

Soft Budget Constraint, Strategic Delegation and Overcapacity of Chinese SOE

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How to cite this paper: Xiang, H. J., & Xiang, W. Y. (2023). Soft Budget Constraint, Strategic Delegation and Overcapacity of Chinese SOE. *iBusiness*, 15, 71-83.
<https://doi.org/10.4236/ib.2023.151005>

Received: January 22, 2023

Accepted: March 26, 2023

Published: March 29, 2023

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Abstract

Overcapacity has become a major obstacle to the healthy development of China's economy in recent years. Using a mixed oligopoly competition model, this paper studies how the government soft budget constraint and strategic delegation for State-Owned Enterprise (SOE) impact the capacity choice of SOE and private enterprise. Theoretical analysis shows that: 1) Generally, SOE tends to have excess capacity, while private enterprise tends to have undercapacity; 2) The government soft budget constraint and strategic delegation to SOE will not only aggravate the overcapacity of SOE, but the undercapacity of private enterprise. Based on the theoretical analysis, this paper puts forward policy recommendations on the issue of overcapacity for some industrial sectors in China.

Keywords

Mixed Oligopoly Competition Model, State-Owned Enterprise, Soft Budget Constraints, Overcapacity

1. Introduction

In the global economic downturn, overcapacity is a serious challenge facing the Chinese economy. Overcapacity on an industrial level occurs when actual output is lower than the potential production capacity. Although in recent years, de-capacity has been one of the top priorities of Chinese governments at all levels, the problem of overcapacity in key industries such as automobile, coal and photovoltaic is becoming more and more serious. The problem of overcapacity is particularly serious not only for traditional industries such as iron and steel, cement, coal, electrolytic aluminum and shipbuilding, but for emerging industries such as wind power equipment and polycrystalline silicon as well. For example, according to the data from the Statistics Bureau of China, the capacity utilization rate of Chi-

na's passenger car industry in 2020 is only 48.45%. **Figure 1** shows that during 2003-2020, China's industrial capacity utilization rate has been around 76%, which is significantly below the internationally recognized normal utilization of 82%.

As a normal phenomenon of the market economy, moderate overcapacity promotes market competition and efficiency. But serious overcapacity will lead to waste of resources and environmental pollution. At the micro level, insufficient utilization leads to low corporate profitability, unemployment and bankruptcies. Resolving the contradiction of serious overcapacity has become a top priority for China's economic institutional reform and industrial restructuring in recent years. Finding and identifying the root causes of overcapacity is the key and prerequisite for solving the problem of overcapacity for the Chinese government.

According to relevant statistics, most industries with serious overcapacity in China are characterized by the dominance of large and medium-sized State-Owned Enterprise (SOE for short) coexisting with competing private enterprises. **Wang et al. (2018)** empirically investigated the causes of coal overcapacity in China and found that insufficient demand, market failure, and institutional distortion are the main causes of coal overcapacity in China, but the government support policies and institutional distortion are the fundamental factors, with a 73.75% contribution. This indicates that although sluggish overall market demand is indeed a cause of China's overcapacity, the fundamental cause is the operational system of SOE. Based on the characteristic reality of China's economic activities, this paper constructs a mixed oligopolistic competition model and reveals how the government's soft budget constraint and strategic delegation impact the capacity choice of Chinese SOE.

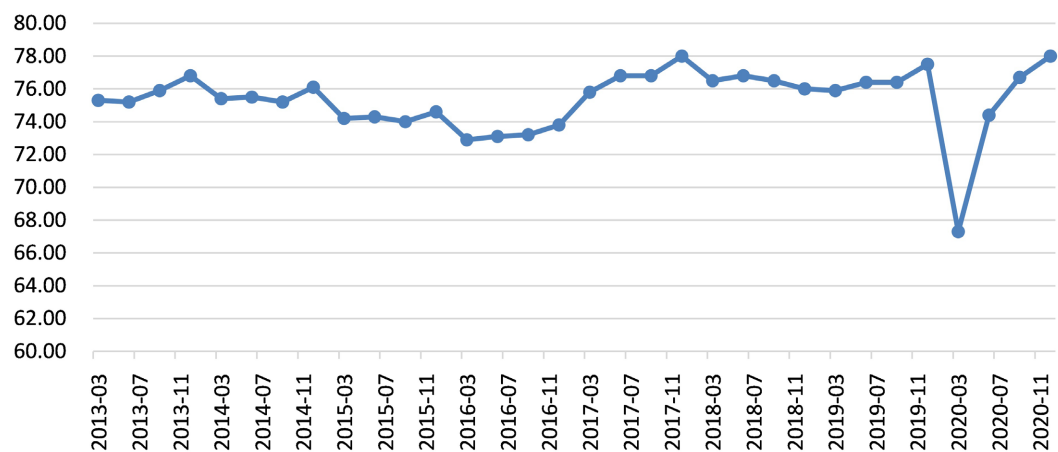


Figure 1. Capacity utilization rate of China's industry in 2013-2020.

