing from their SOE jobs at some point during the day to work on their own small business in areas such as these.[12]

Under this formulation, the utility function (3) is defined over a vector of SOE products, G_j, and private sector goods, C_k, as

$$U^i\left(G_j^i, C_k^i\right) \quad (i = 1, \ldots N); (j = 1, \ldots N); (k = 1, \ldots K) \tag{10}$$

where C_k^i denotes consumption of the privately provided good k by household (worker) type i (in this formulation there are K privately provided goods).

Now shirked labour no longer enters the utility function (3) but the production function for the state owned enterprise is again given by Eq. (1), and the enterprise budget constraint remains as Eq. (2). The household budget constraint for type i workers is instead given by

$$\sum_{j=1}^{N} \bar{P}_j G_j^i + \sum_{k=1}^{K} P_k C_k^i = \bar{W}_i \bar{L}_i + (1 - \lambda_i)\bar{L}_i W_i \tag{11}$$

[9] This is in the spirit of satisficing behaviour first described by Simon (1959).

[10] Recent papers by Dong and Dow (1993), and Bai and Wang (1998) also discuss shirking and state owned enterprise operations; but do not draw the link to trade liberalization we emphasize here. Also see Mori (1991).

[11] Data on Vietnam from the General Office of Statistics indicate that this is what has happened empirically in Vietnam as liberalization has occurred. Output in manufacturing, where SOEs are prevalent, grew by 18% in 1992, 12% in 1993, 12% in 1994, 12% in 1995, and 10% in 1996, as Vietnam was liberalizing in the trade sector.

[12] This is common in Vietnam. The World Bank (1995) also discusses this phenomenon more broadly, indicating its presence in many countries. See also footnote 3.

where W_i is the private sector market wage for workers initially employed in state owned enterprise i; $(1-\lambda_i)$ is the portion of labour of type i sold on private sector labour markets; and P_k is the price of the private sector product of type k.

Private sector production of good k is given by the production function

$$C_k = \phi_k \left(L_k^P\right)^{\alpha_k} \quad (k = 1, \ldots K) \tag{12}$$

where there are again decreasing returns to the variable input L_K^P. In equilibrium, the total labour used in all private sector enterprises equals shirked labour supplied by members of all SOEs, i.e.,

$$\sum_{i=1}^{N} (1-\lambda_i)\,\overline{\mathrm{L}}_i = \sum_{k=1}^{K} L_k^P. \tag{13}$$

Since labour in each private sector enterprise is paid its value marginal product, it follows that

$$W_k = \phi_k P_k \alpha_k \left(L_k^P\right)^{\alpha_{k-1}} \quad (k = 1, \ldots K). \tag{14}$$

The return to the implicit fixed factor in each private sector production process reflects the difference between the value of output at private sector market prices, *Pk*, and the payment to the variable factor (shirked labour supplied by SOE members).

In this formulation, private sector goods and labour markets clear in equilibrium, and the λ_i are endogenously determined as before. Trade quotas, N_i, are again needed to support prices set by government for the state owned enterprise sectors. Trade liberalization, represented again by an elimination of import quotas, will, as before, perversely increase production in protected sectors and reduce production where export restraints no longer apply. Impacts on imports can again be opposite to conventional analyses. Whether such a change is welfare worsening or welfare improving are yet again ambiguous, but now also depend upon the relationship between the value marginal product of labour in SOEs and the private sector, and the impact on shirking.

2.3. Mobility between SOEs and the private sector

We finally consider a further variant on the basic model above where the membership of SOEs is variable rather than fixed. In this, workers are mobile between SOEs and the private sector in the event of a shock to the economy, such as trade liberalization. New entry to SOEs can occur, and individual members of SOEs can choose to terminate their membership and instead work in the private sector. Part time jobs in the private sector are excluded under this formulation.

