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AND SOFT BUDGET CONSTRAINT**

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Abstract: We present a model of policy burden and soft budget constraint (SBC) that explains many stylized facts in socialist and transition economies. We find that under information asymmetry, policy burdens will lead to the moral hazards of the SOE managers and hence the low efficiency of SOEs; and when competition increases to certain degree, policy burdens will definitely result in the SBC problems. Privatization will not necessarily eradicate the SBCs of firms; on the contrary, a privatized firm with policy burdens will be more likely to bring the SBCs and ask for more subsidies from the state than a SOE under the same condition. We also show that in socialist and transition economies, when SOEs bear policy burdens, a restriction of the control power of SOE managers by the state, as a second-best institutional arrangement, may improve the efficiency of SOEs and the social welfare.

Key Words: Policy burden, Soft Budget Constraint, Moral Hazard, SOEs, Privatization

Policy Burden , Moral Hazard and Soft Budget Constraint

In socialist economies, when state-owned enterprises (SOEs) incur losses, the state often provides them with additional credits or other subsidies, which is known as the Soft Budget Constraint (SBC) syndromes. The term, SBC, is coined by Kornai (1980) and frequently used to explain many styled facts in socialist and transition economies. Due to the serious incentive problems accompanying the SBC syndromes, in the process of economic transition in many former socialist countries, the necessity of hardening the budget constraints of enterprises has clearly been recognized both in academic literature and in economic policy designs. But after several years of economic reforms, the SBC syndromes are still pervasive in the transition economies, even in some of which the SOEs have been massively privatized (World Bank, 1996, 2000).

Kornai's seminal work and the following literature focus primarily on the consequences of the SBCs, such as the shortages in socialist economies. But till now, about the causes for the SBCs and on how to effectively harden the budget constraints, there still exist controversies in the literature and less detailed work has been done on these issues. The new ideas of our theory may contribute to the understanding of these important issues in the SBC syndromes.

In this paper, we extend the work of Lin et al (1996, 1998, 1999, 2000) by presenting a dynamic game model to investigate the relationship between the policy burden and the SBC, which help to understand the recent SBC facts in transition economies. The rest of the paper is organized as follows. Section 1 reviews the literature. Section 2 proposes our main ideas on SBC syndromes in transition economies. Section 3 develops a model of the policy burden and the SBC of SOEs. Section 4 investigates the effects of privatization on the SBC syndromes. Section 5 concludes by discussing the policy implications of our analysis.

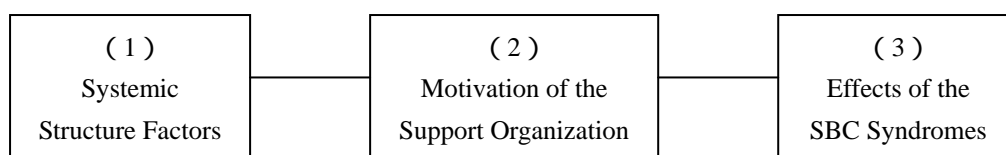
1. Literature Review

A large formal literature on the SBC syndromes has developed, much of it evolving from the seminal work of Dewatripont and Maskin (1995). Understanding the SBC syndromes entails bearing in mind a complex chain of causality, which is depicted in a schematic form in Figure 1. Block (1) represents the political and social factors that generate the motives behind the formation of the SBCs. Block (2) represents the motives that create the SBC syndromes, such as the motivation of the state or creditor to refinance the loss-making enterprises. Finally Block (3) represents the effects that the SBCs bring about.

The present theories of the SBCs focus on the effects of Block (2) on Block (3), but little detailed work has been done on the implication (1) (2). Although most theories on the SBC have to some degree reached a consensus on how the SBC may influence the working of

the economy, there still exist debates on the root causes for the formation of SBC and on how to harden the budget constraints of enterprises.

Figure 1. The SBC Syndrome: The Chain of Causality



Source: Kornai et al (2002)

About the theoretical models of the SBC, Dewatripont and Maskin (1995) is a seminal work, which formulates the SBC in the context of dynamic commitment inconsistency and effectively reflects the main ideas of Kornai (1980) on the SBC syndromes. In their two period dynamic game, they propose that the state or creditor may have incentives to refinance an inefficient, uncompleted project because the marginal benefit of refinancing exceeds the marginal cost of abandoning it, which means refinancing is an *ex post* efficient decision for the support organization. Dewatripont and Maskin (1995) provides a basic framework to formulate the (2) (3) causality chain of SBC syndromes, from which a large amount of literature on SBC have developed.

