THE STUDY OF PLANNED ECONOMY AND MAR-
KET ECONOMY OF OIL AND ENGINE DEMAND
IN THE EQUILIBRIUM SYSTEM THROUGH S.D.

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Abstract The systems of oil and engine production
of our complete planned economy before 1979 and mar-
ket economy guided by planned economy after 1980 are
simulated and some conclusions are given in these
models.

The complete planned economy can't meet the na-
tional requiment for oil and engines and the market
economy guided by planned economy can develop equi-
librumly under the instruction of mixed policies
applied to the production of oil and engines.

The main items of microeconomics are simulated
and some useful plots and conclusions are given.
Further study of many fields of macroeconomics and
microeconomics is expected.

Preface

System dynamics (in brief S.D.) has already been
applied to many fields. The S.D. is thought to be used
in many fields of economics too.

Recently two models of planned and market economy
has been built to simulate the production of oil and
interconbustion engines (in brief engine) in China.

Introduction To The Models

We have built the two models by the S.D. One is a
model of complete planned economy before 1979 in
China. The other is a model of market economy guided
by planned economy. After 1980 in China, in order to
decrease exterion variable, we chose oil, engines
and capital as principle elements. The production of
oil and engines, capital of oil and engine and amount
of engines stand for five levels. The supply of oil
and engines, prices of oil and engines are reprented as
important auxiliary variables, the amount of engines
and oil capital growth are important rates.

Model Of Planned Economy

Our complete planned economy is guided nationally.
Market economy factors were totally rejected. The
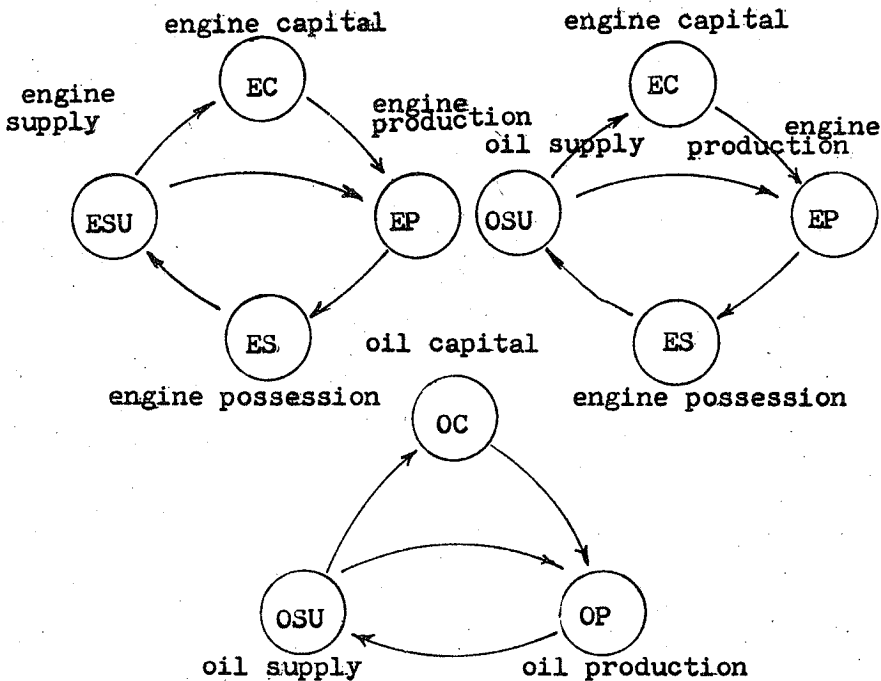causal loops diagragh is as follows:

Fig.1 the causal loops diagragh of comlete
planned economy

In this models the oil plan is based on our oil
sources, oil capital and oil production capability.
The oil investment is stimulated by engine demands,
the engine plan depends upon our national macroscopic
plan. It is limited by our oil supply, engine capital
and engine production capability. The oil supply in
this model is the key as the engine production depends
on the oil supply. The conclusion from our regression
analysis is that the amount of engines possessed in-
creases 10,000 horse powers while oil consumption or
production increases 2700 tons. In this model, the
prices of oil and engines do not stimulate the out-
put or demands of oil and engines, but the oil supply
affects to production of oil and engines to a great
extent. Thus the variable of oil plan is the key of
oil output and its value planned depends on increasing
rate of our oil plans and our oil output. The instruct
of this model is simple. The flow diagragh is as
follows: Figure Two.

