ANALYZING THE MECHANISM OF JOINT-VENTURE AND TOWNSHIP ENTERPRISES IN CHINA*

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ABSTRACT

By means of the theory and methodology of system dynamics, we create a model which provides us with the study of hidden unemployment,control of production capacity and length of working time, and market promotion.

INTRODUCTION

In the course of ten-year-long implememtation of reform and open-door policy, China has been experiencing an immense change both in society and in economy. During the period, more and more social and economical phenomena, such as, new structures, new economic forms* have arisen. In pace with the multi-economic constituent policy, a lot of joint-ventures appear in China, They share the common characteristics, sush as, market-orientation, emphasizing on the effect of marketing on the promotion of production, easier mobility of labor than that is in state-owned enterprises, the ability to control the length of working time according to the specific requirement of production, and various productivity based on the skill of the employed workers. Besides the joint-ventures, the township enterprises also enjoy them. All these characteristics concerning the inner structure and operating mechanism of the system are deserving of further study.

THE FRAME-WORKS OF THE MODEL

Figure 1 illustrates the frame of the model which is mainly made up of three sectors: sales and order backlog, workforce hiring and productivity and the adjustment of the length of working time, and the adjustment of production capacity.

1. For the sector of sales and order backlog, on one hand, delivery rate determines revenue to sales which determines the number of salesmen through the market budget.

The more salesmen the enterprise hires, the more customers are absorbed. More customers form more potential order. On the other hand, according to the change of delivery delay, customer order rate is adjusted. The more order backlog, the more negative role is played in the order rate. Thus, there are one positive and one negative feedback loops with which salesmen and order backlog are adjusted in this sector.

In the sector of production capacity adjustment, production capacity is adjusted by the production capacity adjustment coefficient which is concerned in desired output and real average output. Otherwise, the number of workforce is influenced by the number of workforces allowed by capacity facilities which will adjust the hiring of workforces further.

Now, we give a detailed discussion to the partial workforce hiring, production and the adjustment of the length of working time.

2. In Figure 2, workforces are divided into skilled workforces (OWF) and unskilled wokforces (NWF). The NWF's hiring and firing rate are determined by desired workforces (DWF),workforces allowed by capacity facilities (AWF) and workforces (WF),etc. When DWF >= AWF, net rate of hiring and firing RWFHL=(AWF-WF)/TAWF. TAWF is workforces adjustment time. When DWF < AWF, RWFHL=(DWF-WF)/TAWF. These two formulas will be analyzed in the base run.

Not all of established workforces are posted workforces,because posted workforces are influenced by the workforces allowed by capacity facilities (AWF) and designed workforces (DWF). When AWF < OWF, unskilled worforces is equal to zero, because the enterprises always want to use skilled workforces as possible as they can. When OWF<AWF<WF, posted unskilled workforces RNWF=AWF-WF, posted skilled workforces ROWF=OWF. When AWF > WF,RNWF=NWF, ROWF=OWF. Through CLIP function, we put all these above formulas above together. Then we get the numbers of possible skilled and possible unskilled workforces, which are added and become the number of possible workforces (DRWF). To obtain the number of real posted workforces (RWF),DRWF will be influenced by the desired workforces. When DWF >= DRWF, the real number of posted workforces (RWF)is equal to DRWF. When DWF is less than DRWF, we should give a fraction between DWF and DRWF, which is determined by the manager's policies. Thus, we gain the real number of posted workforces (RWF).

Due to these two cases of skilled workforces and unskilled workforces, productivity must be adjusted according to them. Real production (RPROD) is determined by normal productivity,i.e, all jobs will be done by skilled workforces.RPROD is also determined by influence coefficient of experience extent to productivity (ERP).

3. Finally, delivery rate is influenced by the adjustment of the length of working time (AWTL). AWTL is determined by the desired output (DOUT) and normal product (NPROD).

4. Delivery rate (DR)is the product of normal product (NPROD) and AWTL.

BASE RUN AND ITS ANALASIS

In the base run, we choose a type of township enterprises whose market share is lower and whose competition status is disadvantageous.In the structure of the model, this is reflected that the backlog cannot meet the demand of production capacity,

and that the number of appealed customers is lower and there exists hidden unemployment.

