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THE DEVELOPMENT OF PRIVATE ENTERPRISES AND THE STRUGGLE FOR EXISTENCE OF STATE-OWNED ENTERPRISES IN A TRANSITION ECONOMY

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Abstract: This paper uses a theoretical model to analyze the struggle for existence of state-owned enterprises in a transition economy in the short-run and in the long-run. This paper found that:

(1) in the short-run, the optimal quantity of state-owned enterprises depends positively on their production technology, and negatively on their fixed cost and the production technology and the initial quantity of private enterprises;

(2) in the long-run, the development of private enterprises and the struggle for existence of state-owned enterprises depend on the superiorities of production technology and production costs between state-owned and private enterprises.

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1. Introduction

In planning economic countries, state-owned enterprises are controlled by their central or local governments rigidly. State-owned enterprises must try to achieve

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output object and other objects ordered by their country governments. The rigid controls brought the stagnation and inefficiency of production, the absolute shortage of supply, the overrun of black economy and the decline in the standard of living. The Soviet Russia and East European countries could not finally help abandoning planning economic system and chose a shock therapy to adopt market economic system in the beginning of the 1990's. On the other hand, China chose a slowly way to conduct an economic reform and opening policy since 1978. In these transition economies, the co-existence of state-owned and private enterprises is one of special features.

The co-existence of state-owned and private enterprises is studied by economists from different points of view. Gibson and Dutt (1993) provided a theoretical model to indicate that the privatization of sate-owned enterprises is necessary for the promotion of personal capitalization in a transition. Husain (1994) showed that the privatization of state-owned enterprises is desirable for the growth of gross national product. Bai, Li, and Wang (2000), however, showed that the existence of state-owned enterprises is necessary for the supply of public goods in the transition economy. On the other hand, Brandt and Zhu (2000) analyzed the role of state-owned banks in financing sate-owned and private enterprises for maintaining economic growth in transition economy. Cull and Xu (2000) analyzed the relationship between the productivity of state-owned enterprises and finance in China.

This paper uses a theoretical model to provide static analyse on whether state-owned and private enterprises can co-exist in a transition economy in the short-run and in the long-run. This paper assumes that state-owned and private enterprises use a same input factor to produce an identical finanial goods. Forthermore, this paper also assumes that private enterprises cannot freely enter into and leave from the production of the final goods due to the existence of fixed cost in the short-run, but they can freely enter into and leave from it in the long-run. In the short-run, we found that the optimal quantity of state-owned enterprises depends positively on their production technology, and negatively on their fixed cost and the production technology and the initial quantity of private enterprises. In the long-run, we found that the development of private enterprises and the struggle for existence of state-owned enterprises depend on the superiorities of production technology and production costs between state-owned and private enterprises. On the other hand, this paper also found that the degrease of state-owned enterprise brings a fall in the social total output in the transition economy in the short-run, but it have no effect on the social total output in the long-run.

This paper is organized as follows. Section 2 provides a basic theoritical

model with the co-existence of state-owned and private enterprises in a small transition economy. Section 3 provides short-run static studies of effects of the change in the quantity of state-owned enterprises on the social total output in the transition economy and of the relationship between state-owned and private enterprises. Section 4 provides long-run studies of effects of the change in the quantity of state-owned enterprises on the social total output in the transition economy and of the condition of the existence of state-owned enterprises. Finally, Section 5 provides some conclusions.

2. The Model

We assume that m identical state-owned enterprises and n identical private enterprises exist in a small transition economy, and all enterprises use identical input factor to produce a same goods that is traded in world consumption market. The price of the goods can be thought of as being exogenous and so it is assumed to be unit.

We assume that the all enterprises have an identical elasticity of input factor, $\alpha\,(0 < \alpha < 1)$. The production function and the profits of a represented state-owned enterprise and a represented private enterprise are given by

$$y_i = A_i x_i^{\alpha}, \quad i = s,\, p\,, \tag{1}$$

$$\pi_i = y_i - w x_i - k_i, \quad i = s,\, p\,, \tag{2}$$

where s represents the state-owned enterprises and p – the private enterprises, y – the output, x – the input factor, w – the price of the input factor, A – the production technology, π – the profit, and k – the fixed production cost for producing the final goods except the input factor.

