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1 Introduction

On the 19th of October 1990, the Soviet Union decided to adopt the new economic plan. This new economic plan had many kinds of economic reform policies, introducing the market mechanism, non-nationalization, decreasing of the government deficit, pursuing of economic efficiency, financial reforms, and so on.

In spite of "Perestroyka" since 1985, the Soviet economy has not improved. The Soviet economy is bothered with the shortage of food and consumption goods, high inflation, unemployment, government deficit, high defense cost, income differentials and so on. Then it seems that the adoption of the new economic plan in 1990 is the last economic policy to improve the Soviet economy for President Gorbachev. The main purpose of this new economic plan is the introduction of the market mechanism. But it seems that the Soviet government is thinking that the market mechanism which it is planning to introduce is not a perfect market mechanism system, but a partial one. That is, the Soviet government wants to control the industries of energy, information, defense, cosmos, transportation and so on.

On the 4th June of 1990, the Soviet government enacted "The New Enterprise Law". It said that many kinds of enterprises, that is, state enterprise, republic enterprise, self-government enterprise, cooperative enterprise, family enterprise, private enterprise and so on were recognized in the Soviet Union. These enterprises will have to function in economic activities under the system of partial market mechanism which will stand side by side with the command economy.

In this paper, first, we will prove that the partial market mechanism system does not always guarantee the Pareto Optimum. Secondly, we will analyze how the Soviet enterprise will function under the partial market mechanism in the short period. Finally, we will consider the balanced growth path in the long period under the system of partial market mechanism.

2 Partial Market Mechanism

In this section, it will be proved that the partial market mechanism does not always guarantee the Pareto Optimum and the efficient production. It is supposed

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that two kinds of goods are produced, Y_1 and Y_2 . We also suppose, that society employs two kinds of resources, capital (K) and labor (L) and the total amount of these resources are given, \hat{K} and \hat{L} .

The social production function is given as follows,

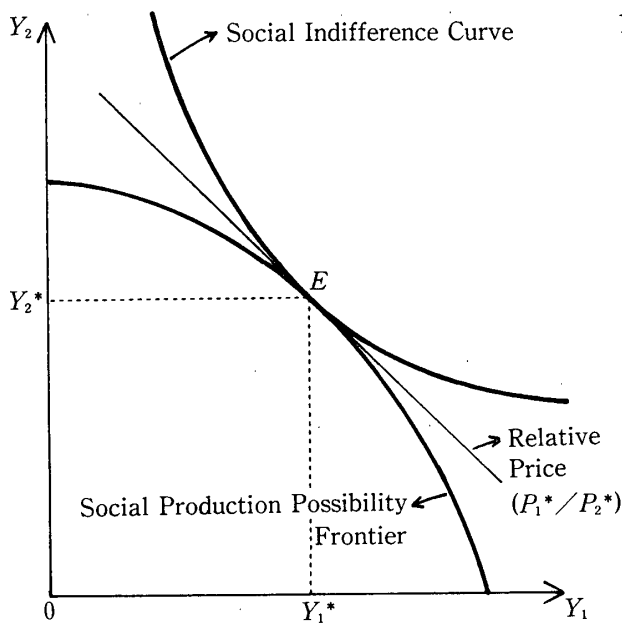
$$f(Y_1, Y_2, \hat{K}, \hat{L}) = 0. \quad (1)$$

Under the condition of the given total amount of capital (\hat{K}) and Labor (\hat{L}), the social production possibility frontier is drawn in figure 1. It is concave to the origin.

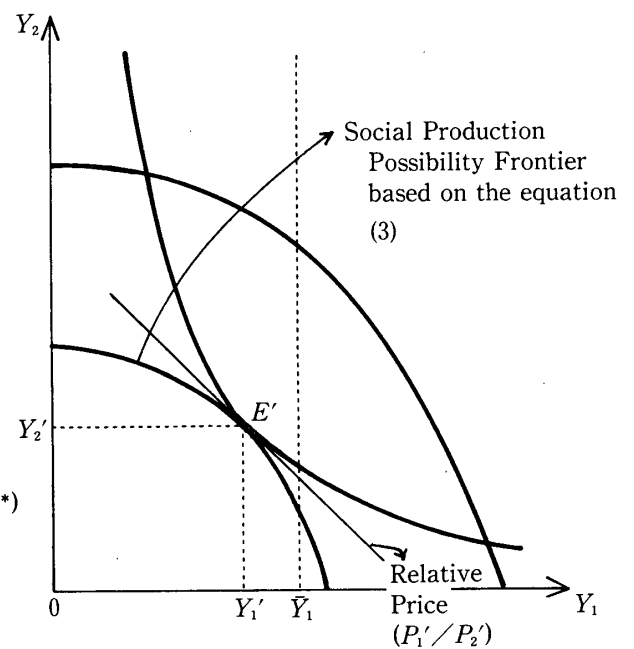
The social welfare function is a function of two kinds of goods, Y_1 and Y_2 .