The running of this model has been tested by 100
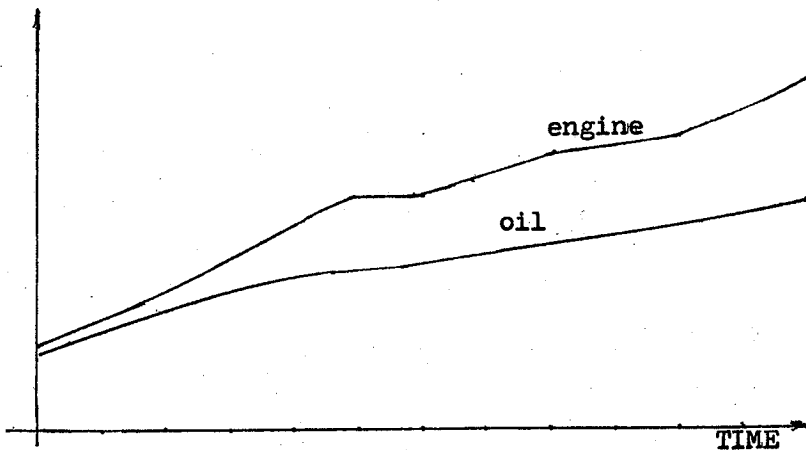equations and the result is as follow:
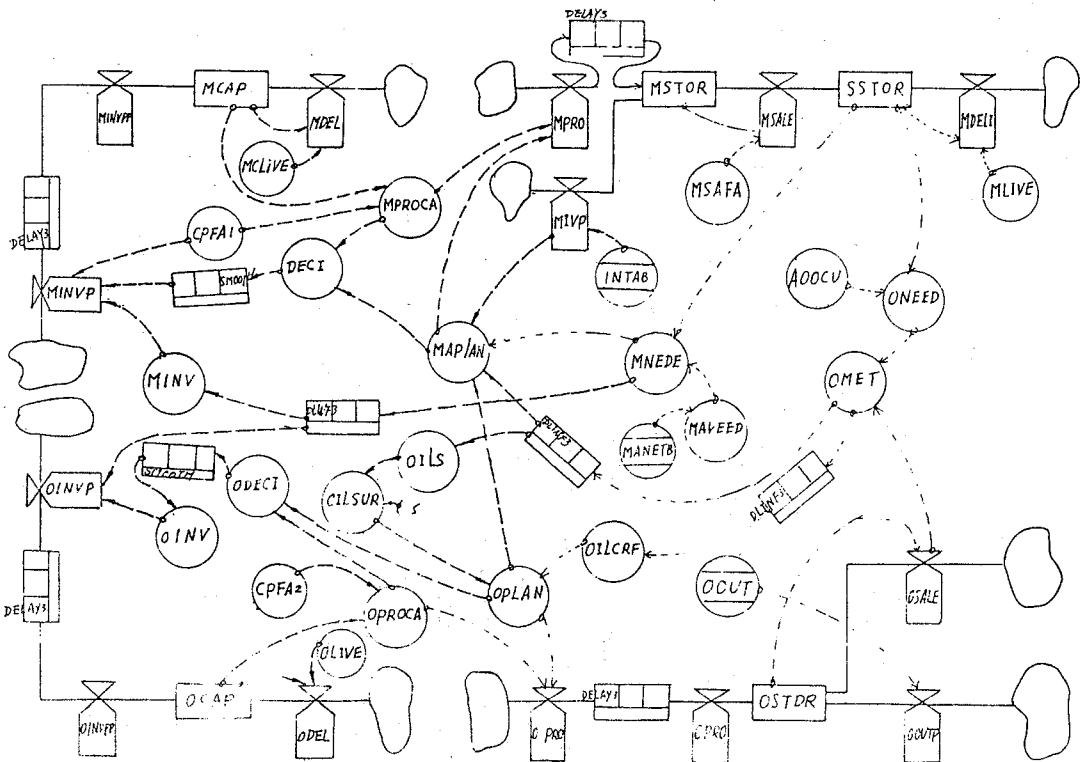

Fig.3 The plot of limitless sources

Fig.2 The flow diagram

From the plots we can foresee the output of oil and
engines in the year 2000. Both the output of oil and
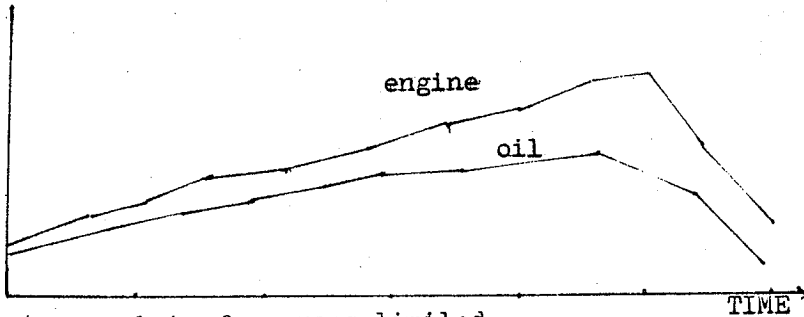engines from figure four precipitately drops.