The results are shown in Figure 3. Hidden unemployment will be eliminated within half a year. The number of workforces declines at first, and then goes up gradually. At last it inclines to the number of workforces allowed by the capacity facilities which will be made full use of. The sign of workforces' hiring and firing rate (RWFHL) turns positive from negative at first so that the number of WF declines within half a year. Then the positive RWFHL makes the number of workforces an S-shaped growth. At last it will incline to AWF within two years.

To analyze the reasonable behaviors above, we give a further discussion on hiring-firing rate from the point of management and decision.

When AWF is greater than WF:
1. if DWF<WF<AWF, the suggestion to decrease the workforces is adopted, WF will incline to DWF;
2. if WF<DWF<AWF, the suggestion to increase the workforces is adopted, WF will incline to DWF;
3. if WF<AWF<DWF, the suggestion to increase the workforces is adopted, WF will incline to AWF;
When AWF is less than WF:
4. if AWF<WF<DWF, the suggestion to decrease the workforces is adopted, WF will incline to AWF;
5. ' if DWF<AWF<WF, the suggestion to decrease the workforces is adopted, WF will incline DWF;
6. if AWF<DWF<WF, the suggestion to decrease the workforces is adopted, WF will incline to AWF.

To sum up all these suggestion, if AWF>DWF, the manager choose the goal of workforces' hiring and firing rate approaching to DWF,if DWF>AWF, approach to AWF.

So, in the base run, there exists the above behaviors in Figure 3. For the adjustment of the length of working time, short-working time will increase from 0.66 to 0.94. There also exists a small overshoot in the ascendant.

POLICY SIMULATION ANALYSIS

1.MARKET SHARE AND WORKFORCES' MOBILITY

There are four sets: (a) low share / mobile easily, i.e., base run (b) high share / mobile uneasily (c) low share / mobile uneasily (d) high share / mobile easily.

In the case of high share and easily moving, hidden unemployment is eliminated rapidly within four months. There exists oscillation which is either a positive value or zero. This causes workforce hiring-firing rate, salesmen, backlog, delivery rate and order rate go up. The adjustment of the length of working time turns from undertime to overtime. At last it takes on oscillation. All these results are shown in Figure 4.

If the workforces cannot mobile easily, as in the case of either high share or low share, hidden unemployment cannot be eliminated thoroughly. High share only eliminates part of hidden unemployment.

2.COMPREHENSIVE TEST

Now we give a set of conditions: (a) To assure the township enterprises either realize the workforces' moving or take account of the stability of the economy, the adjustment time of workforce moving turns from 10 weeks to 26 weeks. (b) Suppose that the enterprises are in the depression at first. through the improvement of sales quality, the products will be accepted by more customers. At last it returns to the original market share level. This line is closer to the life cycle of new product. So the state of the curve influences the existance and development of the enterprise directly. The more CPS (average number of customers appealed by salesmen) lasts,the more competitive the enterprise is, and the more profits it wins. If CPS goes down as soon as it goes up, the product will not be considered to be accepted by the market and the competition ability of the product is weak.

The simulation results are shown in Figure 5. When the enterprise is in the depression, it should fire the workforces who are not needed and eliminate the hidden unemployment thoroughly. Thus the hiring-firing rate inclines to zero through a little overshoot from a negative value. When the enterprise is in the boom, the hiring-firing rate takes on oscillation. At last with further development of market competition, the market share turns small further and hiring-firing rate inclines to zero gradually. Thus, for the behavior of workforces, the number of workforces goes down at first, then it inclines to a stable value through three series connected with S-shaped growth. The first S-shaped growth is caused by the overshoot of the hiring-firing rate. The latter two S-shaped growth are caused by the increase of order rate of the production capacity. These two growth also bring about improvement of the production capacity, workforces and the workforces allowed by the capacity facilities.

The adjustment of the length of working time also changes. At first it changes from work undertime to overtime. From the third year, it takes on oscillation and changes between work overtime work and undertime work. At last, with the decrease of market share, it inclines to undertime.