Maximizing the equation (2), the optimal demand for the input factor is given by

$$x_i^* = \left(\frac{A_i \alpha}{w}\right)^{\frac{1}{1-\alpha}}, \quad i = s, p. \tag{3}$$

Assuming the input factor is inelastically supplied with constant $\bar{x}$ in the input factor market. At the equilibrium in the input factor market, the following equation should be satisfied:

$$m x_s + n x_p = \bar{x}. \tag{4}$$

Substituting equation (3) into equation (4), the equilibrium price of the

input factor is given by

$$w^* = \alpha \left(m A_s^{\frac{1}{1-\alpha}} + n A_p^{\frac{1}{1-\alpha}} \right)^{1-\alpha} \bar{x}^{\alpha-1}. \tag{5}$$

Substituting equation (3) and equation (5) into equation (1), the total output of all the state-owned enterprises and the total output of all the private enterprises are given by

$$Y_s^* = m y_s^* = m A_s \left(\frac{A_s \alpha}{w^*} \right)^{\frac{\alpha}{1-\alpha}}, \tag{6}$$

$$Y_p^* = n y_p^* = n A_p \left(\frac{A_p \alpha}{w^*} \right)^{\frac{\alpha}{1-\alpha}}. \tag{7}$$

So the social total output in the transition economy is given by

$$Y^* = Y_s^* + Y_p^* = \left(m A_s^{\frac{1}{1-\alpha}} + n A_p^{\frac{1}{1-\alpha}} \right) \left(\frac{\alpha}{w^*} \right)^{\frac{\alpha}{1-\alpha}}. \tag{8}$$

Substituting equation (3) and (5) into equation (2), the profit of the represented state-owned enterprise and the profit of the represented private enterprise are given by

$$\pi_s^* = \frac{1-\alpha}{\alpha} (A_s \alpha)^{\frac{1}{1-\alpha}} w^{*-\frac{\alpha}{1-\alpha}} - k_s, \tag{9}$$

$$\pi_p^* = \frac{1-\alpha}{\alpha} (A_p \alpha)^{\frac{1}{1-\alpha}} w^{*-\frac{\alpha}{1-\alpha}} - k_p. \tag{10}$$

So the social total profit in the transition economy is given by

$$\pi^* = m\pi_s^* + n\pi_p^* = \frac{1-\alpha}{\alpha} \alpha^{\frac{\alpha}{1-\alpha}} w^{*-\frac{\alpha}{1-\alpha}} \times \left(m A_s^{\frac{1}{1-\alpha}} + n A_p^{\frac{1}{1-\alpha}} \right) - m k_s - n k_p. \tag{11}$$

3. The Short-Run Static Study

In the short-run, we assume that private enterprises cannot freely enter into and leave from the production of the final goods due to the existence of fixed cost. Under this conditon, we first analyze the effects of the change in the quantity of state-owned enterprises on output. And then we calculate the optimal quantity of state-owned enterprises by maximizing the total profits of the transition economy. Finally, we provide a static analysis on the optimal quantity of state-owned enterprises.

3.1. The Effects of the Change in Quantity of State-Owned Enterprises and its Optimal Quantity

Differentiating equations (6), (7) and (8) with respect to m, we can obtain

$$\frac{\partial Y_s^*}{\partial m} = A_s \left(\frac{A_s\alpha}{w^*}\right)^{\frac{\alpha}{1-\alpha}} \left(mA_s^{\frac{1}{1-\alpha}} + nA_p^{\frac{1}{1-\alpha}}\right)^{-1} \times \left((1-\alpha)mA_s^{\frac{1}{1-\alpha}} + nA_p^{\frac{1}{1-\alpha}}\right) > 0, \quad (12)$$

$$\frac{\partial Y_p^*}{\partial m} = -\frac{\alpha}{1-\alpha} nA_p \left(A_p\alpha\right)^{\frac{\alpha}{1-\alpha}} w^{-\frac{1}{1-\alpha}} w_m < 0, \quad (13)$$

$$\frac{\partial Y^*}{\partial m} = w^{*-\frac{\alpha}{1-\alpha}} A_s^{\frac{1}{1-\alpha}} \alpha^{\frac{\alpha}{\alpha-1}} (1-\alpha) > 0, \quad (14)$$

where

$$w_m = \frac{\partial w^*}{\partial m} = \alpha(1-\alpha)\left(mA_s^{\frac{1}{1-\alpha}} + nA_p^{\frac{1}{1-\alpha}}\right)^{-\alpha} \bar{x}^{\alpha-1} A_s^{\frac{1}{1-\alpha}} > 0.$$