In this case, we again specify a private sector production function of the form

$$C_k = \phi_k \left(L_k^P\right)^{\alpha_k} \quad (k = 1, \ldots .K) \tag{15}$$

where L_K^P denotes to the labour employed in the kth private sector. We again assume that private sector labour is paid its value marginal product, i.e.,

$$W = \phi_k P_k \alpha_k \left(L_k^p\right)^{\alpha_{k-1}} \quad (k = 1, \ldots \ldots K) \tag{16}$$

where W is the private sector wage.

Decisions are made by workers as to whether they should move between SOEs and the private sector by comparing the SOE wage plus the marginal utility of shirking (in money metric terms) they received by remaining in the SOE sector to the wage they would receive (without shirking) in the private sector. Thus, in contrast to the basic variant model, an equilibrium condition prevails across these employment options for workers which implies that

$$\overline{W}_i + \frac{V^l\left((1-\lambda)_i L_i^s\right)}{\mathrm{MUI}_i} = W \quad i = (1\ldots, N) \tag{17}$$

where $V^l((1-\lambda_i)L_i^S)$ is the marginal utility of shirking in the SOE i, and is the marginal utility of income of workers of type i. Labour market clearing implies that

$$\overline{L}_i = \sum_{k=1}^{K} L_{ik}^P + L_i^S \tag{18}$$

where $\bar{L}_i$ is the endowment, L_{ik}^P is the employment in private sector, and L_i^S is the employment in state sector of type i labour.

In this formulation, trade liberalization again lowers shirking in SOEs (raising output as before), and labour flows into SOEs and out of the private sector. Here, since the marginal utility from shirking affects the labour market equilibrium condition, liberalization can again be either be welfare worsening or improving.

3. Illustrative calculations of the impacts of trade liberalization in the presence of SOEs: data for Vietnam

We have used the three models set out above to provide illustrative calculations of the impacts of trade liberalization in the presence of SOEs. These remain illustrative because of the relative absence of literature estimates of key model parameter values. We examine the effects of trade liberalization on output, effort/shirking, welfare and trade. We also compare model predictions in the presence of SOEs to those from comparably specified conventional competitive models which do not recognize SOEs as distinct entities.

To numerically analyze trade liberalization in the presence of SOEs, we follow the procedures widely used in the general equilibrium modelling literature of calibration of model parameters to a base case data set, followed by counterfactual equilibrium calculations and comparisons to a base case equilibrium (Mansur and Whalley, 1984). We use Vietnamese data for this purpose, both because SOEs remain an extensive part of the economy in Vietnam and we have data on private and SOE employment in Vietnam for 1995. Our focus is partly on broad quantitative differences in results compared to conventional competitive models, and so we keep the analysis simple by examining only 2 groups of enterprises in each of the models; export oriented and import competing. In our basic model we model two distinct types of SOEs; in the other two models we model one SOE (the import competing sector) and one private sector enterprise, which we assume is also the export sector.

Table 1 displays the basic data we use to construct model admissible data sets calibrate the base case model, along with the values for the labour share and elasticity parameters we employ in calibration. The central components of this data comes from the Vietnamese Input–Output Table for 1995 published in 1996 by the General Statistical Office, Ministry of Finance, Vietnam. In identifying value added in state owned enterprises, we use estimates of value added shares for respective SOE and private sectors obtained from interviews with Vietnamese researchers (see Footnote to Table 1). This information yields a share of the state sector in total value added which approximately matches the aggregate shares available published data. Employment data both for state owned enterprises and the private sector are from the Vietnamese Social Affairs Yearbook.