2. Literature Review

As a common economic phenomenon, overcapacity has received widespread attention from governments, companies, experts and scholars.

Most related studies explored the mechanism of overcapacity formation. Research on this issue has been conducted from three main perspectives (Wang et al., 2018). Using the game theory, the first perspective focuses on how the decisions made by leading enterprises facing the threat of invasion from potential competitors affect overcapacity (Mathis & Koscianski, 1997). Zhang (2012) concluded that the local government's disorderly even vicious competition aggravates the overcapacity problem in China. Using the oligopoly competition theory, the second perspective focuses on how investment and price strategies are undertaken by enterprises aiming for benefit maximization resulting in excess capacity (Davidson & Deneckere, 1990). The last perspective explores how future market uncertainty impacts the investment decisions made by enterprises aiming to enhance the value of "operational options" leading to surplus capacity (Pindyck, 1986). In addition to these, some scholars revealed the mechanisms of overcapacity from such perspectives such as price mechanism (Pirard & Irland, 2007), business cycles (Mulligan, 2017), and structural constraints (Dagdeviren, 2016).

Using the mixed oligopoly competition models, some literature have investigated the differences in the capacity choice between SOE and private enterprise. Nishimori and Ogawa (2002) were one of literature that investigate the differences in the capacity choice between SOE and private enterprise using a mixed oligopoly competition model. However, existing literature arrived at inconsistent conclusions on such differences. Some studies consider that private enterprise is more likely to experience overcapacity. For instance, Lu and Poddar (2005) concluded that without government intervention, private enterprises are more likely to experience overcapacity than SOE. Ogawa (2006) also reached a similar conclusion, i.e. compared with SOE, private enterprise is more likely to cause overcapacity. However, some other studies believe that SOE is more likely to experience overcapacity. For instance, Barcena-Ruiz and Carzon (2007, 2010), Nakamura (2013) reached a totally opposite conclusion: SOE generally cause overcapacity while whether private enterprises have overcapacity is subject to market demand. Anyway, the common conclusion of these literature is that differences indeed exist in the capacity choice between SOE and private enterprise.

Despite inconsistent research conclusions, the above-mentioned literature shares the following commonalities: first, it is assumed that the target function of SOE is the maximization of social welfare; second, government intervention is not taken into account. Considering that the senior executives of Chinese SOE and particularly large and medium-sized SOE are appointed by the government, the immediate objective of corporate operation is to maximize corporate profitability or return to the management. Therefore, the theoretical hypotheses of the above-mentioned international literature are inconsistent with the reality of Chinese SOE.

3. The Basic Model

3.1. Assumptions

This paper assumes that two types of enterprises exist in a closed economy: A

representative SOE and are presentative private enterprise (respectively denoted by subscripts 1 and 2), which manufacture differentiated goods. Both types of enterprises compete in terms of product price and output capacity, i.e. prior to price competition, SOE and private enterprise will first decide their respective output capacity. Regarding corporate operation system, given the reality of Chinese SOE, this paper assumes that SOE have strategic delegation, i.e. the government delegates the management of SOE to the professional manager.

With these assumptions, this paper's gaming model includes three actors: the government, SOE manager and private enterprise. The gaming process can be divided into the following three stages: Stage I, the government conducts strategic delegation of SOE's manager and determines the incentives for SOE's manager; Stage II, SOE and private enterprise respectively decide their output capacity; Stage III, SOE engage in (Bertrand) price competition with private enterprise in the marketplace.