$$U = U(Y_1, Y_2). \quad (2)$$

The social indifference curve which depends on the upper social welfare function is drawn in figure 1. It is convex against the origin.



(Figure 1)



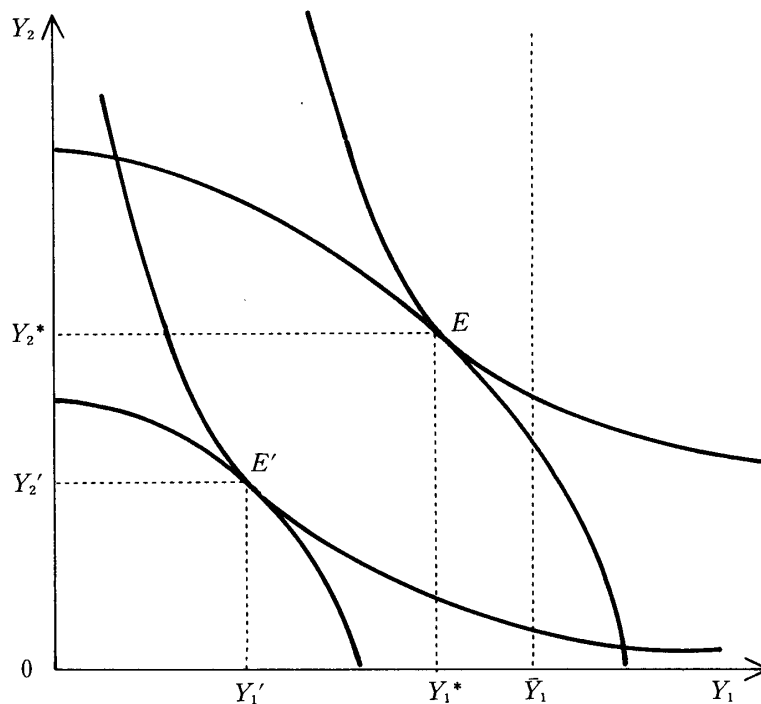
(Figure 2)

In figure 1, under the perfect competition, on point E where the social indifference curve is tangent to the social production possibility frontier, the Pareto Optimum is guaranteed. The slope of tangency on point E is the equilibrium relative price ratio (P_1^*/P_2^*), and Y_1^* and Y_2^* are the optimal productions, as everybody knows.

Next, we analyze the case of the partial market mechanism, that is the adjustment mechanism in which the market mechanism is side by side with the command economy. Suppose that the Soviet government controls the first production sector and commands the prior production order \bar{Y}_1 to all productive subjects. These productive subjects have to produce that production order \bar{Y}_1 , and employ \bar{K} and \bar{L} respectively in order to produce \bar{Y}_1 . Then the society has to employ $\hat{K} - \bar{K}$ and $\hat{L} - \bar{L}$ in order to produce two kinds of goods in the free market.

The social production function is,

$$f(Y_1, Y_2, \hat{K} - \bar{K}, \hat{L} - \bar{L}) = 0. \quad (3)$$



(Figure 3)

The social production possibility frontier based on the equation (3), is shown in figure 2. It is smaller than the one based on the equation (1).

The equilibrium point in figure 2 is E' where the social indifference curve is tangent to the social production possibility frontier based on the social production function (3). In the market the amount of two kinds of goods Y_1' and Y_2' are produced respectively. The equilibrium price in the partial market system is the slope of tangency on point E' that is P_1'/P_2' . Then this society has the total amount of productions $\bar{Y}_1 + Y_1'$ of the first goods and Y_2' of the second goods.