Equations (12) means that the total output of all the state-owned enterprises is an increasing function of the quantity of sated enterprises. Equation (13) means that the total output of all the private enterprises is a decreasing function of the quantity of state-owned enterprises. Equation (14) means that the social total output in the transition economy is an increasing function of the quantity of state-owned enterprises. Therefore, the decrease in the quantity of state-owned enterprises will bring the fall in the social total output in the transition economy in the short-run, because the decrease in the quantity of state-owned enterprises will brings a higher shock to the total output of all the state-owned enterprises though the total output of all the private enterprises is relatively increased.

Differentiating equation (9) and (10) with respect to m, we can obtain

$$\frac{\partial \pi_s^*}{\partial m} = -(A_s\alpha)^{\frac{1}{1-\alpha}} w^{*-\frac{1}{1-\alpha}} w_m < 0, \quad (15)$$

$$\frac{\partial \pi_p^*}{\partial m} = -(A_p\alpha)^{-\frac{1}{1-\alpha}} w^{*-\frac{1}{1-\alpha}} w_m < 0. \quad (16)$$

Equations (15) and (16) mean that, the profit of a represented state-owned enterprise and the profit of a represented private enterprise are decreasing function of the quantity of state-owned enterprises, respectively. Therefore, the decrease in the quantity of state-owned enterprises will simultaneously bring the

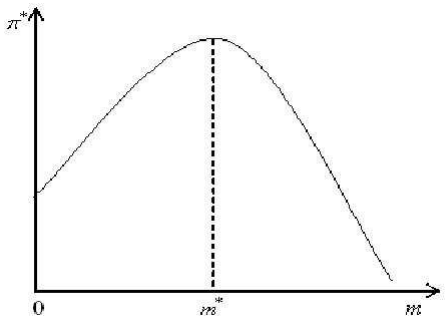

Figure 1: The curve of the social total profit in the transition economy

raise in the total profits of all the state-owned enterprises and all the private enterprises.

In turn, we try to calculate the optimal quantity of sate-owned enterprises in the transition economy. Differentiating equation (11) with respect to m, we can obtain the optimal quantity of state-owned enterprises as follows:

$$m^* = A_s^{-\frac{1}{1-\alpha}} \left(\frac{(1-\alpha)^2}{k_s} \bar{x}^{\alpha} A_s^{\frac{1}{1-\alpha}} \right)^{\frac{1}{\alpha}} - n \left(\frac{A_p}{A_s} \right)^{\frac{1}{1-\alpha}}. \tag{17}$$

Equation (17) means that the optimal quantity of state-owned enterprises is determined by the production technology of state-owned and private enterprises, the endowment of input factor, the elasticity of input factor, the quantity of private enterprises and the fixed cost of state-owned enterprises. From equation (17), we can see that private enterprises give negative effect on the optimal quantity of state-owned enterprises through their production technology and quantity.

The second order derivatives of equation (11) with respect to m, we can obtain

$$\frac{\partial^2 \pi^*}{\partial m^2} = -(1-\alpha)\alpha^{\frac{1}{1-\alpha}} w^{*-\frac{1}{1-\alpha}} A_s^{\frac{1}{1-\alpha}} w_m < 0. \tag{18}$$

Equation (18) means that the social total profit in the transition economy is an increasing function of m when $m < m^*$ and is a decreasing function of m when $m > m^*$. The relationship between the social total profit in the transition economy and the quantity of state-owned enterprises can be showed as Figure 1.