Fig.4 The plot of sources limiled

Further production of engines is limited by oil because
oil sources will be exhausted from a long point of view.
The output of engines has to depend upon the oil plan.
The demand for engines can't stimulate the oil output.
So the possessed engines can't meet the public requi-
rements for them. As there is no price variable, and
market readjustment, invisible hand, the oil plan can't
stimulate the microeconomy and it is difficult to adjust
our production structure according to our market struc-
ture.

Model of market economy guided by planned economy.
When our system reformation started in 1980, we began
making the model of our market economy guided by planned
economy. The causel loops diagragh of this model is in
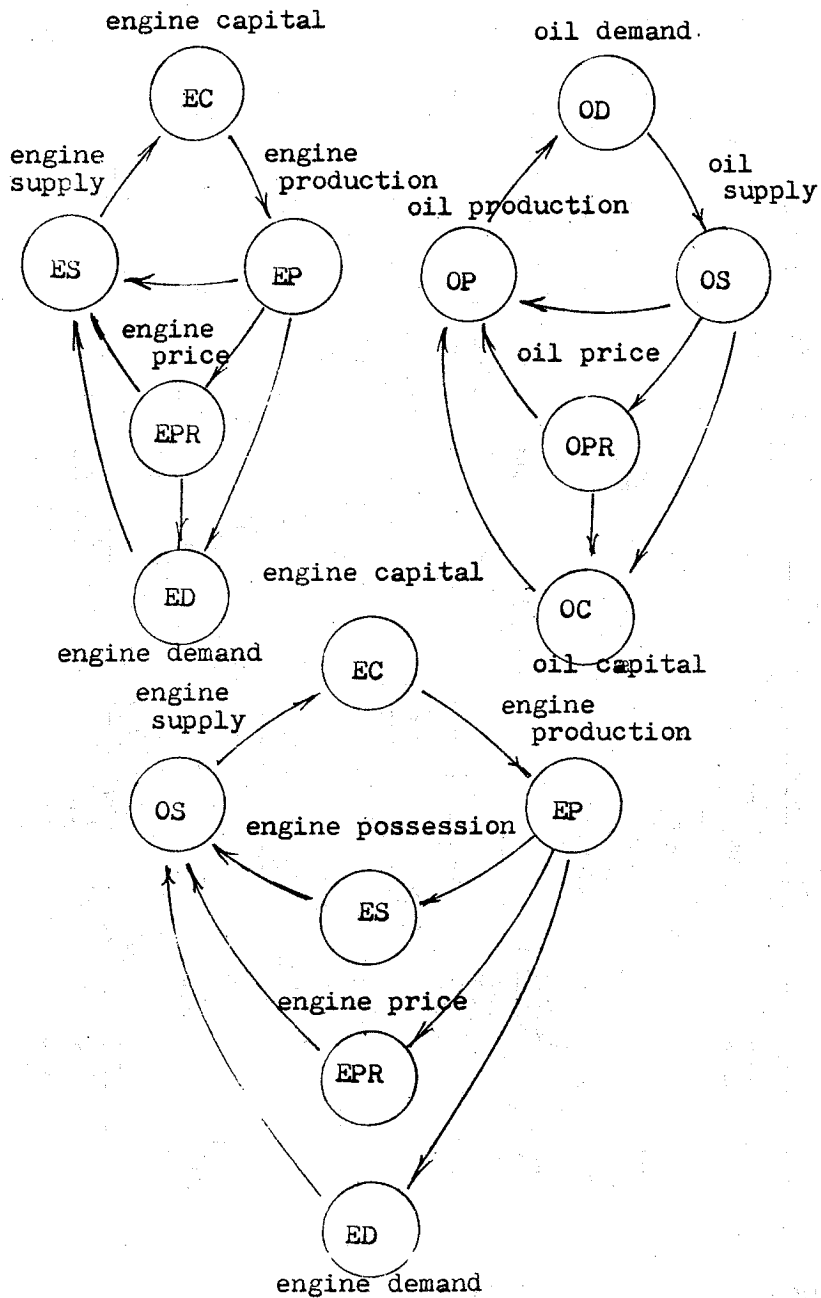Figure Five.

