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POLITICAL AND ECONOMIC FLUCTUATIONS

IN THE SOCIALIST SYSTEM

by

Domenico Mario NUTI

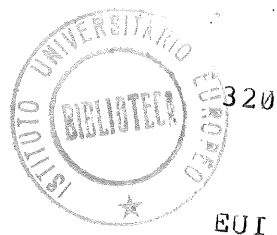
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European University Institute, Florence

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Department of Economics



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Domenico Mario NUTI

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SUMMARY

This paper presents a model of the dynamics of a 'socialist' (i.e. Soviet-type) economic system. A recursive system of seven difference equations summarises the links between indices of economic and political centralisation, capital investment, economic efficiency, shortages, political unrest and economic reform. The model is capable of generating economic and political fluctuations, of the kind actually observable in Soviet-type systems; the internal dynamics of the system are strongly affected by exogenous factors.

POLITICAL AND ECONOMIC FLUCTUATIONS IN THE SOCIALIST SYSTEM *

D.M. Nuti
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1. Political and economic interactions

It is widely recognised that there are strong and important interactions between political and economic factors in any economic system. In a socialist (i.e. Soviet-type) system, these interactions take several forms, such as : i) a link between economic and political centralisation levels; ii) a link between political centralisation and capital investment; iii) a link between full employment and workers' political strength through informal channels; iv) a link between economic achievement and the political legitimation of the system. While there are models for political-economic fluctuations in capitalist systems (e.g. Kalecki 1943; Nordhaus 1975; Frey and Schneider 1978), for socialist systems the discussion of these links and their piecing together into an organic model is still undeveloped. This is partly due to the dominance, in current literature, of the extreme views either that the socialist system is totally under the control of central planners and central committees, or that it is so chaotic as to lack an internal dynamics.

In earlier work (Nuti 1979, 1981, 1984) I have presented a model of socialist dynamics, based on the observation of actual developments in Soviet-type economies, incorporating the links listed above and explaining the recurrence and failure of attempts at economic and political decentralisation. In this paper I shall outline the essential

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features of this model, formulate a simplified mathematical version designed to represent the dynamics of major economic and political variables and provide a computer programme for the simulation of the behaviour of the system over time.

2. The model

The building blocks of the model are the following observable features of socialist development in Soviet-type systems :

i) One-party rule and "democratic centralism" lead to the centralised Soviet-type economic system; political democratisation induces the leadership to release their grip on the economy and, viceversa, any independently generated move towards marketisation of the economy favours political liberalisation.

ii) Economic centralisation is associated with microeconomic inefficiency in the allocation of resources, for the choice of production methods, their technical application, and the choice of consumption structure.

iii) Economic and political centralisation lead to a bias towards capital accumulation. As long as there are labour reserves available, to man efficiently the newly accumulated and the already existing capital, this bias leads to rapid economic growth. After the exhaustion of labour reserves, however, this systemic accumulation bias leads to falling degrees of capital utilisation and excess demand for labour and intermediate inputs.

iv) Systemic commitment to price stability prevents excess demand for labour and goods to be translated into higher (or higher enough) prices; shortages and queues ensue. Unless excess demand is alleviated by a positive net impact of exogenous factors (terms of trade and volume of world trade, agricultural output, technical advance, etcetera) shortages become endemic. This tendency is reinforced by wage drift due to informal bargaining at the factory level; wage drift is not strong enough to eliminate excess

demand for labour but it fuels excess demand in view of upward inflexibility of prices.

v) The inefficiency of falling degrees of capital utilisation calls for economic reform; but at the same time the presence of shortages calls for centralisation; either reforms do not take place, or if they do they are doomed because marketisation cannot operate successfully in conditions of excess demand. Reform will succeed only if it takes place in (rarely and almost accidentally obtainable) conditions of economic tranquillity.

vi) Without a successful economic reform, both shortages and inefficiencies lead to political unrest; up to a critical level this leads to increasing political liberalisation, but beyond that level central response (as in Poland in December 1981) becomes that of increasing centralisation.

Figure 1 (slightly modified from Nuti, 1981, p. 59) summarises this picture diagrammatically. The model is capable of producing three basic alternative paths, according to the types of functional relations and the value of their parameters, as well as the time pattern of (random) exogenous factors : i) a virtuous circle leading to progressive economic decentralisation and political liberalisation towards liberal market socialism, ii) a vicious circle towards political anarchy and economic collapse, or iii) the more probable course of economic and political fluctuations.

3. A mathematical formulation

Let us define the following variables :

PC = Index of political centralisation = the length of the nomenklatura list, i.e. the number of appointments directly controlled by the party.