It is assumed that the consumer surplus function for representative consumers is as follows:

$$CS = a(q_1 + q_2) - 0.5(q_1^2 + 2bq_1q_2 + q_2^2) - (p_1q_1 + p_2q_2) \quad (1)$$

The first two parts to the right side of the equation denote the consumer utility for consumers and the third part denotes consumer spending. Function of market inverse demand can be derived from consumer surplus function:

$$p_i = a - q_i - \theta q_j, \quad a > 0, \theta \in (-1, 1), \theta \neq 0 \quad (2)$$

where, p_i denotes the market prices of products made by SOE or private enterprises and q_i denotes the output of products made by SOE or private enterprises. θ denotes the relationship of substitution between products made by SOE and those made by private enterprises and $\theta \in (0, 1)$, which indicates that products made by the two types of enterprises are substitutes to each other¹.

Regarding production, for simplicity, this paper assumes that the cost of each unit of output is the zero for SOE and private enterprise. SOE and private enterprise respectively choose to produce x_1 and x_2 quantities of output. Given the huge differences of investment and financing costs between SOE and private enterprise and various preferences of bank credit to SOE, the financing costs are much more favorable for SOE than for private enterprise. Therefore, this paper has revised the total cost function employed by [Ogawa \(2006\)](#) and assumes the total cost functions of SOE and private enterprise as follows:

$$\begin{aligned} C(q_1, x_1) &= \lambda(x_1 - q_1)^2 \\ C(q_2, x_2) &= (x_2 - q_2)^2 \end{aligned} \quad (3)$$

where, λ denotes investment and financing cost coefficient of SOE and $0 \leq \lambda \leq 1$, which indicates that compared with private enterprise, cost for the same amount of investment and financing is more favorable to SOE. The above cost function also implies that no matter for SOE or private enterprise, overall corporate cost

¹If $\theta \in (-1, 0)$ products made by the two types of enterprises are supplements to each other, but this situation is not considered in this paper.

will be the lowest when production equals to output capacity. In other words, total costs will be increased by either undercapacity or overcapacity.

Profit function for both types of enterprises is as follows:

$$\begin{aligned}\pi_1 &= p_1 q_1 - \lambda (x_1 - q_1)^2 \\ \pi_2 &= p_2 q_2 - (x_2 - q_2)^2\end{aligned}\quad (4)$$

Corporate target function: The Chinese government has adopted a system of delegation for the management of all large and medium-sized SOE, i.e. the government appoints professional managers to run SOE and determines the incentive mechanisms for them. Such a system is referred to as strategic delegation in the oligopoly theory. Given the delegation of SOE decision-making to professional managers who act according to the maximal self-interest, the target function of SOE is in effect converted into the target function of SOE manager. It is assumed that government incentives for the senior management of SOE can be described by the following equation:

$$\Omega = \beta \pi_1 + (1 - \beta) q_1, \beta \in (0, 1) \quad (5)$$

Equation (5) indicates that the remuneration of SOE manager includes the following two parts: commission from profit and commission from output. Where, π_1 denotes the profits of SOE; q_1 is the output of SOE; β denotes the factor of commission from profit in the remuneration of SOE manager; and $1 - \beta$ is the factor of commission from output in the remuneration of senior management. The size of β is determined by the government. Greater β means that the government attaches importance to the profitability of SOE. The smaller β and thus greater $1 - \beta$ indicate that the government puts greater premium on the social welfare function of SOE².

For simplicity, this paper does not consider the strategic delegation of private enterprise, whose business target is profit maximization and thus target function is π_2 .

Target function of SOE manager is:

$$\beta \left((a - q_1 - \theta \cdot q_2) q_1 - \lambda (x_1 - q_1)^2 \right) + (1 - \beta) q_1 \quad (6)$$

Target function of private enterprises is:

$$\pi_2 = (a - q_2 - \theta \cdot q_1) q_2 - (x_2 - q_2)^2 \quad (7)$$

Assuming that the government pursues social welfare maximization and social welfare equals to consumer surplus plus the profits of both types of enterprises, thus the target function of government can be described as:

$$W = CS + \pi_1 + \pi_2 \quad (8)$$

where, consumer surplus can be simplified as $CS = 0.5(q_1^2 + q_2^2) + \theta q_1 q_2$.

3.2. Nash Equilibrium of the Model

The above-mentioned assumptions imply that this paper creates a three-stage

²Usually, greater total output of enterprises means greater consumer surplus.

gaming model. Thus, backward induction method is employed to arrive at the Nash equilibrium solution of the entire model.