Fig. 5   The causal loops diagragh of market econmy
guided by planned economy

Fig.6 The flow diagragh

The systematic behavior of this model has changed
significantly because some variables---the prices of oil
and engines and their demands have been added to sti-
mulate planned output. Market factors being added, our
engine plan has changed too, our microscopic engine plan
can come from the differece between our national macro-
scopic plan and social engine possession, and market
readjustment. This system contains three important
auxiliaries---instructed plan, guided plan and market
readjustment plan. The engine production is limited by
engine production capability and is controled by mar-
ket. The foodback is affected by prices of oil and
engines, and demands for oil and engines. It can reach
as high as 100%. So it is very important to change the
system behavior. As for oil, its price is affected by
market facters very limitedly. Therefore the system
behavior is adjusted indirectly by oil price and demand.
The value of adjustment is limited by our policies,
our oil plan is nationally made and determined by our
oil sources, our publish engine possession, oil exhaus-
tion rate.

In order to analyse the system behavior of this model
we have supposed many policies, they are:
(1) the policy of limit concerning engine use.
(2) the policy of planned supply of oil.
(3) the policy of engine production limitation.
(4) the policy of forceful engine depreciation.
(5) the policy of controlled engine buying.
(6) the policy of controlled import and export of engines.
(7) the policy of interprise production readjustment.

The results of these policies are as follows:

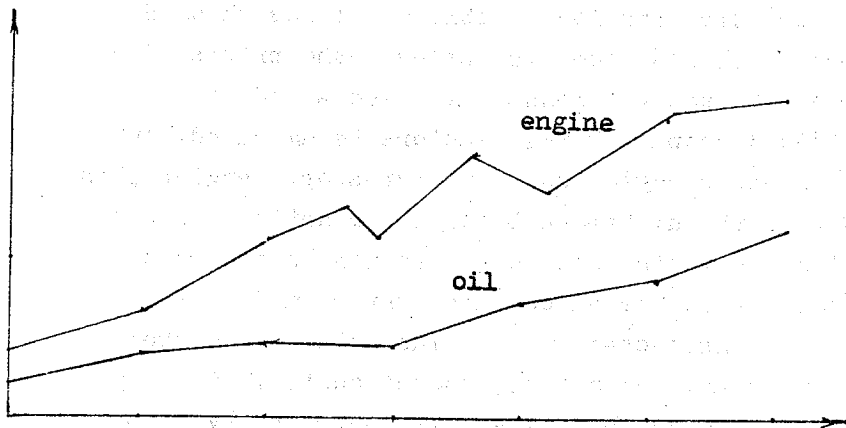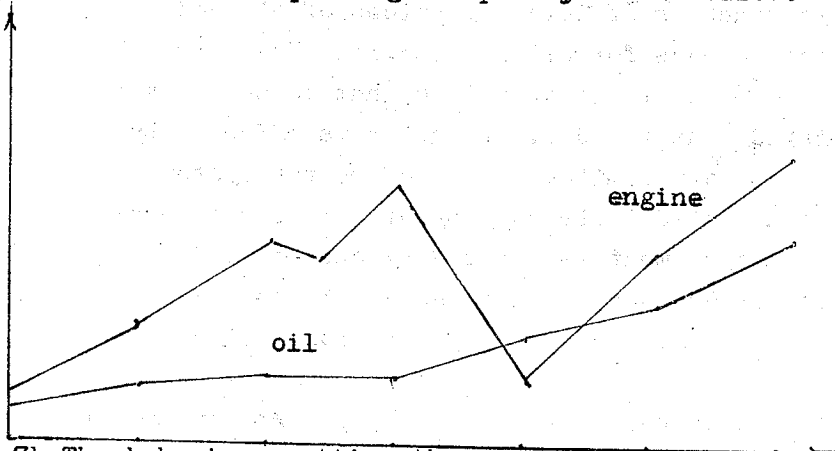Fig.7a The behaviour putting the policy 6 into effect
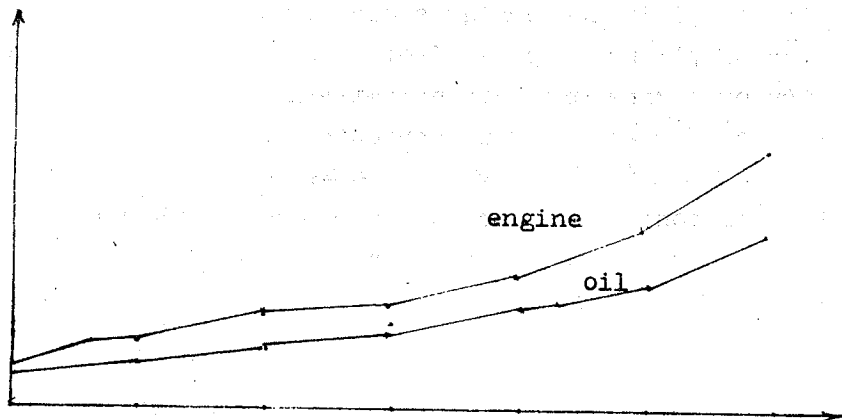
Fig.7b The behaviour putting the policy 3 into effect

Fig.7c The model can develop equilibrumly under the instruction of mixed policies

In microeconomics there are many important items.
Some characteristic items are simulated by the S.D.,
so as to analyse the system behavior.