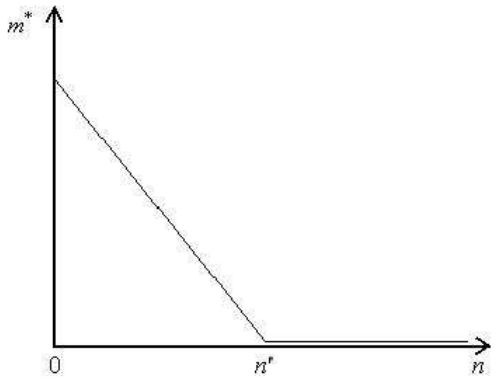

Figure 2: The relationship between the optimal quantity of state-owned enterprises and the quantity of private enterprises

3.2. The Short-Run Static Study of the Optimal Quantity of State-Owned Enterprises

3.2.1. The Effect of the Change in Quantity of Private Enterprises

Differentiating equation (17) with respect to n, we can obtain

$$\frac{\partial m^*}{\partial n} = -\left(\frac{A_p}{A_s}\right)^{\frac{1}{1-\alpha}} < 0. \tag{19}$$

Equation (19) means that the quantity of state-owned enterprises inversely depends on the initial quantity of private enterprises as showed in Figure 2.

Figure 2 shows that the optimal quantity of sated enterprise will decrease to zero when the quantity of private enterprise increases to $n \geq n'$, where n' satisfies the following condition:

$$n' = A_p^{-\frac{1}{1-\alpha}} \left(\frac{(1-\alpha)^2}{k_s} A_s^{\frac{1}{1-\alpha}}\right)^{\frac{1}{\alpha}} \bar{x}.$$

3.2.2. The Effect of the Change in Production Technology

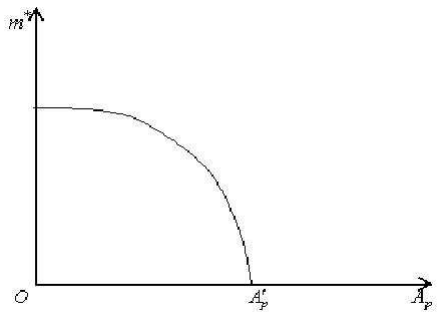

Figure 3: The relationship between the optimal quantity of state-owned enterprises and the production technology of private enterprises

of Private Enterprises

The first and the second order derivatives of equation (17) with respect to A_p are given by

$$\frac{\partial m^*}{\partial A_p} = -\frac{n}{1-\alpha}\left(\frac{A_p}{A_s}\right)^{\frac{\alpha}{1-\alpha}}\frac{1}{A_s} < 0, \tag{20}$$

$$\frac{\partial^2 m^*}{\partial A_p^2} = -\frac{n\alpha}{(1-\alpha)^2}\left(\frac{A_p}{A_s}\right)^{\frac{2\alpha-1}{1-\alpha}}\left(\frac{1}{A_s}\right)^2 < 0. \tag{21}$$

Equations (20) and (21) mean that the quantity of state-owned enterprises is a concave function of the production technology of private enterprises as showed in Figure 3.

Figure 3 shows that the quantity of state-owned enterprises will decrease when the production technology of private enterprises rise and state-owned enterprises do not exist when the production technology of private rises up to $A_p \geq A_p'$, where

$$A_p^{'} = n^{\alpha-1}\left(\frac{(1-\alpha)^2}{k_s}\bar{x}^{\alpha}A_s^{\frac{1}{1-\alpha}}\right)^{\frac{1-\alpha}{\alpha}}.$$

3.2.3. The Effect of the Change in Production Technology

of State-Owned Enterprises

The first and the second order derivatives of equation (17) with respect to A_s are given by

$$\frac{\partial m^*}{\partial A_s} = \left(\frac{(1-\alpha)^2}{k_s}\right)^{\frac{1}{\alpha}} \bar{x}\frac{1}{\alpha}A_s^{\frac{1-\alpha}{\alpha}} + \frac{n}{1-\alpha}\left(\frac{A_p}{A_s}\right)^{\frac{\alpha}{1-\alpha}}\left(\frac{A_p}{A_s^2}\right) > 0, \quad (22)$$

$$\frac{\partial^2 m^*}{\partial A_s^2} = \left(\frac{(1-\alpha)^2}{k_s}\right)^{\frac{1}{\alpha}} \bar{x}^{\frac{1-\alpha}{\alpha^2}} A_s^{\frac{1-2\alpha}{\alpha}} + \frac{n}{1-\alpha}A_p^{\frac{1}{1-\alpha}}\left(\frac{-2+\alpha}{1-\alpha}\right)A_s^{\frac{-3+2\alpha}{1-\alpha}}. \quad (23)$$

The first order derivatives of equation (17) with respect to A_s is positive, but the second order derivative is ambiguous. Equation (22) means that the quantity of state-owned enterprises is an increasing function of the production technology of state-owned enterprise.