Although the major consequences of the SBC have long been clear in literature, yet some important issues are still under debate, such as why the socialist economies are more vulnerable to the SBC than the full-fledged market economies. Put in another way, what are the institutional factors that contribute to the pervasive SBC syndromes in those economies?

Kornai (1980) primarily attributes the causes for the SBC to political constraints, that is, to the paternalism of the socialist governments. However, Dewatripont and Maskin (1995)'s analysis has shown that paternalism is neither a necessary nor a sufficient condition for the SBC. They suggest that the highly centralized system of the social economies is the primary cause for the SBC, because in a de-centralized system, such as in the market economies, the transaction cost of refinancing will be so high that makes refinancing is *ex post* inefficient, hence eliminating the SBC syndromes. Qian (1994) also propose the similar idea: he suggests that China's more decentralized fiscal system increases the competition among different regions, so that increases the opportunity costs of refinancing bad projects, which partly explains the success of China's economic transitions. In our analysis below, however, a decentralization system may also contribute to the formation of the SBC, because the local governments may compete for the public resources to subsidize the loss-making enterprises.

Another influential theory on the SBC is that the public ownership of the socialist economies is the cause for their pervasive SBC syndromes. In Li (1992)'s model, the public ownership means

that the refinancing decision is made jointly by the government and the enterprise, which may contribute to the SBC problem. However, the massive privatization of SOEs in Eastern European Economies does not eradicate the SBC syndromes; on the contrary, the subsidies to the privatized enterprises were even larger than those to the former SOEs, which suggests that public ownership is not necessarily the root cause for the SBC syndromes.

Segal (1998) proposes that the monopoly status of the SOE results in the SBC syndromes: because the monopoly enterprise cannot capture the entire social surplus from its production, the government may have incentives to subsidize an unprofitable enterprise in order to guarantee the social surplus. Yet this theory is not persuasive for monopoly will surely incur efficiency loss of the whole economy. Boycko, Shleifer and Vishny (1996) suggest that the politicians may pay subsidies to the enterprises to induce them to retain excess labor, which may benefit the politicians in their elections. But there are no dynamic elements in their model and hence no problems of commitment, which may constraint the extension of their analysis.

2. Main Ideas

In this paper, we provide a new explanation for the prevalent SBCs in socialist and transition economies. We argue that the policy burdens on the SOEs and other kinds of enterprises are the root causes of the SBC syndromes, and only by eliminating the policy burdens on the enterprises could the state effectively harden the budget constraints of the enterprises.

The traditional socialist economy is known for its planned administrative control of resource allocation and its bias towards the growth of heavy industries. However, in a capital scarce, labor relatively abundant economy such as China, a heavy- industry-oriented strategy is in conflict with the comparative advantages of the economy. Such comparative advantage denying (CAD) strategy may bring two kinds of policy burdens to the SOEs: strategic and social policy burdens. The strategic policy burdens generate from the CAD technology and industry choices of the SOEs, because for developing heavy industries and adopting capital-intensive technologies in a low-development economy, the enterprise will produce with a high cost and hence incur losses in a free competitive market. The social policy burdens refer to the redundant workers, the retirement pensions and other welfare costs born by the SOEs. Since the capital-intensive heavy industries cannot absorb too much labor, to resolve the employment problems and remain social stabilities, the state will require the SOEs to retain excessive workers, which results in the social policy burdens.

With these policy burdens, the SOEs are nonviable in a free, open and competitive market. We define the term *viability* as the following (Lin, 2003): if, without any external subsidies or protections, a normally managed firm is expected to earn a socially acceptable profit in a free, open, and competitive market, the firm is viable; otherwise, the firm is nonviable. When the economy is in the transition from a planned economy to a competitive market economy, it

will be more difficult for the SOEs with the policy burdens to survive the competition. And the state may take two measures to guarantee the survival of the SOEs: one is protection, such as restricting competition in the market, and the other is subsidizing the SOEs, which will result in the SBC syndromes. Under information asymmetry, the policy burdens will certainly bring the incentive problems of the SOE managers, because the governments cannot distinguish between the losses due to policy burdens and those due to the low efforts of the managers. In these cases, a restriction of managerial autonomy is a second-best institutional arrangement for solving the problem of moral hazards (Lin, Cai, and Li 1998).

Privatization will not necessarily eradicate the SBC syndromes. On the contrary, privatization may make situation worse, because privatization accompanies the turnover of the control rights, which will change the reservation payoffs and the bargain powers of the enterprises and the state, and will result in even more subsidies to the privatized enterprises if they still bear the policy burdens.