The simulation of spide web effect.

Suppose the engine supply is S·K in a month. It is
function of price twelve monthes ago, so S·K = S(P·K-12)
and engine demand is N·K in a month. It is also fun-
ction of price a month ago, so N·K= N(P·K—1).

$$N_{demand·k} = S(DLINF3(PRICE·K,1)) \qquad (1)$$

$$S_{supply·k} = S(DLINF3(PRICE·K,12)) \qquad (2)$$

The price·k stands for the present price. As PRICE·K is
related with $S_{supply·k}$ and $N_{demand·k}$ it is known that

$$PRICE·K= k* \frac{N_{demand·k}}{S_{suplly·k}} \qquad (3)$$

k is factor.

According to the relationship between supply and de-
mand, if $N_{demand·k} > S_{supply·k}$, that is PRICE·K>1, the
supply is stimulated, vi·ce ver·sa the DEMAND·K is
stimulated . Through clip function, we can express the
item of the relation of spide web between supply and
demand.

The description of elasticity demand through S.D..

The elasticity theory is famous in microeconomies.
Elasticity between supply and demand is sensitive to the
change of goods supply versus the demand. In this model
the elasticity of demand between the supply and demand is
simulated.

$$\text{The elasticity } e= \frac{\frac{\Delta y}{y}}{\frac{\Delta x}{x}} \qquad (4)$$

So the engine elasticity between supply and demand is

$$e = \frac{\frac{\Delta y}{y}}{\frac{\Delta x}{x}} = \frac{\frac{\text{Smooth}(\text{DEMAND}\cdot K, DT)}{\text{Smooth}(\text{DEMAND } K, DT)} \quad \frac{\text{DEMAND}\cdot K}{}}{\frac{\text{Smooth}(\text{SUPPLY}\cdot K, \ DT)}{\text{Smooth}(\text{SUPPLY}\cdot K, \ DT)} \quad \frac{\text{SUPPLY}\cdot K}{}} \qquad (5)$$

The DT is length of steps.

In this model, many elasticity items can be expressed, for example: elasticity of demand, elasticity between demand and price, elasticity between supply and price,etc. The elasticity of price of engine is in Figure 8
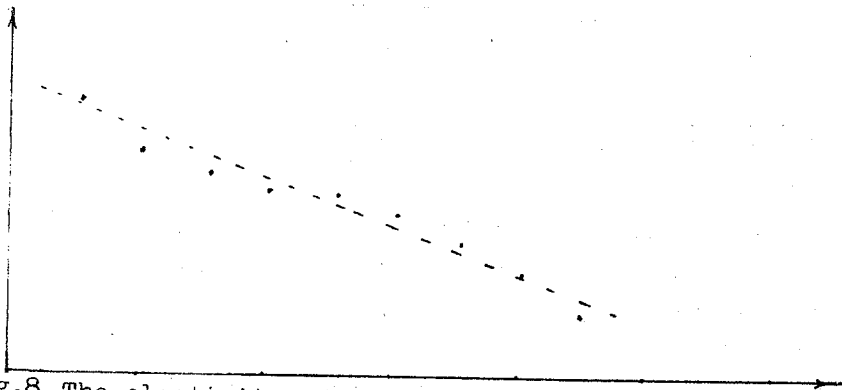

Fig.8 The elasticity of price of engine

The conclusions and evaluations of the simulating model.

The simulating conclusions are as follows:
a. In the system the elasticity of oil price is weak because oil is controlled largely by planned economy.
b. The system readjustment is limited by the price readjustment.
c. The efficiency of our mixed policies is seen in the equilibrium development of the oil and engine system.

The S.D. can simulate planned economy and market economy guided by planned economy in China., the

characteristic relationships in microeconomics —— the
relationship of demand, relationship of price, the rela-
tionship of elasticity, can be simulated as well.

If the model is improved, the study of margin effect in
microeconomics can be widened and deepened. When popula-
tion and income are necessarily taken into consideration,
this model can be enlarged easily.