In using these data to produce model admissible data used at a higher level of aggregation to calibrate our model formulations we make a number adjustments, some of which imply small modifications to the structure set above. The model admissible data used in this way are set out in Table 2 for the basic model. We accommodate the trade imbalance in the basic data on Table 1 through an exogenous trade imbalance term in Eq. (7) which is fixed in real terms. We also calculate the total value added originating in the state owned enterprise sector, which we then separate into two parts; one representing an import

Table 1
1995 Vietnamese data used in constructing more aggregated model admissible data sets for counterfactual analysis of the effects of trade liberalization (Bill. VND at producers prices)

Sector	Estimated state share in value added [a] (%)	Net of tax value added by sector	Imports by sector	Exports by sector	Net imports by sector	Net exports by sector
1 Elec–gas	100	3627	0	0	0	0
2 Water	100	591	0	0	0	0
3 Mining	100	7664	20	6590	–	6570
4 Cons. Materials	80	2478	9161	904	8257	–
5 Steel	90	644	15,141	76	15,065	–
6 Chemicals	80	1546	7498	494	7004	–
7 Pharmaceutical	70	460	2855	30	2825	–
8 Food processing	60	12,259	11,992	15,716	–	3724
9 Leather	60	257	113	220	–	107
10 Textiles	60	3387	9095	10,900	–	1805
11 Electrical	90	879	6572	28	6544	–
12 Other processing	20	8654	15,775	1150	14,625	–
13 Cultivation	0	32,987	3595	13,337	–	9742
14 Breading animal	0	9989	244	776	–	532
15 Forestry	30	2372	1744	1320	424	–
16 Fishing	10	6228	2207	6282	–	4075
17 Construction	60	14,419	0	0	0	0
18 Transportation	40	5047	2625	1008	1617	–
19 Postal services, tele	100	2711	29	103	–	74
20 Trade, material supply	20	21,578	2000	8869	–	6869
21 Finance, banking and insurance	100	4699	0	0	0	0
22 Public administration	100	10,411	0	0	0	0
23 Hotel & restaurant	20	5795	1560	6157	–	4597
24 Culture, education, health	90	12,308	867	178	689	–
25 Other	40	17,502	2850	430	2420	–
Total		188,492	95,943	74,568	59,470	38,095
Share in aggregate value added	43.2					

Note: Sectors Aggregated into a single Import competing sector are 1,2,4–7,11–12,15,17,18,21–22,24,25.
The remaining are aggregated into a single export oriented sector.
In aggregate these estimates imply an aggregate share of state owned enterprises in value added approximately consistent with data available for the whole economy.
Source: 1995, Input–Output Table for Vietnam, General Statistical Office, Ministry of Finance, Vietnam.
[a] These data were obtained from interviews with Vietnamese researchers, in the absence of firm available data.

Table 2
1995 model admissible base case data and key parameter assumptions used in SOE trade liberalization analyses

Data used in calibrating the basic model			Key parameter assumptions and calibrated values		
Items	Import competing sector	Export sector	Items	Sector 1	Sector 2
Production (Value added, bill VN Dong)	55,431	26,014	Scale parameter in production (Φ) (set exogenously)	1	1
Labour Value added (bill VN Dong)	39,005	12,924			
No of Workers (thousands)	1880	882	Labour share parameter (α) (set exogenously)	0.6	0.6
Returns to capital (value added, bill VN Dong)	16,426	13,090	Work coefficient (λ) (endogenously determined)	0.663	0.466
International price (set exogenously)	0.851	1	Consumption share (β) for household 1 (endogenously determined)	0.876	0.124
Tariff rates (%)	17.5	0	Consumption share (β) for household 2 (endogenously determined)	0.875	0.124
Domestic prices (world prices plus tariffs)	1	1.0	Elasticity of subs in consumption, goods (σ) 1.2 (set exogenously)		
Exports (bill VN Dong)	–	12,726	Leisure sub-utility function elasticity (ρ) 1.5 (set exogenously)		
Imports (bill VN Dong)	38,920	–			

Source: Basic data come from Table 1.
Employment data from: Statistical Yearbook of Labour Invalids and Social Affairs (1996b), General Statistical Office, Vietnam.

competing and the other an export sector. Sectors which are net importers are aggregated as the import competing sector, and those that are net exporters are aggregated and classified as the export oriented sector. Total SOE employment is divided in the same way. Our data on 1995 tariff rates for Vietnam imply differences between domestic and world prices. We assume that the only trade intervention is the tariff (i.e., no quotas or other instruments are used), while in reality other instruments are employed; which we model as an equivalent quota.