In the first step, the optimal output for SOE and private enterprise in the third stage is to be solved. According to the first-order conditions of target function maximization, the optimal output for both types of enterprise can be solved using the following equation:

$$\begin{aligned} q_1 &= \frac{4(1-\beta) + (4-\theta)a\beta + 8\beta\lambda x_1 - 2\beta\theta x_2}{\beta(8+8\lambda-\theta^2)} \\ q_2 &= \frac{a\beta(2+2\lambda-\theta) - \theta(1-\beta) - 2\beta\theta\lambda x_1 + (1+4\lambda)\beta x_2}{\beta(8+8\lambda-\theta^2)} \end{aligned} \quad (9)$$

In the second step, the optimal capacity of enterprises is solved. By substituting the optimal output for each type of enterprises arrived at using the above equation into the target functions of SOE and private enterprise, we may solve the output choices of Nash equilibrium for each type of enterprises using the following equations also according to the first-order conditions of target function maximization:

$$\begin{aligned} x_1 &= \frac{8(1+\lambda)(4(1-\beta)(\theta^2 - 4(1+\lambda)) - a\beta(-4\theta^2 + \theta^3 + (16-8\theta)(1+\lambda)))}{\beta(\theta^6 - 24\theta^4(1+\lambda) - 256(1+\lambda)^2 + 32\theta^2(5+8\lambda+3\lambda^2))} \\ x_2 &= \frac{8(1+\lambda)(\theta(1-\beta)(8(1+\lambda) - \theta^2) - a\beta(\theta^3 + (16-8\theta-2\theta^2)(1+\lambda)))}{\beta(\theta^6 - 24\theta^4(1+\lambda) - 256(1+\lambda)^2 + 32\theta^2(5+8\lambda+3\lambda^2))} \end{aligned} \quad (10)$$

Then, by substituting the optimal output capacity (10) for both types of enterprises into Equation (9), we may arrive at the Nash equilibrium output for both types of enterprises after simplification:

$$\begin{aligned} q_1 &= \frac{(\theta^2 - 8(1+\lambda))(4(\theta^2 - 4(1+\lambda))(\beta-1) + a\beta(-4\theta^2 + \theta^3 + (16-8\theta)(1+\lambda)))}{\beta(\theta^6 - 24\theta^4(1+\lambda) - 256(1+\lambda)^2 + 32\theta^2(5+8\lambda+3\lambda^2))} \\ q_2 &= \frac{(\theta^2 - 8(1+\lambda))((1-\beta)\theta(\theta^2 - 8(1+\lambda)) + a\beta(\theta^3 + (16-8\theta-2\theta^2)(1+\lambda)))}{\beta(\theta^6 - 24\theta^4(1+\lambda) - 256(1+\lambda)^2 + 32\theta^2(5+8\lambda+3\lambda^2))} \end{aligned} \quad (11)$$

In the third step, we solve the optimal incentive configuration for SOE manager. Assuming that the government pursues social welfare maximization, we may further solve the optimal incentive configuration by the government for SOE manager. Given that this paper focuses on the choice of output capacity of enterprise, the question of optimal incentives for SOE will not be discussed in depth in the interest of length.

4. Overcapacity and Its Causes

4.1. Overcapacity

Whether the two types of enterprises have the problem of overcapacity can be ana-

lyzed according to the optimal output and capacity of SOE and private enterprise. By comparing the optimal capacity and output of both types of enterprise, we may arrive at:

$$x_1 - q_1 = \frac{\theta^2 \left(4(\theta^2 - 4(1+\lambda))(1-\beta) + a(4\theta^2 - \theta^3 - (16-8\theta)(1+\lambda)) \right)}{\beta \left(\theta^6 - 24\theta^4(1+\lambda) - 256(1+\lambda)^2 + 32\theta^2(5+8\lambda+3\lambda^2) \right)} > 0 \quad (12)$$

Equation (12) calculates the difference between the optimal capacity x_1 and optimal output of SOE. Given that this paper assumes that $0 < \beta < 1$ and $0 < \theta < 1, 0 < \lambda < 1$, it is not difficult to prove that we have $x_1 - q_1 > 0$ under Nash equilibrium. This indicates that the equilibrium capacity of SOE exceeds their equilibrium output, i.e. SOE have overcapacity.