Our theory above contributes to the understanding of the SBC syndromes in two aspects. First, we provide a relatively comprehensive framework and a new angle to investigate the SBC syndromes in socialist and transition economies, which cover the entire causality chains of SBC syndromes depicted in Figure 1. Second, our theory have important policy implications on how to eliminate the pervasive SBC syndromes in transition economies, that is, to remove the policy burdens on enterprises. In addition, our theory may also be applied in explaining the SBCs in market economies, especially for those enterprises that bear the policy burdens from the government.

3. Policy Burden, SOE and the SBC Syndrome

3.1 A Benchmark Model of the SOEs with No Policy Burdens

We first consider the Nash-Cournot equilibrium in a free-entry market, when the SOEs do not bear policy burdens. We assume there are N SOEs in the market, and they produce the same output. The demand for the firms' output is given by a strictly decreasing inverse demand function $P(Q)$, where Q is the total supply of this output. We assume the cost function is the same for all the SOEs; the cost function is $C(q) = K + e(q)$, in which K is the capital input, q is the output of a firm and $e(q)$ refers to the effort of the firm manager. For any $q \geq 0$, we have $e'(q) > 0$, $e''(q) > 0$ and $e(0) = 0$. We assume \bar{N} is the long term Nash-Cournot equilibrium number of firms in the free-entry market, and the profit of firm i is defined as $\pi(q_i) = P(Q) \cdot q_i - e(q_i) - K$, where $Q_i = Q_{-i} + q_i$ (Q_{-i} is the total outputs of the other $N-1$ firms). The SOEs do not have policy burdens, and under this condition there is no information asymmetry between the government and the SOE managers.

Given the firm number $N \leq \bar{N}$, we have the following conditions of Nash-Cournot

equilibriums:

- 1) Profit maximization: $q_i \in \arg \max p(Q_{-i} + q_i) \cdot q_i - K - e(q_i)$
- 2) Output market equilibrium: $p(Q) = p(Q_{-i} + q_i)$
- 3) Participant constraint: $w - e(q_i) = 0$ $i = 1, 2, \dots, N$

where w is the payment to the SOE managers, whose reservation payoffs are 0. According to Novshek (1980), there exists a solution of the problem above, which is denoted as $\{q^*(N), w^*(N)\}$ in our model. We assume the equilibrium profit is $\pi^*(N)$, and the payment to the SOE manager is $w^*(N) = e(q^*(N))$ ¹. If we further assume $p' + p'' \cdot q < 0$, which is always satisfied if marginal revenue is falling at a rate steeper than the slope of demand curve, we get the following lemma:

Lemma 1. If $N^* < N^{**} \leq \bar{N}$, then under the conditions of Nash-Cournot market equilibrium, we will have $\pi^* > \pi^{**}$ and $q^* > q^{**}$.

Lemma 1 tells us that when there are new firms entering the market, the equilibrium profit and equilibrium output of each firm will decrease. Or put in another word, increasing competition reduces the profit level of each firm. In the following sections we will analyze the effects of competition on the SBC syndromes of the SOEs.

3.2 Policy Burdens and the SBCs of the SOEs

In reality, there are always different kinds of policy burdens on the SOEs, which may bring incentive problems of the SOE managers. In this subsection, we introduce the policy burdens into our analytical framework and investigate the relationship between the policy burdens and the SBC syndromes of the SOEs.

Here we use L to denote the policy burden on a SOE, such as the redundant workers or the CAD technology choices, and π is the profit of the SOE when it does not bear the policy burdens. The profit level with policy burdens is therefore $\Pi = \pi - L$. $B(L)$ represents the benefits the policy burdens bring to the government, and in general we assume $B(L) \geq L$: policy burdens always bring additional benefits to the government, such as citizens' support to the government and the development of Hi-Tech industries that the politicians may take as their own achievements in posts. We assume the government pays the SOE manager a fixed payment w^* , and the payoff function of the SOE manager is $U_S = w^* - e(q)$, and that of the government (without providing subsidies) is $U_G = B(L) + \Pi = B(L) + \pi(q) - L$. We consider the following dynamic game between the government and the SOE manger:

Game 1.

¹ For simplicity, we will denote as q^*, π^* and w^* in the following sections.

Stage 1. The government decides whether to have the SOE take policy burdens.

Stage 2. The SOE manager observes the government's decision and chooses his effort $e(q)$.

Stage 3. Production is completed. The government observes the final profit of the firm and decide whether to subsidize the SOE.