We assume a production function coefficient on labour for each state owned enterprise of 0.6. No estimates for this parameter for Vietnam are available, and we somewhat schematically rely on estimates by Young (1994) of the labour share parameter for the South Korean manufacturing sector in the late 1980s of 0.57. Along with the output and employment data we use, this 0.6 value implies that 33% of labour in the two SOE sectors is shirked in the base case. We subsequently report sensitivity of results with respect to alternative values of this labour share parameter value.

Finally, to complete the model specification we need values for substitution elasticities in preferences. We use 1.2 as the substitution elasticity between goods in the top level utility function and 1.5 as the elasticity parameter in the leisure sub function, since estimates of elasticities of substitution in preferences for Vietnam are not available. These may appear on the high side, but mirror parameter values used in nested CES functions elsewhere whose empirical literature is unavailable (see the values used by Piggott and Whalley, 1996, for instance). We use these values in the base case and perform sensitivity tests around them.

As is the convention in applied general equilibrium modelling work, we can somewhat arbitrarily choose units for goods given the value data that we use in calibration. We use units for goods as that amount which sells for prespecified base period prices (1 million Vietnamese Dong). Wage rates are then implied by the combination of employment and labour value added data by sector available to us. We use all the above data and assumed elasticity and other parameter values to calibrate the model. This yields the values of λ_i, and β_i (consumption shares) reported in Table 2.

The data and assumed parameter values we use in calibrating our second model (with both SOE and private enterprises) are reported in Table 3. For this model, the data on state owned enterprises from the first model (value added, employment and use of

Table 3
1995 model admissible base case data and key parameters used in trade liberalization analyses using an SOE model with both private and state owned enterprises

Data for SOE and private sectors			Key parameter values assigned and determined via calibration		
Items	SOE sector	Private sector	Items	State	Private
Production (value added, bill VN Dong)	81,445	107,047	Scale in production (Φ) (exogenous)	0.923	0.429
No of workers[b] (thousands)	2762	7720			
VA by labour (bill VN Dong)[a]	51,929	65,745	Labour share (α) (exogenous)	0.663	0.614
Fixed capital (value added, bill VN Dong)[a]	29,516	41,302	Work coefficient (λ) (endogenous)	0.319	1
Assumed International prices	0.851	1	Wage rate (endogenous)	0.188	0.088
Tariff rates (%)	17.5	0	Consumption share (β) (endogenous)	0.523	0.477
Domestic prices	1	1	Elasticity of substitution in consumption among goods (σ) 1.2 (exogenous)		
Exports (bill VN Dong)[c]	–	8727			
Imports (bill VN Dong)[c]	26,191	–			

Sources: See Table 1.
Note; a — Capital income in the basic value added data in the private sector in the IO (1995) table is reduced by a 40% factor and this is added to the labour component in the same sector to reflect the undistributed wages of family businesses included in capital income in value added.
b — The no. of workers employed in the private sector is only 6789 (thousands), and shirked labour from SOE is 931 (thousands) in the base case equilibrium.
c — The implicit trade imbalances in Tables 2 and 3 are different because Table 2 (model 1) does not include the private sector, and cross-hauling is present in the trade data in Table 1 which disappears when SOEs are aggregated in Table 3.