By the same token, by comparing the optimal output and optimal capacity of private enterprise, we may arrive at:

$$x_2 - q_2 = \frac{-\theta^2 \left((1-\beta)\theta(\theta^2 - 8(1+\lambda)) - a\beta(\theta^3 + (16-8\theta-2\theta^2)(1+\lambda)) \right)}{\beta \left(\theta^6 - 24\theta^4(1+\lambda) - 256(1+\lambda)^2 + 32\theta^2(5+8\lambda+3\lambda^2) \right)} < 0 \quad (13)$$

It can be seen from Equation (13) that $q_2 - x_2$ and the difference between equilibrium capacity and output of private enterprises is smaller than zero as well, which indicates that under Nash equilibrium, private enterprise has the problem of undercapacity.

Proposition 1. *The strategic delegation and Soft Budget Constraint (SBC) of SOE will not only lead to the overcapacity of SOE but also undercapacity of private enterprise as well.*

4.2. Determinants of Overcapacity

According to the above analysis, when the government enforces strategic delegation and soft budget constraint for SOE, both the SOE and private enterprise will have capacity problems. Next, we will discuss how the strategic delegation and soft budget constraint of SOE affect the overcapacity of SOE and private enterprise.

4.2.1. Impact of Soft Budget Constraint on the Overcapacity of SOE

This paper considers that the soft budget constraint of Chinese SOE is mainly embodied in the access to bank lending at costs significantly below those of private enterprise. Thus, this paper includes a financing cost coefficient λ before the capacity cost of SOE and $0 < \lambda < 1$. The smaller λ is, the lower financing costs would be for SOE. In order to investigate the effects of soft budget constraint on the overcapacity of SOEs, we arrived at the following equation by taking the partial derivative of $x_1 - q_1$ with respect of soft budget constraint coefficient λ :

$$\frac{d(x_1 - q_1)}{d\lambda} = \frac{-\theta^2 \left(\theta(1-\beta)(\theta^2 - 8(1+\lambda)) - a\beta(\theta^3 + (16-8\theta-2\theta^2)(1+\lambda)) \right)}{\beta \left(\theta^6 - 24\theta^4(1+\lambda) - 256(1+\lambda)^2 + 32\theta^2(5+8\lambda+3\lambda^2) \right)} < 0 \quad (14)$$

Obviously, $\frac{d(x_1 - q_1)}{d\lambda} < 0$, which indicates the negative correlation between the overcapacity of SOE and the financing cost of SOE. That is to say, with other conditions held constant, the greater investment and financing cost coefficient λ is for SOE, the smaller overcapacity of SOE would be and vice versa. Hence, increasing the financing cost for SOE is favorable to alleviating the excess capacity of Chinese large and medium-sized SOE.

Effects of investment and financing costs on the overcapacity of Chinese SOE can also be illustrated graphically. Taking fixed values for other parameters to the right side of Equation (14), we make $a = 10, \theta = 0.5, \lambda = 0.5$ and get **Figure 2**.

At the least, the following two conclusions can be drawn in **Figure 2**. First, under the assumptions of this paper, the value of $x_1 - q_1$ is positive, i.e. $x_1 - q_1 > 0$, which indicates that SOE have the problem of overcapacity; second, with other conditions held constant, the financing cost of SOE varies in a reverse direction with excess capacity. In other words, the higher financing cost, the smaller overcapacity would be for SOE and vice versa.

4.2.2. Impacts of Management Incentives on the Overcapacity of SOE

According to the model's assumptions, parameter β denotes the factor of commission from profits in the remuneration of senior SOE management and $1 - \beta$ denotes the factor of commission from output in the remuneration of senior SOE manager. In order to investigate the effects of SOE manager incentives on the overcapacity of SOE, we may arrive at the following equation by taking a partial differential of $x_1 - q_1$ with respect to β :

$$\frac{d(x_1 - q_1)}{d\beta} = \frac{4\theta^2(4(1+\lambda) - \theta^2)}{\beta^2(\theta^6 - 24\theta^4(1+\lambda) - 256(1+\lambda)^2 + 32\theta^2(5 + 8\lambda + 3\lambda^2))} < 0 \quad (15)$$

Obviously, $\frac{d(x_1 - q_1)}{d\beta} < 0$, which indicates that the overcapacity of SOE changes in an opposite direction with the factor of commission from profits in the remuneration of senior SOE manager. By increasing the factor of commission from profits in the remuneration of SOE manager, the overcapacity of SOE will be reduced. Impacts of management incentives on the overcapacity of SOE are shown in **Figure 3**.