3. THE CONTRACT ANALYSIS BETWEEN STATE-OWNED ENTERPRISE AND JOINT-VENTURE ENTERPRISE

Suppose a state-owned enterprise and a joint-venture enterprise have these same conditions: productivity,skilled workforces,unskilled workforces,initial backlog,initial value of salesmen. The only difference is that the former's workforces can not move freely and the latter's can.

Figure 6. illustrates the behaviors of the joint-venture. In the brisk market,the product quantity, order, salesmen, and workforce increase exponentially. In the third year when the

market share begins to decline, the product quantity, order, and workforces begin to decrease gradually through a period of overshoot and the decline extent is lower. This reflects an adjustment to the policy of products which meets new demand of the market. In the period of growth, the length of working time takes on oscillation and becomes overtime work from undertime work. At last, when the market shares decreases, it becomes undertime work again.

For the state-owned enterprises, the case is different. The reason is that their adaptive ability is poorer, and workforces can not move freely. Thus, in the case of the brisk market, they can not absorb enough workforces to increase the scale of the enterprise so that there are a series of inverse S-shaped decreases for the delivery rate, order rate when the market share decreases. Meanwhile, hidden unemployment has an S-shaped increase. Also, order, normal product quantity and desired output have increased transiently. But they decrease in only one year.

4. OTHER TESTS

To analyze the relationship and joint-venture between the structure and behavior, we also conduct some policy tests such as productivity, market share, and average wage, etc.

CONCLUSIONS

In order to find out the way of developing township enterprises and joint-venture enterprises, we conduct a series of policy tests to put forward comprehensive policies included as the following:
1. If possible, relex restrictions of staff mobility partly or completely. Adjustment time for the staff mobility should be kept within three to six months. If the adjustment time is too short, it will be disadvantageous to the stability of the enterprise. If it is too long, it will be disadvantageous to the regular staff mobility.

2. Township enterprises should gradually enhance productivity and catch up with the average level of joint-venture and state-owned enterprises. Township enterprises can enhance their market competiveness further in this way.
3. Joint-venture enterprises should become the pioneers in opening up markets. Only by this way can they keep relatively high market share and avert the decrease of market share caused by competition.
4. Average wage of workforces should increase more slowly than prodictivity. Only by this way can enterprises develop quickly.
5. The number of skilled workforces should be greater than that of unskilled ones in joint-venture enterprises while in township enterprises, as technology requirement and productivity are relative low, the number of unskilled workforces may be greater

than that of skilled ones.

The stable and coordinative development of township enterprises and joint-venture enterprise depend on many other factors, but we believe that if the above policies are adopted, these enterprises will gain new vigour and their futures will be prosperous. We sincerely hope that the results of the study will be beneficial to the management and future development of this type of enterprises.

REFERENCES

1. Qifan Wang, System Dynamics, Tsinghua University Press, 1988
2. Jay.W. Forrester, Industrial Dynamics, Camb., Ma.Wright-Allen. Press Inc.,1961