Table 4
1995 Model admissible base case data and key parameter values used in model variant with SOE-private sector mobility

Base case data for SOE model			Key parameter values assigned and determined via calibration		
Items	State	Private	Items	State	Private
Production (value added, bill VN Dong)	81,445	107,047	Scale in production (Φ) (exogenous)	0.949	0.79
No of workers[b] (thousands)	2762	2860	Labour share (α) (exogenous)	0.6	0.614
VA by labour (bill VN Dong)[a]	51,929	65,745			
Fixed capital (value added, bill VN Dong)[a]	29,516	41,302	Work coefficient (λ) (endogenous)	0.633	1
Assumed international prices	0.851	1	Wage rate (endogenous)	0.188	0.23
Tariff rates	17.5%	0	Consumption share (β) (endogenous)	0.523	0.477
Domestic prices	1	1	Elasticity of substitution in consumption of goods utility function (σ) 1.2		
Exports (bill VN Dong)[c]	–	8728	Leisure sub-utility function elasticity parameter (ρ) 1.5		
Imports (bill VN Dong)[c]	26,191	–	Scale parameter in sub-utility function ψ=0.29 (endogenous) $U(L_e) = \psi(L_e)^{\frac{1}{\rho}}$		

Sources: See Table 1.
Note: a — Capital income in the basic value added data in the private sector in the IO (1995) table is reduced by a 40% factor and this is added to the labour component in the same sector to reflect the undistributed wages of family businesses included in capital income in value added.
b — Private sector employment is set so as to yield a wage differential of 20% between the private and SOE sectors given other elements of the data set.
c —The implicit trade imbalances in Tables 2 and 4 are different because Table 2 (model 1) does not include the private sector, and cross-hauling is present in the trade data in Table 1 which disappears when SOEs are aggregated in Table 4.

capital) are aggregated into a single SOE enterprise. Data from Vietnamese government statistical sources give private sector employment, and value added by labour and capital. We treat the value added by capital as fixed capital required in production. The trade data we use are from the Vietnamese input–output Table for 1995 (see Table 1). A similar unit conventions for prices to earlier is adopted when calibrating the model, and tariff rates (quotas) imply a similar relationship between world and domestic prices. The elasticity of substitution in preferences between goods is again assumed to be 1.2. There is no leisure in preferences in this model variant, and so no sublevel elasticity parameter. Consumption shares (β_i), and shirking coefficients (λ_i) are again endogenously determined through calibration.

The data we use to calibrate the third model (with SOE/private sector mobility) are similar to above, and are reported in Table 4. We make an adjustment to private sector employment data in calibrating this model to ensure that the private sector wage exceeds the SOE wage (which it must if there is any marginal benefit from shirking), since market wage rates for the private sector are typically underestimated as family workers receive profits. Relative to the second model, the addition of leisure in the utility function implies the use of a first order condition linking wage differentials between SOEs and the private sector to the marginal utility of income. In calibrating this model variant, we use a value for the leisure subutility function elasticity parameter of 1.5, as is in the basic model. Calibration of this model to the data in Table 4 using with the wage equality constraint in Eq. (17) also involves endogenously determining a scale factor R in preferences which satisfies the wage equality condition between the SOE and the private sector.

We have used these three model variants calibrated in the ways we indicate above to analyze the impacts of trade liberalization in the presence of SOEs; contrasting the three sets of results to those generated from a comparable conventional competitive trade model with homogeneous products. The data we use for the conventional model is the same as for our first model. All our models involve small open economy price taking behaviour, and hence no terms of trade effects are present.

4. Illustrative results from quantitative model analyses

Table 5 reports results of the impact of trade liberalization in Vietnam using 1995 data generated by the basic version of the SOE model described earlier, and compares these with results from both the two elaborations also described above, and to those from as a comparably specified competitive model. The overall picture across all these cases, is that trade liberalization in the presence of SOEs produces results which differ sharply, both qualitatively and quantitatively, from the competitive case. Output responses from

Table 5
Impacts of trade liberalization in the basic and elaborated SOE models and a comparably specified conventional competitive model