We need to specify some key features of the actions of the government and SOE manager to complete our description of Game 1. First, we assume the government may subsidize the SOE only when the firm's profit $\Pi = \pi(q) - L < 0$, and the amount of subsidy will be $S = |\pi(q) - L|$; in addition, the government's cost of subsidy is $\theta \cdot S$, $\theta \in (0, 1]$, suggesting that the government may just sustain a part of the total cost of subsidy². Second, we assume that if at stage 3, the SOE's profit $\Pi < 0$ and the government do not provide subsidy, the SOE will be closed down and the payment to the SOE manager and the payoff of the government will both be 0. Finally, we assume that at stage 2, the government cannot observe and hence cannot control the effort investment of the SOE manager. We also assume that with the same payoff level, the government always prefers the SOE taking policy burdens, and the manager always prefers less effort investment. Solve Game 1 and we will get:

Proposition 1. The subgame-perfect equilibrium outcomes of Game 1 are given by

- (1) If $\pi^* < B(L)$, the SOE manager chooses to produce $q_L = \{q | \pi(q) = L + \frac{1}{\theta} \cdot (\pi^* - B(L))\}$, and the firm incurs loss. The government has the SOE take policy burden L , and provide a subsidy of $\frac{1}{\theta} [B(L) - \pi^*]$.
- (2) If $\pi^* \geq B(L)$, the SOE manager chooses to produce $q_H = \{q | \pi(q) = L + (\pi^* - B(L))\}$, and the firm does not incur loss. The government has the SOE take policy burden L and provide no subsidy.

According to Proposition 1, the relative values of π^* and $B(L)$ decide the profitability of a SOE and the government's subsidy to the SOE. We refer to part (1) of Proposition 1 as the SBC outcome, because the government *ex post* subsidizes a loss-making SOE. Proposition 1 clearly reveals the effects of policy burdens on the production decisions of the SOE manager, and it also tells us how a SOE with policy burdens survive in the market.

First, the policy burdens will incur the efficiency loss of the SOE, for the SOE manager always chooses the outputs different from the optimal level q^* . Much literature has revealed that the SOEs generally are less efficient than the private enterprises, and many theories attribute this inefficiency to the public ownership of the SOEs. But from our analysis, we find that the policy burdens also serve as an important cause for the low efficiency of the SOEs. Second, due to the increased cost resulted from the policy burden L , the SOEs with policy burdens are non-viable in a competitive market. Proposition 1 tells us that these SOEs may survive through two approaches: one is to receive subsidies from the

² This is especially true in China, where the local governments force the state banks to provide policy loans to the local SOEs, but they care little about the non-performing loans (NPLs) that may resulted from the policy loans.

government (part (1)), and the other is to maintain a monopolistic power in the market (part (2)). In fact, we may generalize the results of Proposition 1 both as the SBC outcomes, because in both cases, the government either subsidizes the SOEs with external resources (part (1)) or at the cost of the efficiency loss of the entire economy (part (2)). From Proposition 1, we may also derive the following corollaries:

Corollary 1. When the SOE bears policy burdens, the SOE manager always chooses $q < q^*$.

Corollary 1 reveals the truth that, under the condition of information asymmetry, policy burdens will surely result in the moral hazard of the SOE manager, which is reflected by the low level of effort investment. And the welfare loss is depicted in Figure 2. The problem of moral hazards is also reflected by the critical value in Proposition 1, which is $B(L)$ rather than L . For example, when the condition $L < \pi^* < B(L)$ is satisfied, the SOE may avoid loss by just choosing to produce q^* , but the SOE manager has no incentive to produce that much because he expects the government will subsidize the firm at the end of production, which will bring better payoff to the SOE manager.

Corollary 2. When the SOE bears policy burdens, an increase of market competition makes the SOEs more vulnerable to loss and increases the amount of government subsidies.

Corollary 2 tells us that increasing market competition will make the SBC syndromes more explicit and increase the amount of government subsidies. The relationship between firm number in the market and the government subsidy is depicted in Figure 3. We see that an increase of the firm number in the market will reduce the profit of each firm (Lemma 1), and will result in more subsidies to the SOE. This result has interesting implications in explaining the transitions of China's state sectors in the past two decades. Since the beginning of China's economic reforms in 1978, more and more private firms have entered the markets with low entrance barriers, and the SOEs, especially those in the competitive markets, have incurred great losses in this period. And the increasing subsidies to the SOEs have become heavy burdens on the governments and have resulted in huge amounts of NPLs in the banking sector. In recent years, the government decides to abandon the small and medium SOEs, most of which are in the competitive markets, and only retain the large SOEs that are monopolies in their industries and account for nearly all the profits of the state sectors³.