Appendix

Sales & Ordering

Backlog

Production
Capacity
Adjustment

Workforces Hiring,
Productivity &
Adjustment of
Working Time Length
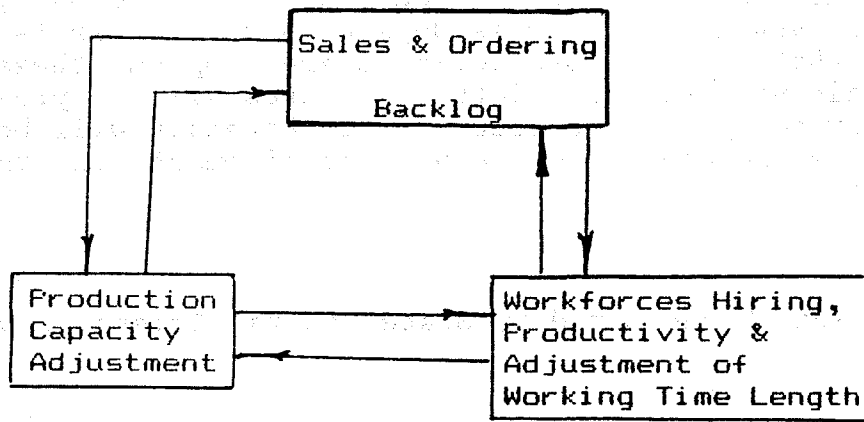
Figure-1   The model's frame
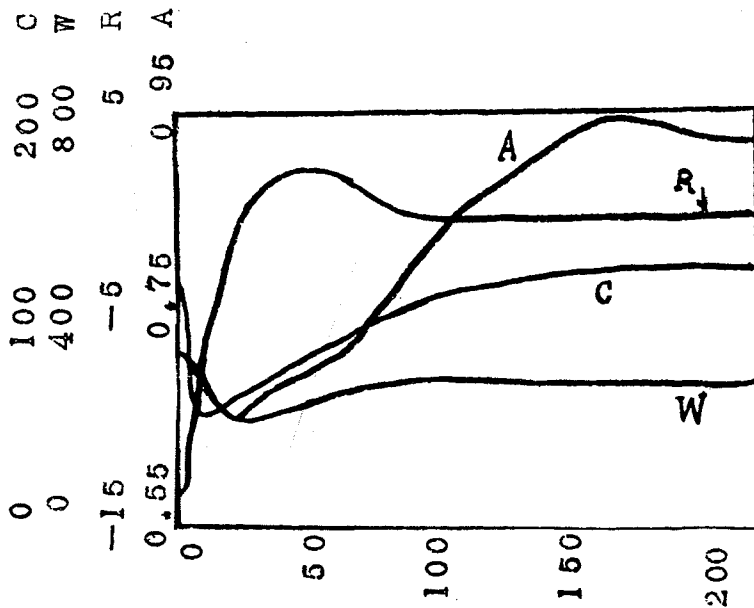
Notes:

A: The Adjustment of the
   Length of Working Time
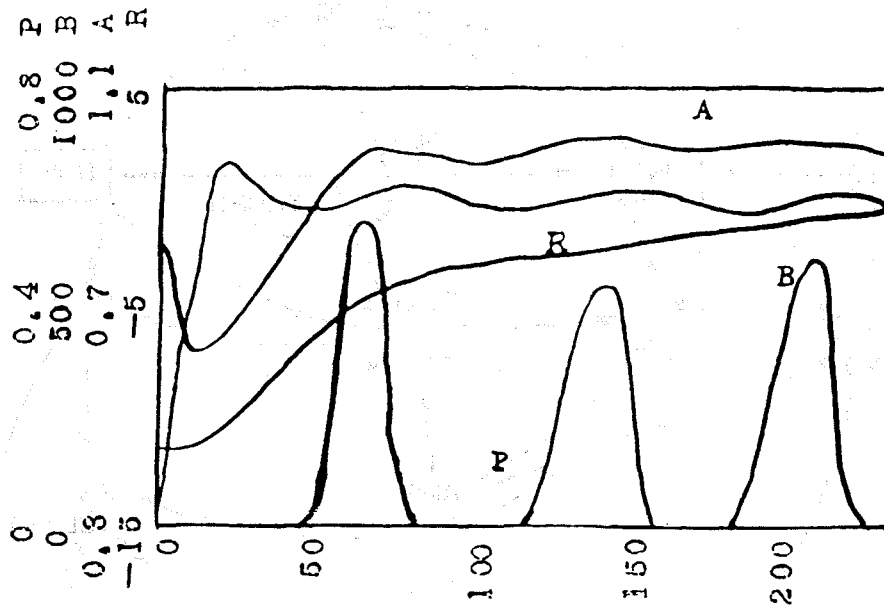W: Workforces