3.2.4. The Effect of the Change in the Endowment of Input Factor

The first and the second order derivative of equation (17) with respect to $\bar{x}$ are given by

$$\frac{\partial m^*}{\partial \bar{x}} = \left(\frac{(1-\alpha)^2}{k_s}\right)^{\frac{1}{\alpha}} A_s^{\frac{1}{\alpha}} > 0, \quad (24)$$

$$\frac{\partial^2 m^*}{\partial \bar{x}^2} = 0. \quad (25)$$

Equations (24) and (25) mean that the quantity of state-owned enterprises is an increasing function of the endowment of input factor as showed in Figure 4.

Figure 4 shows that the quantity of state-owned enterprises will increase when the endowment of input factor rise, in which

$$\bar{x}' = n\left(\frac{A_p}{A_s}\right)^{\frac{1}{1-\alpha}}\left(\frac{(1-\alpha)^2 A_s}{k_s}\right)^{-\frac{1}{\alpha}}.$$

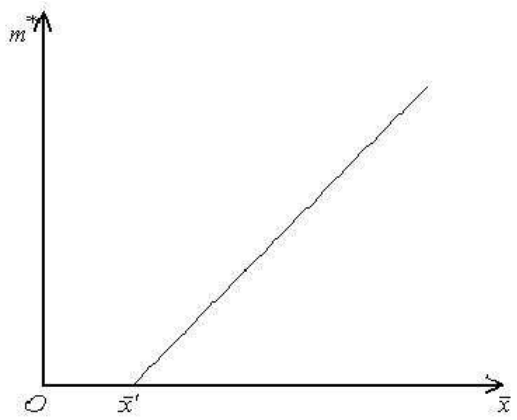

Figure 4: The relationship between the optimal quantity of state-owned enterprises and the endowment of input factor

3.2.5. The Effect of the Change in the Fixed Cost of State-Owned Enterprises

The first and the second order derivatives of equation (17) with respect to k_s are given by

$$\frac{\partial m^*}{\partial k_s} = A_s^{-\frac{1}{1-\alpha}} \left(\frac{(1-\alpha)^2}{k_s} \bar{x}^{\alpha} A_s^{\frac{1}{1-\alpha}} \right)^{\frac{1-\alpha}{\alpha}} \left(-\frac{(1-\alpha)^2}{k_s^2} \right) \frac{1}{\alpha} < 0, \tag{26}$$

$$\begin{aligned} \frac{\partial^2 m^*}{\partial k_s^2} = -\frac{1-\alpha}{\alpha^2} A_s^{\frac{1}{1-\alpha}} & \left(\frac{(1-\alpha)^2}{k_s} \bar{x}^{\alpha} A_s^{\frac{1}{1-\alpha}} \right)^{\frac{1-2\alpha}{\alpha}} \frac{(1-\alpha)^2}{k_s^2} \\ & - A_s^{-\frac{1}{1-\alpha}} \left(\frac{(1-\alpha)^2}{k_s} \bar{x}^{\alpha} A_s^{\frac{1}{1-\alpha}} \right)^{\frac{1-\alpha}{\alpha}} \frac{2(1-\alpha)^2}{\alpha k_s^3} < 0. \end{aligned} \tag{27}$$

Equations (26) and (27) mean that the quantity of state-owned enterprises is a concave function of the production technology of private enterprises as it is showed in Figure 5.

Figure 5 shows that the quantity of state-owned enterprises will decrease when the fixed cost of state-owned enterprises rise and state-owned enterprises

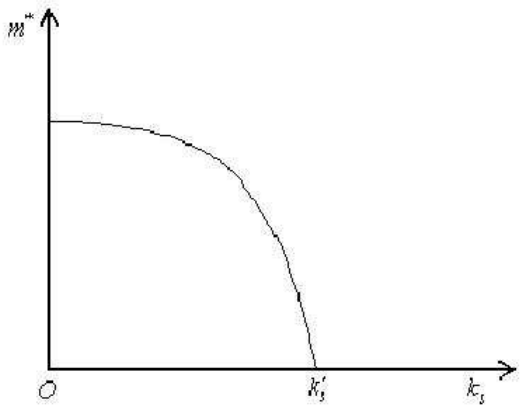

Figure 5: The relationship between the optimal quantity of state-owned enterprises and the fixed cost of state-owned enterprises

do not exist when the fixed cost of state-owned enterprises rises up to $k_s \geq k_s'$, where

$$k_s' = (1-\alpha)^2 \bar{x}^{\alpha} A_s^{\frac{1}{1-\alpha}} n^{-\alpha} A_p^{-\frac{\alpha}{1-\alpha}}.$$