Fig. 2 Policy Burdens and the Moral Hazard

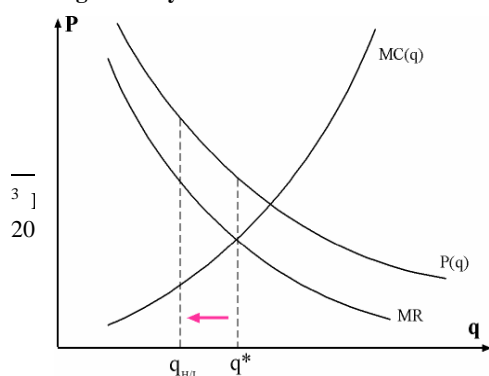
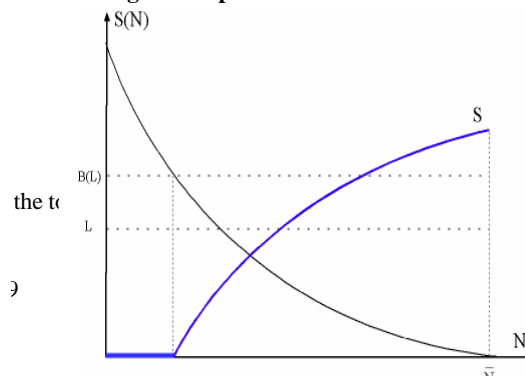


Fig. 3 Competition and the Size of Subsidy



π^*

Corollary 3. When the SOE bears policy burdens and incurs losses, a smaller value of θ will result in more subsidies from the government and smaller outputs of the SOE.

Corollary 3 says that if the government sustains a smaller part of the total subsidies, then the government can afford more subsidies to the SOE, and the SOE manager will reduce the outputs in order to get more subsidies. A higher θ may clearly be interpreted as a tougher monetary and fiscal policy instance in our model, which makes subsidies more costly for the governments. And we naturally reach the conclusion that a tougher monetary and fiscal policy instance may increase the efficiency of the SOEs and reduce the amounts of government subsidies. The results of Corollary 3 also suggest that decentralization (or fiscal federalism) may bring softer budget constraints for the SOEs, especially when the local governments have significant influences on the operations of the financial institutions.

Corollary 4. When the SOE bears policy burdens, a larger value of $B(L)$ results in smaller outputs of the SOE.

Corollary 4 reflects an idea similar to that of Corollary 3, but it can be applied in a broader scope, for it does not require the SOE incur losses. The intuition behind this result is that, if the government gets more benefits from the policy burdens, the SOE manager will have opportunities to share the benefits with the government by reducing its outputs.

2.3 Policy Burdens and the Restriction of Managerial Autonomy

From the model above we see that under information asymmetry, if the SOE manager could freely decide the outputs of the firm, the policy burdens will result in the under-invested efforts of the SOE manager. But in reality, the governments in the socialist and transition economies often take planning and administrative measures, such as output quota and price ceiling, to restrict the managerial autonomy of the SOE manager.

In this subsection we will prove that a restriction of the managerial autonomy of the SOE manager, as a second-best institutional arrangement, may increase the efficiency of the SOE with the policy burdens. We here consider a modification of Game 1, in which the SOE manager's effort decision is now restricted by an output quota assigned by the government, and then investigate the new equilibriums under such a modification. We assume that at stage 1, the SOE manager writes a contract with the government, specifying the output quota q_0 that the SOE must finish at the end of production; for simplicity, we assume $e(q_0) \leq w^*$,

which means that the specified output quota q_0 is acceptable for the SOE manager. At stage 3, if the SOE manager does not finish the assigned output quota, he will be laid off by the government and receive no payment; in this case, the SOE manager's payoff is $U_S = -e(q)$. The other assumptions of Game 1 remain unchanged, solving this modified game, and we will get the following proposition:

Proposition 2. Under the condition of output quota (q_0), the sub-game perfect equilibrium of the modified Game 1 is:

- (1) If $\pi^* \geq B(L)$, the SOE manager will choose to produce $q = \max\{q_H, q_0\}$; otherwise, the SOE manager will choose to produce $q = \max\{q_L, q_0\}$;
- (2) The government will have the SOE bear the policy burdens, and if the firm incurs losses, the government will subsidize the SOE.