	Base model (per cent)	Conventional competitive model	Model with SOE and private sector	Model with SOE and private sector with labour mobility
1. Welfare gain or loss (Hicksian EV as % of income)	4.71	0.5	4.2	1.3
2. % Change in imports	3.2	16.5	4	−4.5
3. % Change in exports	8.4	42.9	10.3	−11.4
4. % Change in output of import competing SOEs	17.5	−6.7	17.5	23.2
5. Change in output of export enterprises	0	13.2	−4.6	−4.6
6. % Change in shirking in SOEs	−60.8	–	−60.7	−54.5
7. % Change in effort level in SOEs	30.8	–	30.8	31.6

Notes: The impacts on the two groups of workers (one from each enterprise type) in this case, for illustrative purposes, are a welfare loss of 0.3% in equivalent income terms for those from the import competing sector and a gain of 5% for those from the export sector.

Table 6
Parametric sensitivity analyses of results on trade liberalization for the basic SOE model

	Welfare change (Hicksian EV as % of income)	% Change in imports	% Change in shirking	% Change in effort
Central case	4.7	3.2	−60.8	30.8
High goods elasticity (σ=2.4)	4.9	9.1	−60.8	30.8
Low goods elasticity (σ=0.6)	4.5	0	−60.8	30.8
High labour product share (α=0.8)	10	3.2	−14.8	22.3
High leisure elasticity (ρ=2)	11.1	3.2	−60.8	30.8
Low leisure elasticity (ρ=1)	−20.8	3.2	−60.8	30.8
Critical leisure elasticity for zero welfare effect (ρ=1.338)	0	3.2	−60.8	30.8

Table 7
Parametric sensitivity analyses of results on trade liberalization for SOE/private enterprise model

	Welfare change (Hicksian EV as % of income)	% Change in imports	% change in shirking	% Change in effort
SOE/private enterprise model				
Central case	4.2	4	−60.7	30.8
High goods elasticity (σ=2.4)	4.6	46.3	−60.7	30.8
Low goods elasticity(σ=0.6)	4	−17.3	−60.7	30.8
High labour product share (α=0.8) in SOE	4.9	7.3	−44	22.3
Low labour product share (α=0.5) in SOE	3.6	1.3	−75	38.1
Model SOE/private sector mobility				
Central case	1.3	−4.5	54.5	31.6
High goods elasticity (σ=2.4)	1.66	39.1	−54.5	31.6
Low goods elasticity (σ=0.6)	1.1	−26.5	−54.5	31.6
High labour product share (α=0.8) in SOE	2.9	7.8	−37.3	21.6
Low labour product share (α=0.5) in SOE	−1.8	−37.7	−79.8	46.3
High leisure elasticity (ρ=1, ψ=0.042)	5.8	26.2	−52.7	30.5
Low leisure elasticity (ρ=1.3, ψ=0.159)	3.2	4.7	−53.9	31.2

trade protected SOEs are positive rather than negative. Imports fall as well as rise in some cases. Quantitative impacts suggests much larger welfare impacts for SOE (by factors of 8–10), along with smaller trade impacts.

In the basic model there are two SOEs, one involved in import competing and the other in export production. Table 5 reports results for this model which show an aggregate welfare gain from a move to free trade, involving the elimination of all trade restrictions, of 4.7% of income[13]. This gain stands in contrast to a much smaller gain of 0.5% from a comparably specified competitive model[14]. In these results, the output of the import competing SOE sector from whom protection is withdrawn increases by 17.5% in contrast to a reduction of 6.7% in the competitive case. Effort increases sharply (shirking falls) by over 30%. Trade impacts are much larger in the competitive case compared to the SOE case, with imports rising 16.5% as against 3.2% in the SOE case and exports rising 42.9% as against 8.4% in the SOE case. The smaller trade changes in the SOE case reflect the increase in output of previously protected enterprises, and the disciplining of shirking under trade liberalization that occurs, as discussed earlier. The asymmetric percentage trade change for imports and exports reflect the large trade imbalance in the base case data.