In the perfect competitive market system, the total amount of productions Y_1^* and Y_2^* are the equilibrium outputs and guarantee the Pareto Optimum and the effective production. On the other hand, in the partial market system the equilibrium total outputs are $\bar{Y}_1 + Y_1'$ and Y_2' .

Then we will consider the reasons why the total outputs, $\bar{Y}_1 + Y_1'$ and Y_2' in the partial market system, do not necessarily guarantee the Pareto Optimum and the effective production.

First, the equilibrium relative price in the partial market system (P_1'/P_2') based on the equations (2) and (3) is not always equal to the equilibrium relative price in the perfect competitive system (P_1^*/P_2^*) based on the equations (1) and (2). That is, the following inequality may be held,

$$\frac{P_1'}{P_2'} \neq \frac{P_1^*}{P_2^*}$$

Secondly, the equilibrium outputs $\bar{Y}_1 + Y_1'$ and Y_2' based on the equations (2) and (3) are not always equal to Y_1^* and Y_2^* which guarantee the Pareto Optimum and the effective production. That is, there is the possibility that the following inequalities are held.

$$\begin{aligned} \bar{Y}_1 + Y_1' &\neq Y_1^*, \\ Y_2' &\neq Y_2^*. \end{aligned}$$

Finally, there is the possibility that the production order of the Soviet government (\bar{Y}_1) exceeds the optimal output Y_1^* . For example, if the first goods is a weapon, we can easily suppose that possibility. In that case, the following inequality is held.

$$\bar{Y}_1 + Y_1' > Y_1^*.$$

This case is shown in figure 3.

In these cases, the outputs $\bar{Y}_1 + Y_1'$ and Y_2' are not equal to Y_1^* and Y_2^* . Then the equilibrium in the partial market system does not always guarantee the Pareto Optimum and the effective production.

3 Enterprise Behaviors in the Partial Market System

In this section, we analyze the Soviet enterprise behaviors in the system of partial market mechanism where the market mechanism stands side by side with the command economy.

[1] Economic Model

It is supposed that one enterprise has two production sectors, the first sector is commanded by the government and the second is the private sector in which the enterprise can produce the second goods freely. Y_1 is the output of the first sector. We assume that the production function of Y_1 is the following Leontief type function.

$$Y_1 = aL_1 \quad (4)$$

L_1 is a production resource, a is a production coefficient of L_1 . The government commands the production order \bar{Y}_1 and buys it from each enterprise directly by the government price \bar{P}_1 . Each Enterprise can sell the production remainder of the first goods $Y_1 - \bar{Y}_1$ in the free market.

It is assumed that the production function of the second goods, which each enterprise can produce and sell freely, is the Neoclassical production function.

$$Y_2 = f(L_2). \quad (5)$$

In the short period, the total amount of production resource is given (\hat{L}).

$$\hat{L} = L_1 + L_2. \quad (6)$$

Each enterprise maximizes its profit. The profit function is,

$$\Pi = P_1 (Y_1 - \bar{Y}_1) + \bar{P}_1 \bar{Y}_1 + P_2 Y_2 - (w_1 L_1 + w_2 L_2). \quad (7)$$

w_1 is the official price of the resource which the government supplies to each enterprise in proportion to the government production order. w_2 is the market price of the production resource. P_1 and P_2 are the market prices of the first and second goods in the free market.

It is assumed that each enterprise produces the amount of first goods more than the government order \bar{Y}_1 , and the official price \bar{P}_1 is lower than the market price P_1 .

$$\begin{aligned} Y_1 &> \bar{Y}_1, \\ P_1 &> \bar{P}_1. \end{aligned}$$

[2] Equilibrium Condition

The equilibrium condition of each enterprise is as follows,

$$P_1 a - w_1 = P_2 f' - w_2. \quad (8)$$

This means that the marginal profit of the resource in the first sector is equal to one of the second sector.