The results reveal that a restriction of the SOE managerial autonomy may increase the outputs of a SOE and hence reduce the efficiency loss, because in either cases, the outputs of the SOE will be no less than those in Proposition 1. Specifically, when $q_0 > q_H, q_L$, there will be a strict increase of SOE outputs and the government will receive better payoffs. Proposition 2 shows that in socialist and transition economies, when SOEs bear policy burdens and there exists information asymmetry between the government and the SOE manager, a restriction of the managerial autonomy of the SOE managers may improve the efficiency of the SOEs.

4. Privatization, Policy Burden and the SBCs

An influential theory on the SBC syndromes states that the public ownership of the SOEs is the root cause for the pervasive SBC syndromes in former socialist and now transition economies. However, the evidences of economic reforms in the Eastern European Economies prove that this theory is not necessarily true. In this section, we will investigate the relationship between policy burden, privatization and the SBC syndromes, and try to propose an explanation for the recent SBC syndromes in the transition economies.

According to Grossman and Hart (1986), the privatization means a combination of two changes in our model. The first is the turnover of control rights from the government to the enterprise manager, and the manager is now able to reject the policy burdens assigned by the government. The second is the reduction of the profit ownership by the government and the increase of profit ownership of the manager and outside shareholders. For simplicity, we assume that the government has no share in the privatized enterprise. Consider the following game between the government and the enterprise manager after the privatization:

Game 2.

Stage 1. The government decides whether to ask the enterprise to take the policy burden L .

Stage 2. The enterprise manager observes the government's decision and decides whether or

not to accept the policy burden L . And the manager chooses his effort level $e(q)$.

Stage 3. Production is completed. If the privatized enterprise bears the policy burdens, the enterprise manager will ask for a subsidy of S from the government.

Stage 4. The government decides whether to provide the subsidy of S to the enterprise.

In Game 2, the privatization has changed the bargain powers and the reservation payoffs of the government and the enterprise manager. First, as we have stated, the enterprise manager now has the control right of the privatized enterprise and may reject the policy burdens assigned by the government. Second, the reservation payoff of the government changes to be 0, rather than the former π^* , and that of the manager change from 0 to be π^* . And finally, the enterprise manager requires a subsidy of S , and the government chooses whether or not to accept. Other assumptions remain the same as in Game 1, and solving Game 2, we reach the following proposition:

Proposition 3. The subgame-perfect equilibrium outcomes of Game 2 are given by

- (1) If $\pi^* < \frac{1}{\theta} B(L)$, the government asks the privatized enterprise to take the policy burden L , and the enterprise manager will accept the policy burden and choose to produce $q = \{q \mid \pi(q) = \min(L, \pi^*)\}$. The subsidy provided by the government is $S = \frac{1}{\theta} B(L)$.
- (2) If $\pi^* \geq \frac{1}{\theta} B(L)$, the government asks the privatized enterprise to take the policy burden L , but the enterprise manager will reject the policy burden and choose to produce $q = \{q \mid \pi(q) = \pi^*\}$.

From Proposition 3, we see that when a privatized enterprise bears the policy burdens, the government must subsidize the enterprise after the production, which is known as the SBC problems; and when $\pi^* < \frac{1}{\theta} B(L)$ and $L < \pi^*$, the policy burdens will also bring the efficiency loss to the privatized enterprise. We next compare the main results of Proposition 3 with those of Proposition 1 (summarized in Table 1), and investigate the major differences between the SOE and the privatized enterprise in their SBC syndromes.

Table 1. Policy Burden and the SBCs of the SOE and the Private Enterprise (PE)

	Proposition 1 (SOE)	Proposition 3 (PE)
1. Condition of Resulting SBC	$\pi^* < B(L)$	$\pi^* < \frac{1}{\theta} B(L)$
2. Amount of Subsidy	$\frac{1}{\theta} [B(L) - \pi^*]$	$\frac{1}{\theta} B(L)$
3. Output of Enterprise	$q_L = \{q \mid \pi(q) = L - \frac{1}{\theta} (B(L) - \pi^*)\}$	$q = \{q \mid \pi(q) = \min(L, \pi^*)\}$

From Table 1, the following conclusions can be easily reached. First, when the SOE and the private enterprise both bear the policy burdens and $\theta \in (0,1)$, given other things equal, it will be more likely for the private enterprise to bring the SBC syndromes. For instance, when $B(L) < \pi^* < \frac{1}{\theta} B(L)$, the SOE will not have the SBC problem, but the privatized enterprise will

surely have the SBC problem. Second, when the SOE and the privatized enterprise both bear the policy burdens and $\pi^* > 0$, given other things equal, the government will provide more subsidies to the private enterprise than to the SOE. This result may explain why the subsidies to the enterprises increased in Russia after massive privatization of the SOEs, because the privatization changes the control rights and the reservation payoffs of the enterprise managers. Finally, when the SOE and the private enterprise both have the SBCs, given other things equal, the private enterprise will produce more than the SOE, which means that the efficiency losses of the SOE is larger than that of the private enterprise under this condition.