R: Hiring-Firing Rate
C: Capacity Ordering Rate

Figure 3   Base-run
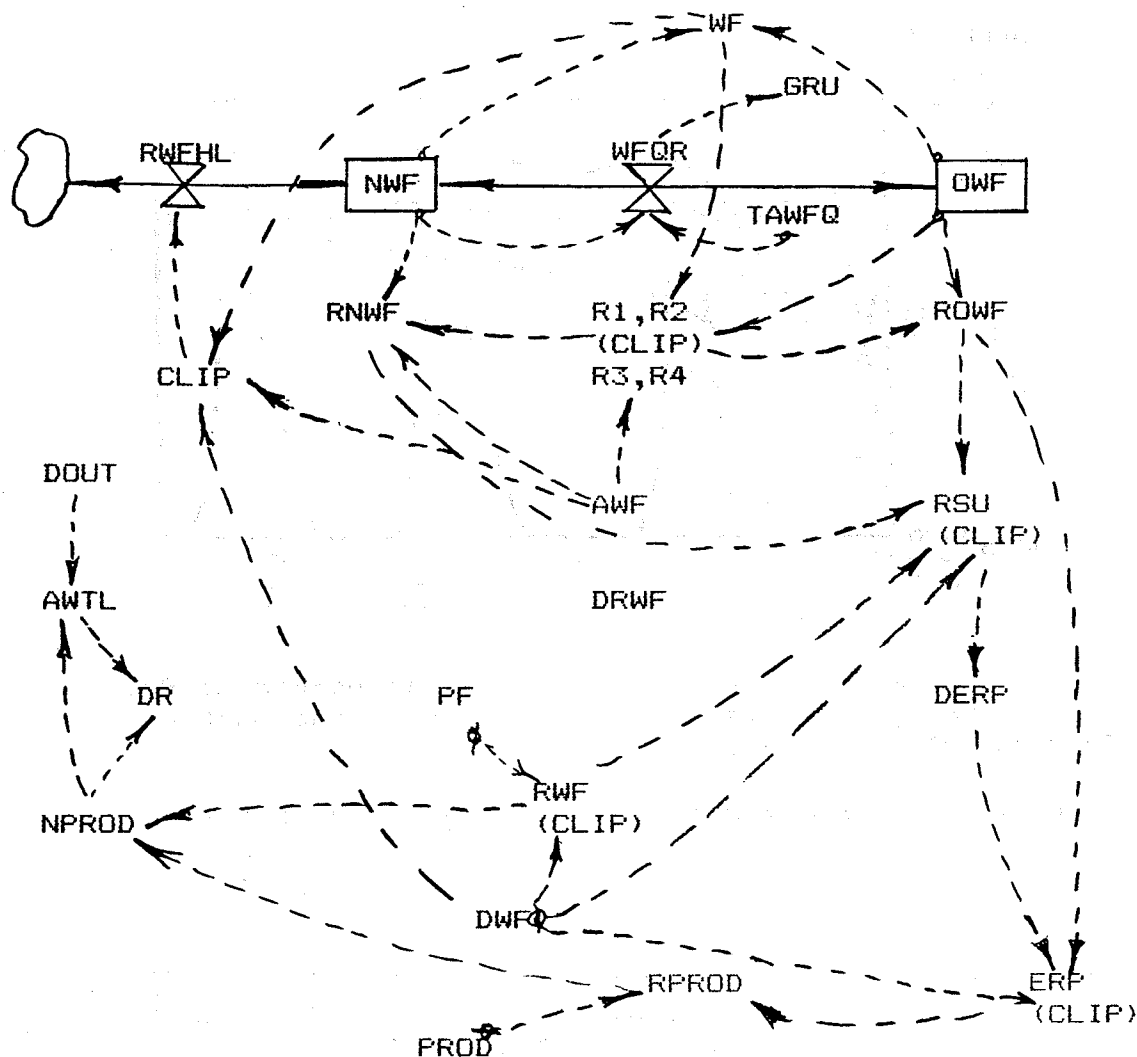
Note:
RWFHL: Hiring-firing Rate   PROD: Productivity
WF: Workforces   RPROD: Real Productivity
PROD: Productivity   DRWF: Posted Workforces
ERP: Productivity Coefficient   DOUT: Designed Output
DR: Delivery Rate   OWF: Skilled Workforces
RWF: Real Posted Workforces   DWF: Desired Workforces
ROWF: Posted Skilled Workforces   NPROD: Normal Product
ERP: Productivity Coefficient
GRU: Growth Rate of the Unskilled
RNWF: Posted Unskilled Workforces
AWF: Wokforces Allowed Capacity Facilities
RSU: Ratio of the Skilled to the Unskilled
AWTL: The adjustment of the Length of Working Time