In the other SOE cases, results from the model with an SOE and a private sector (column 3 of Table 5) are broadly similar to those from the basic SOE model (column 1 of Table 5). However, results from the model where mobility of labour between SOEs and the private sector enters show more differences. To ensure marginal conditions hold in the labour market in the base case, calibration involves the selection of a units term for the subutility function for leisure, which produces a changed marginal valuation of leisure relative to model 1 and different welfare effects from liberalization. In this case, liberalization generates a larger export response from SOEs to trade liberalization, but a smaller change in effort. This is due to a reduction in leisure consumption under liberalization. In this case, and in contrast to model,1 and 3, imports fall rather than rise on liberalization reflecting the proportionally larger production response from import competing SOEs that occurs.

Table 6 reports sensitivity analyses for the results from the basic model reported in Table 4 to values of key parameters used. These showing limited sensitivity to elasticity of substitution (F) parameters, while higher values for the labour share parameter (α) yield higher welfare gains from trade liberalization and lower values small losses.

The most sensitivity in welfare effects occur under changes in the value of the elasticity parameter in the leisure subutility function in the model. A higher elasticity yields higher welfare gains, and for a low value these become losses. The latter occurs where the marginal product of labour forgone in the SOE when labour shirks exceeds the money metric value of the marginal utility of leisure. In such cases, labour still shirks, since they receive the wage $\bar{w_i}$ independently of their effort level, but the level of shirking is lower. We highlight earlier the uncertainty of the sign of the welfare effects from trade liberalization in the presence of SOEs, and here we can locate critical regions in the parameter space for which the sign of results change. A critical value of D for which the welfare effect of

[13] Measured as the Hicksian equivalent variation summed across the two consumer (enterprise) groups.
[14] See also Chan et al. (1999) for further assessment of the impact of trade liberalization in Vietnam using a competitive model structure.

trade liberalization is zero can be calculated in this model; this is 1.34. A value of ρ lower than 1.34 yields welfare worsening trade liberalization for this model parameterization.

Sensitivity analyses of results for variations on key parameter values for the other two models are reported in Table 7. We are able to calibrate the model with mobility such that given the elasticity values in the leisure subutility function, we can choose units terms for this subfunction such that the wage equality condition (17) holds. If we change the elasticity parameter values in the leisure subutility function across different model runs, we must also rescale the utility function in this way so that Eq. (17) is satisfied in calibration. Limited sensitivity is again found for both models with regard to the elasticity of substitution in preferences. Welfare effects show more sensitivity to alternative values of the labour share parameters (α_i) in production compared to the basic model.

5. Conclusion

This paper seeks to analyse the impacts of trade liberalization in economies with State Owned Enterprises (SOEs), motivated by both the lack of literature on this topic, and its importance for work on developing and transition economies. SOEs are modelled as controlled by the members of the enterprise who set output levels and shirk while facing fixed output prices and wage rates set by government. Enterprise members must collectively meet the budget constraint that the value of sales must equal their wage bill plus an exogenous enterprise commitment to the state budget. Once this constraint is met, labour can shirk either through reduced on the job effort (leisure), or through moonlighting to second jobs in the private sector.

Three alternative formulations of equilibria in SOE economies are explored, including numerically using data for Vietnam. In these, trade liberalization can produce effects opposite to those found in conventional competitive models; such as increasing rather than reducing the output of the import competing SOEs, and potentially changing the sign of the impacts on trade flows and welfare, even in the small open economy case. Our results point to sharply larger welfare impacts from trade liberalization in SOE models than is the case in conventional competitive models, because the initial departures from Pareto optimality in SOE economies can be large. In such cases our results suggest that trade liberalization can act to discipline the shirking associated with these inefficiencies.

The broad implication we draw from our analyses is that to assess policy initiatives, in developing and transition economies, such as trade liberalization, without explicitly recognizing the role that SOEs can play may be misleading. This is especially the case where such enterprises account for a significant portion of economic activity.

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