The necessary condition of existence of the equilibrium solution is,

$$\min f' < \frac{P_1 a - w_1 + w_2}{P_2} < \max f' \quad (9)$$

The second sufficient condition of profit maximization is that the Bordered Hessian is positive, and we stand for it by D .

$$\begin{vmatrix} 0 & 0 & -1 \\ 0 & P_2 f'' & -1 \\ -1 & -1 & 0 \end{vmatrix} = D > 0. \quad (10)$$

[3] Comparative Statics

(1) Change of the market price of the first goods

$$\frac{\partial L_1}{\partial P_1} = \frac{a}{D} > 0,$$

$$\frac{\partial L_2}{\partial P_1} = -\frac{a}{D} < 0.$$

An increase of the market price of the first goods increases the production of the first goods and decreases the one of the second goods, and vice versa.

(2) Change of the price of the second goods

$$\frac{\partial L_1}{\partial P_2} = -\frac{f'}{D} < 0,$$

$$\frac{\partial L_2}{\partial P_2} = \frac{f'}{D} > 0.$$

When the demand for the second goods increases, in the free market the price of the second goods goes up, then the production of the second goods increases, and vice versa.

(3) Change of the production efficiency in the first sector

$$\frac{\partial L_1}{\partial a} = \frac{P_1}{D} > 0,$$

$$\frac{\partial L_2}{\partial a} = -\frac{P_1}{D} < 0.$$

When the production efficiency in the first sector goes up, each enterprise wants to increase the output of the first sector and the amount of the second goods in the market decreases, and vice versa.

(4) Change of the official price of resource

$$\frac{\partial L_1}{\partial w_1} = -\frac{1}{D} < 0,$$

$$\frac{\partial L_2}{\partial w_1} = \frac{1}{D} > 0.$$

An increase of the official price of resource naturally decreases the output of the first goods and increases the one of the second goods, and vice versa.

(5) Change of the market price of resource

$$\frac{\partial L_1}{\partial w_2} = \frac{1}{D} > 0,$$

$$\frac{\partial L_2}{\partial w_2} = -\frac{1}{D} < 0.$$

When the price of resource in the wholesale market goes up, each enterprise decreases the output of the second goods and increases the one of the first goods, and vice versa.

According to the upper comparative static analysis, the behaviors of each enterprise are understandable for us. When one parameter change has the possibility to increase the profit of the first sector, then each enterprise increases the output of the first sector and decreases the one of the second sector, and vice versa.

[4] Balanced Growth Path

In this part, we will analyze the balanced growth in the long period. y stands for the ratio of two kinds of goods, Y_2 and Y_1 .

$$y = \frac{Y_2}{Y_1} \quad (11)$$

\dot{y} stands for the differential of y by time and l_2 stands for the resource ratio (L_2/\hat{L}).

$$l_2 = \frac{L_2}{\hat{L}} \quad (12)$$

From the calculation of the equation (11), the following equation is obtained.

$$\frac{\dot{y}}{y} = \dot{l}_2 \left\{ \frac{f'(l_2)}{f(l_2)} - \frac{1}{l_2 - 1} \right\} \quad (13)$$

l_2^* which satisfies the equation (14), guarantees the existence of balanced growth path.

$$\frac{f'(l_2)}{f(l_2)} = \frac{1}{l_2 - 1} \quad (14)$$

When $l_2 = l_2^*$, then the first and second goods grow up at the same rate.

If $l_2 > l_2^*$, then the second goods grows up at the higher rate than the first goods.

If $l_2 < l_2^*$, then the second goods grows up at the lower rate than the first goods.

4 Concluding Remarks

This paper analyzed the introduction of the market mechanism into the Soviet type command economy. Then this paper proved the following results. First, the partial market system, in which the market mechanism is side by side with the command economy, does not always guarantee the Pareto Optimum and the production efficiency. Secondly, the existence of the equilibrium solution of enterprise analysis and the comparative static analysis in the partial market system, were analyzed. Finally, it is proved that there is the possibility in which the balanced growth path is existent.

Each Soviet enterprise which is in the face of introducing the market mechanism, has to solve the following problems.

- (1) It has to produce the high quality goods which have the international competitive power.
- (2) It has to be managed without the government help, that is, in the way of self-management system.
- (3) It has to be managed in the way of self-financed system.
- (4) It has to employ the production resources from the wholesale market competitively.
- (5) It has to employ the high quality labor and to fire the low quality labor.
- (6) It has to set the normal price to its goods by itself.
- (7) It has to supervise selling goods through illegal channels and diding goods.

It is very difficult for the Soviet Union to introduce the market mechanism into the command economy.

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