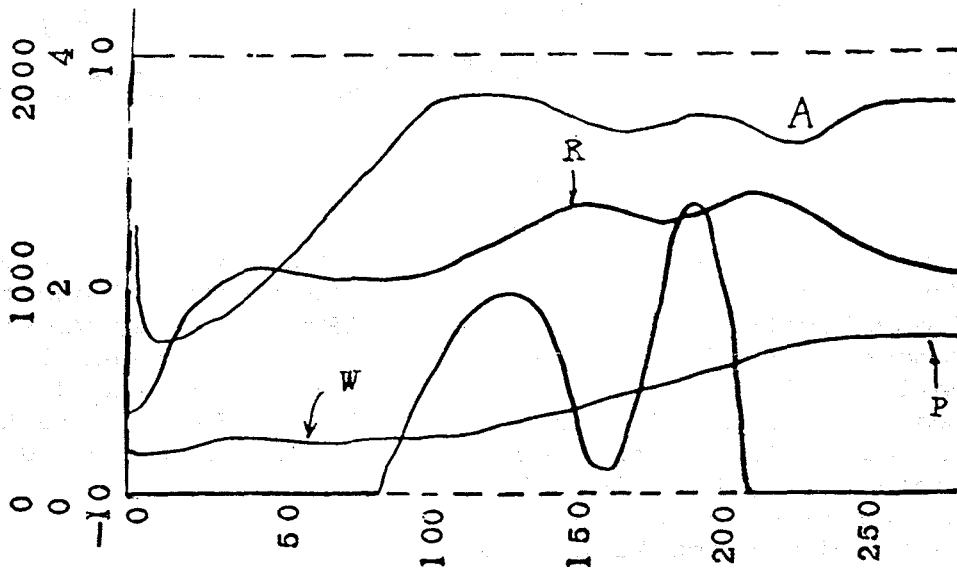
Figure-2   Structure of the part of workforces hiring,
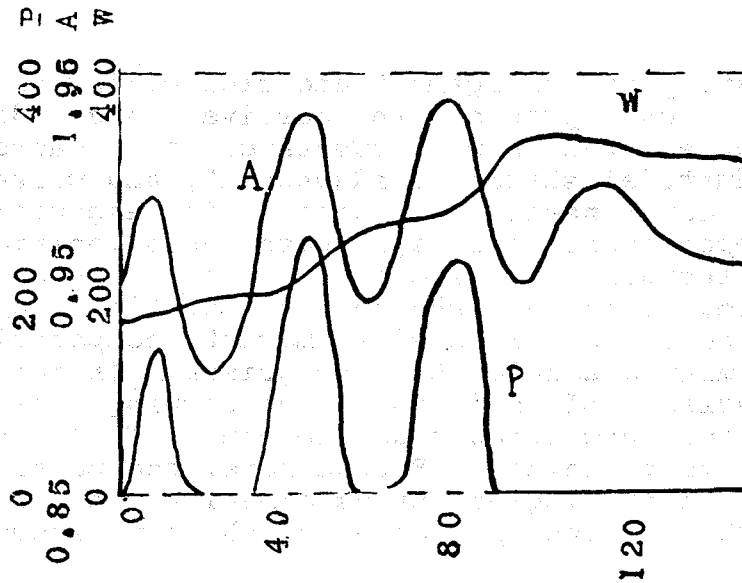   productivity & adjustment of the length of
            working time

A: The Adjustment of the
    Length of Working Time
P: Capacity Ordering Rate

R: Hiring-Firing Rate
B: Ordering Backlog

Figure 4   Behaviors for high share & mobility

A: The Adjustment of the
    Length of Working Time
P: Capacity Ordering Rate

R: Hiring-Firing Rate
W: Workforces

Figure 5   Behaviors for comprehensive test

A: The Adjustment of the   W: Workforces
   Length of Working Time   P: Capacity Ordering Rate

Figure 6   Behaviors for the joint-venture enterprises