5. Discussions and Applications

Our models in the above two sections extend the work of Lin et al (1996, 1998, 1999, 2000). In this section, we will provide a short discussion of the key assumptions of our model, and then apply the major results of our analysis to explain the stylized facts of the SBC syndromes in socialist and transition economies. We will also propose our policy suggestions on how to harden the budget constraints of the enterprises in transition economies.

There are two pivotal assumptions in our model. One is that the policy burdens on the enterprise bring additional benefits to the government, which is denoted by the condition of $B(L) \geq L$ in our model. In general, the government cares not only about economic, but also political issues, such as the social stability and the citizen's support for the government, and the policy burdens on the enterprises may bring the additional political benefits to the government. The other key assumption is that the government may only sustain a part of the cost of the subsidies to the enterprises, which is represented by the condition of $\theta \in (0,1]$ in our model. For example, when the operations of the financial institutions are intervened by the local governments, the government will use the financial credits, rather than its fiscal revenues, to subsidize the enterprises. If either of the above two assumptions is true, the governments will have incentives to put the policy burdens on the enterprises.

Next we will apply the results of our model to explain the main facts in socialist and transition economies. First, we know that in the traditional socialist economies, the control rights of the SOE managers are strictly restricted by the government through such approaches as price ceilings or production quotas. Our model suggests that under information asymmetry, the policy burdens on the SOEs may incur the moral hazards of the SOE managers, and a restriction of the managerial autonomy may guarantee the lowest effort investment of the managers (Proposition 2). Second, an interesting phenomenon in China's SOE reforms is that the governments originally subsidized to the SOEs with the fiscal revenues, then with the bank credits, and recently with the public selling of the SOE shares. According to our analysis, when subsidizing the SOEs with the fiscal revenues, the government sustains nearly

all the cost of subsidy, while in the other two instances, the government only sustains a part of the cost of subsidy (Corollary 3). Our model also proposes that privatization will not necessarily eliminate the SBCs in transition economies, and it may result in more subsidies to the enterprises (Proposition 3), which has important implications in explaining the facts in many transition economies where massive privatization has happened.

In the literature, researchers have reached the consensus that hardening the budget constraints of the SOEs is a necessity for the success of economic transitions, but they do not agree on how to harden the budget constraints of the enterprises. We argue that the policy burdens are the root cause for the SBCs of the SOEs in transition economies, and if we want to harden the budget constraints, we should reduce the incentives of the government to put the policy burdens on the SOEs, which can be done through two approaches.

One is to reduce the value of $B(L)$, the benefits that the policy burdens on the SOEs may bring to the governments. If we set up a comprehensive social security system in the economy, then the social policy burdens, such as retaining redundant workers in the SOEs, will bring fewer benefits to the governments. Or if we abandon the strategies of preferentially developing the heavy and Hi-Tech industries in the less developed transition economies, then the strategic policy burdens will also bring fewer benefits to the governments. The second approach is to harden the finance constraint of the governments, requiring the governments, particularly the local governments, to sustain all the costs of subsidizing the SOEs. For example, we should keep the financial institutions to be able to operate independently, without the interventions from the governments. With these policies to be implemented, the governments will have low incentives to put policy burdens on the SOEs, which may help to eradicate the SBC syndromes in these economies.

6. Conclusion

In this paper, we present a model of the policy burden and the SBC that helps to explain many stylized facts in socialist and transition economies. We find that under information asymmetry, the policy burdens will lead to the moral hazards of the SOE managers and hence the low efficiency of SOEs; and when competition increases to certain degree, the policy burdens will definitely result in the SBC syndromes. Privatization will not necessarily harden the SBCs of firms; on the contrary, a private firm with the policy burdens will be more likely to bring the SBCs and ask for more subsidies from the government than a SOE in the same condition. We also show that in socialist and transition economies, when SOEs bear policy burdens, a restriction of the control power of SOE managers by the government may improve the efficiency of the SOEs.

Our analysis has important policy implications on how to harden the budget constraints of the SOEs in transition economies. We propose that establishing a comprehensive social security

system, abandoning the CAD development strategies, and protecting the independent operations of the financial sectors all will reduce the governments' incentives to put the policy burdens on the firms, and hence help to eradicate the SBC syndromes in transition economies.