Proposition 2. *With other conditions held constant, the financing cost of SOE and the factor of commission from profits in the remuneration of SOE manager both have a negative correlation with the overcapacity of SOE.*

In other words, increasing the financing cost of SOE or the factor of commission from profits in the remuneration of SOE manager can both reduce the overcapacity of SOE.

4.2.3. Impacts of Financing Cost for SOE on the Overcapacity of Private Enterprises

As indicated by the above analysis, when SOE have soft budget constraint and strategic delegation, SOE will have overcapacity while private enterprises will

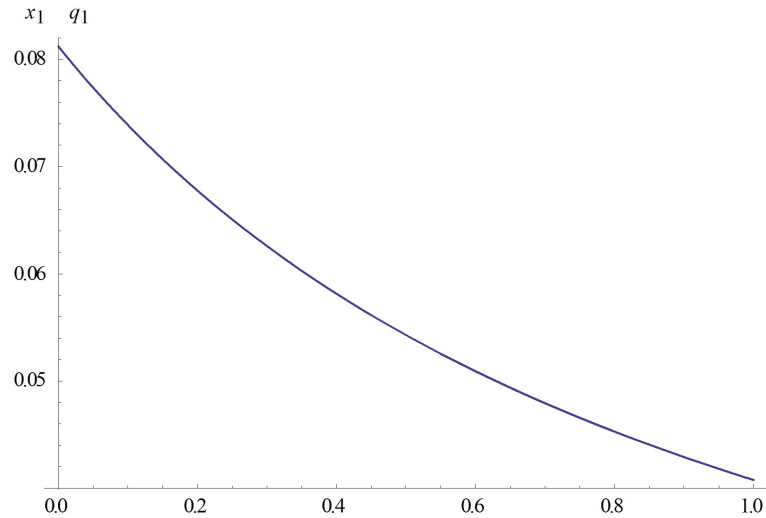


Figure 2. Impacts of financing cost on the overcapacity of SOE.

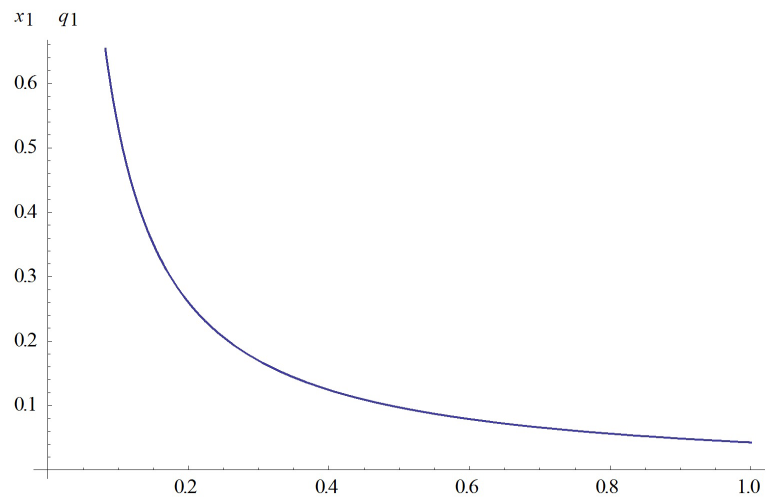


Figure 3. Impacts of management incentives on the overcapacity of SOE.

have undercapacity. Below, we will further analyze how the financing cost for SOE will affect the undercapacity of private enterprises. By taking partial derivative of $x_2 - q_2$ with respect to SOE financing cost coefficient λ , we get:

$$\frac{d(x_2 - q_2)}{d\lambda} = \frac{8\theta^2(8 - 3\theta^2)(8(1 + \lambda) - \theta^2)((8\theta(1 - \beta)(1 - \lambda)) - \beta(a - c)(16 - 8\theta - 2\theta^2)(1 + \lambda))}{\beta(\theta^6 - 24\theta^4(1 + \lambda) - 256(1 + \lambda)^2 + 32\theta^2(5 + 8\lambda + 3\lambda^2))^2} > 0 \quad (16)$$