4. The Long-Run Static Study

In the previous section, we assume that private enterprise can not freely entire into and leave from the production of the final goods due to the existence of the fixed cost in the short-run. In the long-run, however, private enterprise freely entire into and leave from the production of the final goods because the fixed cost can also be adjusted. In the long-run, if private enterprises have an excess of profit in the production of the final goods, new private enterprises will entire into the production of the final goods. On the other hand, if private enterprises have a deficit in the production of the final goods, some present private enterprises will leave from the production of the final goods. Therefore, the profit of a represented private enterprise will become zero in the long-run, that is

$$\pi_p = y_p - w x_p - k_p = 0. \tag{28}$$

where k_p does not mean the fixed cost of the represented enterprise but means a part of the total cost for producing the final goods except the cost of the input factor.

From equation (28), we can obtain

$$\left[\alpha\left(mA_s^{\frac{1}{1-\alpha}}+nA_p^{\frac{1}{1-\alpha}}\right)^{1-\alpha}\bar{x}^{\alpha-1}\right]^{-\frac{\alpha}{1-\alpha}} \times\frac{1-\alpha}{\alpha}(A_p\alpha)^{-\frac{\alpha}{1-\alpha}}-k_p=0. \quad (29)$$

The equilibrium price of the input factor in the long-run is given by

$$w^{**}=\alpha\left(mA_s^{\frac{1}{1-\alpha}}+nA_p^{\frac{1}{1-\alpha}}\right)^{1-\alpha}\bar{x}^{\alpha-1}. \quad (30)$$

Differentiating equation (29) with respect to m, we can obtain

$$\frac{\partial n}{\partial m}=-\left(\frac{A_s}{A_p}\right)^{\frac{1}{1-\alpha}}<0. \quad (31)$$

Equation (31) means that the quantity of private enterprises will increase when the quantity of state-owned enterprises decreases.

Differentiating equation (30) with respect to m, we can obtain

$$\frac{\partial w^{**}}{\partial m}=\alpha(\alpha-1)\bar{x}^{\alpha-1}\left(mA_s^{\frac{1}{1-\alpha}}+nA_p^{\frac{1}{1-\alpha}}\right)^{-\alpha} \times\left(A_s^{\frac{1}{1-\alpha}}+A_p^{\frac{1}{1-\alpha}}\frac{\partial n}{\partial m}\right)=0. \quad (32)$$

Equation (32) means that the change in the quantity of state-owned enterprises has no effect on the price of input factor in the long-run.

The total output produced by all the state-owned enterprises and the total output produced by all the private enterprises in the long-run are respectively given by

$$Y_s^{**}=mA_s\left(\frac{A_s\alpha}{w^{**}}\right)^{\frac{\alpha}{1-\alpha}}, \quad (33)$$

$$Y_p^{**}=nA_p\left(\frac{A_p\alpha}{w^{**}}\right)^{\frac{\alpha}{1-\alpha}}. \quad (34)$$

So, the social total output in the transition economy is given by

$$Y^{**} = Y_s^{**} + Y_p^{**} = \left(mA_s^{\frac{1}{1-\alpha}} + nA_p^{\frac{1}{1-\alpha}} \right) \left(\frac{\alpha}{w^{**}} \right)^{\frac{\alpha}{1-\alpha}}. \tag{35}$$

Differentiating equations (33), (34) and (35) with respect to m, we can obtain

$$\frac{\partial Y_s^{**}}{\partial m} = A_s \left(\frac{A_s \alpha}{w^{**}} \right)^{\frac{\alpha}{1-\alpha}} > 0, \tag{36}$$

$$\frac{\partial Y_p^{**}}{\partial m} = \frac{\partial n}{\partial m} A_p \left(\frac{A_p \alpha}{w^{**}} \right)^{\frac{\alpha}{1-\alpha}} < 0, \tag{37}$$

$$\frac{\partial Y^{**}}{\partial m} = A_s \left(\frac{A_s \alpha}{w^{**}} \right)^{\frac{\alpha}{1-\alpha}} + \frac{\partial n}{\partial m} A_p \left(\frac{A_p \alpha}{w^{**}} \right)^{\frac{\alpha}{1-\alpha}} = 0. \tag{38}$$