Mathematical Appendix:

1. *Proof of Lemma 1.* The first order condition of Nash-Cournot Market equilibrium is:

$$\begin{cases} p(Q) + p'(Q) \cdot q = e'(q) \\ Q = N \cdot q \end{cases}$$

Perform analysis of comparative statistics and we will get:

$$\begin{pmatrix} p' + p''q & p' - e'' \\ 1 & -N \end{pmatrix} \begin{pmatrix} dQ \\ dq \end{pmatrix} = \begin{pmatrix} 0 \\ q \cdot dN \end{pmatrix} \therefore \frac{dQ}{dN} > 0, \frac{dq}{dN} < 0, \frac{d\pi}{dN} = p'q \cdot \frac{dQ}{dN} + p \cdot \frac{dq}{dN} - e' \cdot \frac{dq}{dN} < 0$$

2. *Proof of Proposition 1.* Game 1 is easily solvable by backward induction.

Stage 3: If $\Pi = \pi - L \geq 0$, the government does not subsidize the SOE, and the payoffs of the government and the SOE manager are respectively $U_G = B(L) + \pi - L$ and $U_S = w^* - e(q)$; if $\Pi = \pi - L < 0$ and the government subsidizes the SOE, the payoffs of the government and the SOE manager are respectively $U_G = B(L) - \theta \cdot L$ and $U_S = w^* - e(q)$; if $\Pi = \pi - L < 0$ and the government does not subsidize the SOE, the payoffs of the government and the SOE manager are respectively 0 and $-e(q)$.

Stage 2: If $\Pi = \pi - L \geq 0$, the SOE manager solves $\max_q U_S = w^* - e(q)$, s.t. $B(L) + \pi(q) - L \geq \pi^*$, and we will get $q_H = \{q | \pi(q) = L + (\pi^* - B(L))\}$; if $\Pi = \pi - L < 0$ and the government subsidizes the SOE, the SOE manager will choose $\max_q U_S = w^* - e(q)$ s.t. $B(L) + \theta \cdot S \geq \pi^*$, $S = |\pi(q) - L|$; if $\Pi = \pi - L < 0$ and the government does not subsidize the SOE, the SOE manager will choose $q = 0$.

Stage 1: Given the strategy of the manager, the government has the SOE bear the policy burden L .

3. *Proof of Corollary 1.* $\Theta B(L) > L, \theta \in (0, 1]$, from Proposition 1 we have:

1) When $\pi^* \geq B(L)$, $\pi(q_H) = \pi^* + L - B(L) < \pi^*$, $\therefore q_H < q^*$

2) When $\pi^* < B(L)$, $\pi^* - \pi(q_L) = \pi^* - L + \frac{1}{\theta} [B(L) - \pi^*] \geq B(L) - L > 0$, $\therefore q_L < q^*$

Proof of Corollary 2, 3, 4: These results are obvious from Proposition 1 and Corollary 1.

4. *Proof of Proposition 2.* [Backward induction]

Stage 3: If $q < q_0$, we have $U_G = B(L) + \pi - L$ and $U_S = -e(q)$; if $\Pi = \pi - L \geq 0$ and $q \geq q_0$, the government does not subsidize the SOE, we have $U_G = B(L) + \pi - L$, $U_S = w^* - e(q)$; if $\Pi = \pi - L < 0$, $q \geq q_0$, and the government subsidizes the SOE, we have $U_G = B(L) - \theta \cdot S$ and $U_S = w^* - e(q)$; otherwise, $U_G = 0$, $U_S = -e(q)$.

Stage 2: If $q < q_0$, the SOE manager will choose $q = 0$; if $q \geq q_0$ and $\pi(q_0) \geq L$, the SOE manager will choose $q = q_0$; if $q \geq q_0$ and $\pi(q_0) < L$, following the similar approaches of the *Proof of Proposition 1*, we will get if $\pi^* \geq B(L)$, the SOE manager will choose $q = q_H > q_0$; otherwise, the SOE manager chooses $q = \max\{q_0, q_L\}$.

Stage 1. Given the strategy of the SOE manager, the government will have the SOE bear the policy burden L .

5. *Proof of Proposition 3.* The proof is similar to those of Proposition 1 and 2, and the only thing to be pointed out is that, when $\Pi = \pi - L < 0$ and the government provides subsidy, the private enterprise manager solve the optimization problem of: $\max_{q,S} : U_p = \pi(q) - L + S$, s.t. $B(L) - \theta \cdot S \geq 0$, $\pi(q) < L$, and $U_p \geq \pi^*$.

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