It is not difficult to prove that, $\frac{d(x_2 - q_2)}{d\lambda} > 0$ which indicates a positive

correlation between the overcapacity of private enterprises and SOE financing cost. In other words, the lower financing cost is for SOEs, the less overcapacity will be for private enterprises and vice versa. This may also be graphically illustrated. By the same token, we make $a = 10, \theta = 0.5, \lambda = 0.5$ and get **Figure 4**. At least, the following two conclusions can be drawn in **Figure 4**: First, with given parameter values, $x_2 - q_2 < 0$, which indicates undercapacity of private

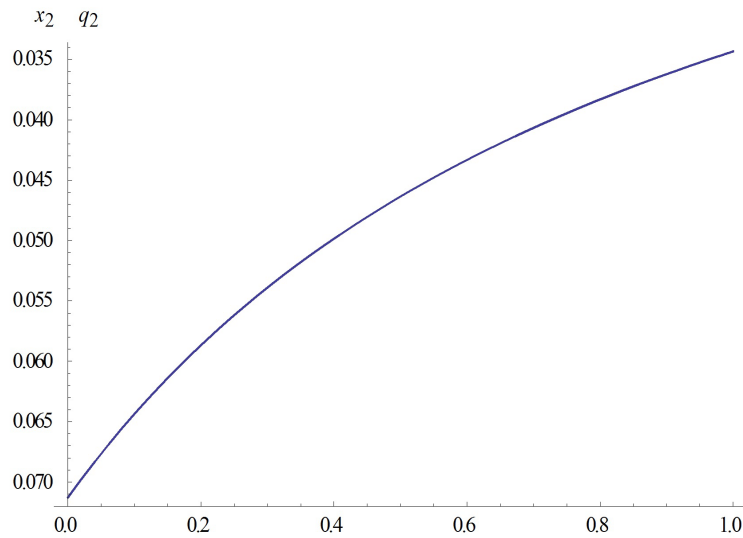


Figure 4. Impacts of SOE financing cost on the overcapacity of private enterprises.

enterprises; second, with the increase of λ , the level of undercapacity of private enterprises will reduce, i.e. with other coefficients held constant, undercapacity of private enterprises will reduce with the increase of financing cost for SOE. A possible economics explanation is that the soft budget constraint of SOE has reduced the efficiency of resource allocation, which not only led to the overcapacity of SOE, but also made financing difficult for private enterprises that urgently need capacity expansion.

4.2.4. Impacts of SOE Strategic Delegation on the Overcapacity of Private Enterprise

Lastly, let us examine the effects of SOE strategic delegation on the overcapacity of private enterprises. By taking partial derivative of $x_2 - q_2$ with respect to the factor of commission from profits for SOE manager β , we arrive at:

$$\frac{d(x_2 - q_2)}{d\beta} = \frac{\theta^3 (\theta^2 - 8(1 + \lambda))}{\beta^2 (\theta^6 - 24\theta^4 (1 + \lambda) - 256(1 + \lambda)^2 + 32\theta^2 (5 + 8\lambda + 3\lambda^2))} > 0 \quad (17)$$

Obviously, $\frac{d(x_2 - q_2)}{d\lambda} > 0$, which indicates a positive correlation between

$x_2 - q_2$ and SOE strategic delegation index β . According to Equation (13), we know that $x_2 - q_2 < 0$, i.e. undercapacity of private enterprises. Based on the assumptions, β denotes the factor of commission from profits for SOE manager. Hence, Equation (17) indicates that when the government puts greater premium on the performance of SOE manager (when β increases), the level of undercapacity will be less significant for private enterprises ($x_2 - q_2$ becomes greater). A possible economics explanation is that when the government increases the factor of commission from profits for SOE manager β , SOE manager will attach great importance to the profitability of SOE and thus reduce output and increase price. Private enterprises that seek profit maximization will also take similar actions (reducing output while increasing price), thus mitigating undercapaci-

ty of private enterprise.

This may also be demonstrated graphically. By making $a = 10, \theta = 0.5, \lambda = 0.5$, we have arrived at $a = 10, \theta = 0.5, \lambda = 0.5$. It can be seen from $a = 10, \theta = 0.5, \lambda = 0.5$ that: first, with given parameter values, $x_2 - q_2 < 0$, which indicates that the capacity of private enterprises is insufficient; second, with the increase of β , $x_2 - q_2$ also increases and the undercapacity of private enterprises will be abated (Figure 5).

Proposition 3. *With other conditions held constant, both the financing cost of SOE and the factor of commission from profits in the remuneration of SOE manager are in positive correlation with the undercapacity of private enterprise.*

In other words, the undercapacity of private enterprises can be abated either by increasing the financing cost for SOE or increasing the factor of commission from profits in the remuneration of SOE managers.