Equations (36) and (37) mean that the decrease in state-owned enterprises will bring a fall in the total output produced by all the state-owned enterprises, but bring a raise in the total output produced by all the private enterprises in the long-run. On the other hand, equation (38) means that the fall in total output produced by all the state-owned enterprises will be wiped out by the raise in total output produced by private enterprises in the long-run. That is to say, the change in the quantity of state-owned enterprises will have no any effect on the total output in the transition economy in the long-run.

The difference in the profit between a represented state-owned enterprise and a represented private enterprise in the long-run is given by

$$\pi_s^{**} - \pi_p^{**} = \alpha^{\frac{1}{1-\alpha}} \left(\frac{1}{\alpha} - 1 \right) \left(\frac{1}{w} \right)^{\frac{1}{1-\alpha}} \times \left(A_s^{\frac{1}{1-\alpha}} - A_p^{\frac{1}{1-\alpha}} \right) + (k_p - k_s). \tag{39}$$

If the profit of the represented state-owned enterprise is less than that of the represented private enterprise, the following condition must be satisfied:

$$A_s < A_p, \quad k_s > k_p. \tag{40}$$

Since the profit of the represented private enterprise in the long-run is zero, that is $\pi_p^{**} = 0$, so we can obtain

$$\pi_s^{**} < 0. \tag{41}$$

Equation (41) means that the represented state-owned enterprises have negative profit in the long-run. That is to say, all the state-owned enterprises operate at a loss in the long-run in the small transition economy. Therefore, state-owned enterprises have to leave from the production of the final goods in the long-run.

On the other hand, if the profit of the represented state-owned enterprise is not less than that of the represented private enterprise, the following condition must be satisfied:

$$A_s \geq A_p, \quad k_s \leq k_p, \tag{42}$$

Since the profit of the represented private enterprise in the long-run is zero, that is $\pi_p^{**} = 0$, so we can obtain

$$\pi_s^{**} \geq 0. \tag{43}$$

Equation (43) means state-owned enterprises and private enterprises can co-exist in the long-run.

5. Conclusions

This paper analyzed the development of private enterprises and the struggle for existence of state-owned enterprises in a transition economy in the short-run and in the long-run. In the short-run, we assume that private enterprises cannot freely enter into and leave from the production of the final goods because of the existence of fixed cost. This consumption means that the quantity of private enterprises keeps constant. We therefore found that the optimal quantity of state-owned enterprises not only depends on the production technology of state-owned and private enterprises and the fixed cost of state-owned enterprises but also on the initial quantity of private enterprises. We found that (1) the improvement of production technology in private enterprises will make the optimal quantity of state-owned enterprises decrease but the improvement of production technology and the cutback in the fixed cost of sate-owned enterprises will make itself increase; (2) the initial quantity of private enterprises will put pressure on the existence of state-owned enterprises. We also found that the fall in the quantity of state-owned enterprises will decrease the total output of all the state-owned enterprises and raise the total output of all the private enterprises. However, the fall in the quantity of state-owned enterprises will bring the fall in the social total output in the transition economy in the short-run.

In the long-run, we assume that private enterprises cannot freely enter into and leave from the production of the final goods. We therefore found that the struggle for existence of state-owned enterprises depends on the superiorities of their production technology and production cost: if the production technology of state-owned enterprises is less than that of private enterprises and the cost of state-owned enterprises is higher than that of private enterprises, state-owned enterprises will vanish completely because they sustain their deficits; if the production technology of state-owned enterprises is not less than that of private enterprises and the cost of state-owned enterprises is not higher than that of private enterprises, state-owned enterprises and private enterprises will co-exist. Furthermore, we found that the fall in the quantity of state-owned enterprises will bring the decrease in the total output of all the state-owned enterprises and the raise in the output of private enterprises, but it have no effect on the social total output of the final goods in the transition economy in the long-run.

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