5. Conclusion

Overcapacity is the main cause for the plunging profitability and operational difficulties of enterprises in such sectors as iron and steel, electrolytic aluminum, shipbuilding and photovoltaic. If overcapacity continues unabated, it will inevitably intensify vicious market competition, loss-making, unemployment, non-performing assets of banks, bottlenecks of energy and natural resources and environmental degradation, compromising not only China's industrial development, but people's welfare and social stability as well. By creating a mixed oligopoly competition model, this paper reveals the strategic delegation of China's SOE and the impact of soft budget constraint on capacity choices and private enterprises. Theoretical deduction indicates that the soft budget constraint of SOE and the single-minded pursuit of production quantity by SOE may lead to the overcapacity of SOE on the one hand and the undercapacity of private enterprises on the other. Theoretical research also shows that the overcapacity of SOE can be effectively mitigated while

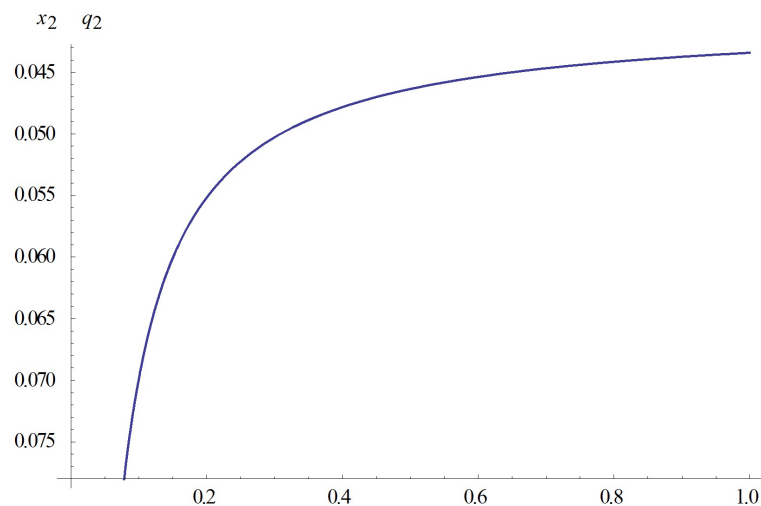


Figure 5. Impacts of incentives for senior SOE management on the overcapacity of private enterprises.

the undercapacity of private enterprises can be addressed either by increasing the investment and financing costs for SOE or improving the business performance of SOE.

This study demonstrates that the flaws of soft budget constraint for SOE and the performance evaluation and remuneration systems for senior SOE managers are the fundamental cause of overcapacity in some industries in China. Thus, efforts must be made in the following aspects in order to fundamentally resolve the problem of overcapacity in China:

First, properly define the role of the government and market in resolving the issue of overcapacity. The market should play a decisive role in resource allocation. Excessive government intervention in resolving overcapacity will not only cause wild swings in the market, but leads to wasteful use of resources as well.

Second, push forward the institutional reform of SOE. In order to address the root cause of overcapacity, the operational pattern of medium and large-sized SOE must be transformed from a crude pattern to an intensive pattern of development. By establishing modern corporate systems, SOE should become market entities that take sole responsibility for their own profits and losses in the real sense. In addition, the remuneration and performance evaluation systems of SOE managers should be reformed to make corporate profitability and business performance as the main determinants for the remuneration of SOE managers.

Third, proactively reform China's fiscal and financial systems. Various fiscal and tax policy preferences for SOE and particularly for-profit SOE should be abolished and other policy preferences of investment and financing for SOE should be revoked as well, with a view to creating a level playing field for SOE and private enterprises.

Acknowledgments

This paper is supported by Science Foundations of Ministry of Education of China (Grant No. 22YJA790066 and 20YJCGJW005) and Jiangsu Humanities and Social Sciences Foundation (Grant No. 22EYB005).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Highlight

- We study how the government soft budget and strategic delegation affect the capacity choice of Chinese SOE and private enterprise.
- A mixed oligopoly competition model with soft budget constraint and strategic delegation for SOE is constructed.
- Soft budget and strategic delegation will aggravate overcapacity of SOE.
- Soft budget and strategic delegation will aggravate undercapacity of private enterprise.