PU = Index of political unrest = the excess of disaffected citizens over and above the number of citizens loyal to the régime, or

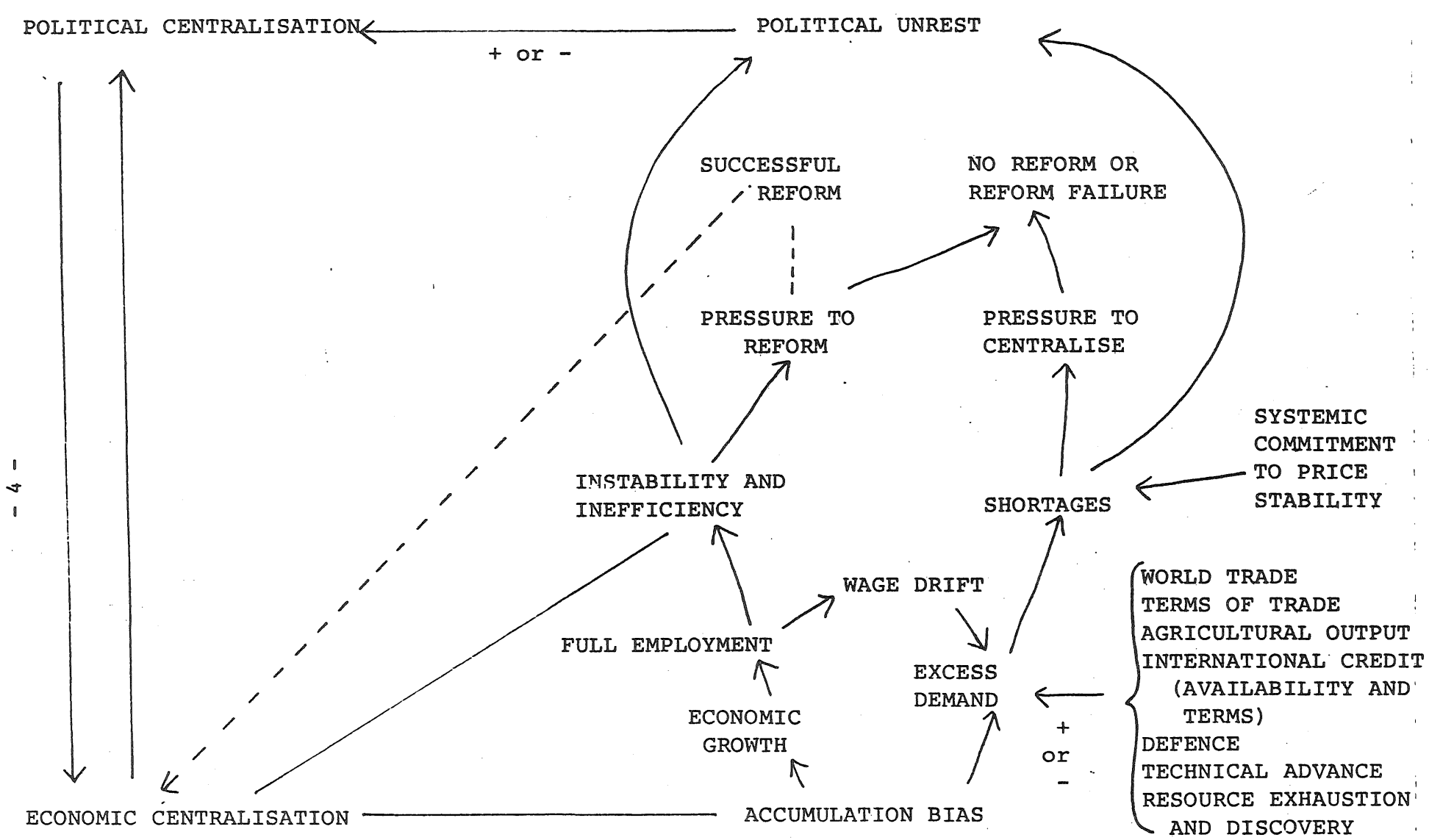


Fig. 1 The mechanism of political and economic fluctuations in the socialist system.

alternatively the absolute change in party membership, with its sign reversed.

Political centralisation and unrest are so related (as in (vi) above):

$$(1) \quad PC_t = \begin{cases} PC_{t-1} + a - b.PU_{t-1} & \text{where } a > 0, 1 > b > 0, \text{ for } PU \leq \widetilde{PU}; \\ PC_{t-1} + c + g.PU_{t-1} & \text{where } c \leq 0, 1 > g > 0, \text{ for } PU > \widetilde{PU}; \end{cases}$$

Thus up to the critical level \widetilde{PU} political unrest reduces political centralisation and possibly more than offsets the natural centralisation tendency of the system (otherwise ever-increasing due to $a > 0$), while beyond that critical level political unrest evokes a drastic authoritarian response and is counterproductive.

Figure 2 represents relationship (1) diagrammatically. Segment BC can be interpreted as a measure of the maximum absolute rate of change of which the system is capable in the direction of liberalisation under the pressure of sustained political unrest. Pessimism about the political reformability of the system would be reflected by high values of a and b coefficients, and low values of PU and the length of BC (if BC is negative; if C was in the positive quadrant the system would be inexorably moving towards ever-increasing centralisation regardless of circumstances). These parameters indicate different aspects of reformability, which are often confused in the literature: a measures the natural tendency of the system in the absence of political unrest; b measures the degree of response to political unrest; BC measures the maximum speed at which the system can be reformed; PU measures the maximum level of political unrest which the authorities are willing to tolerate. (We could introduce also a maximum absolute rate of change for PC, or a maximum level of PC which is reached when political centralisation is total).

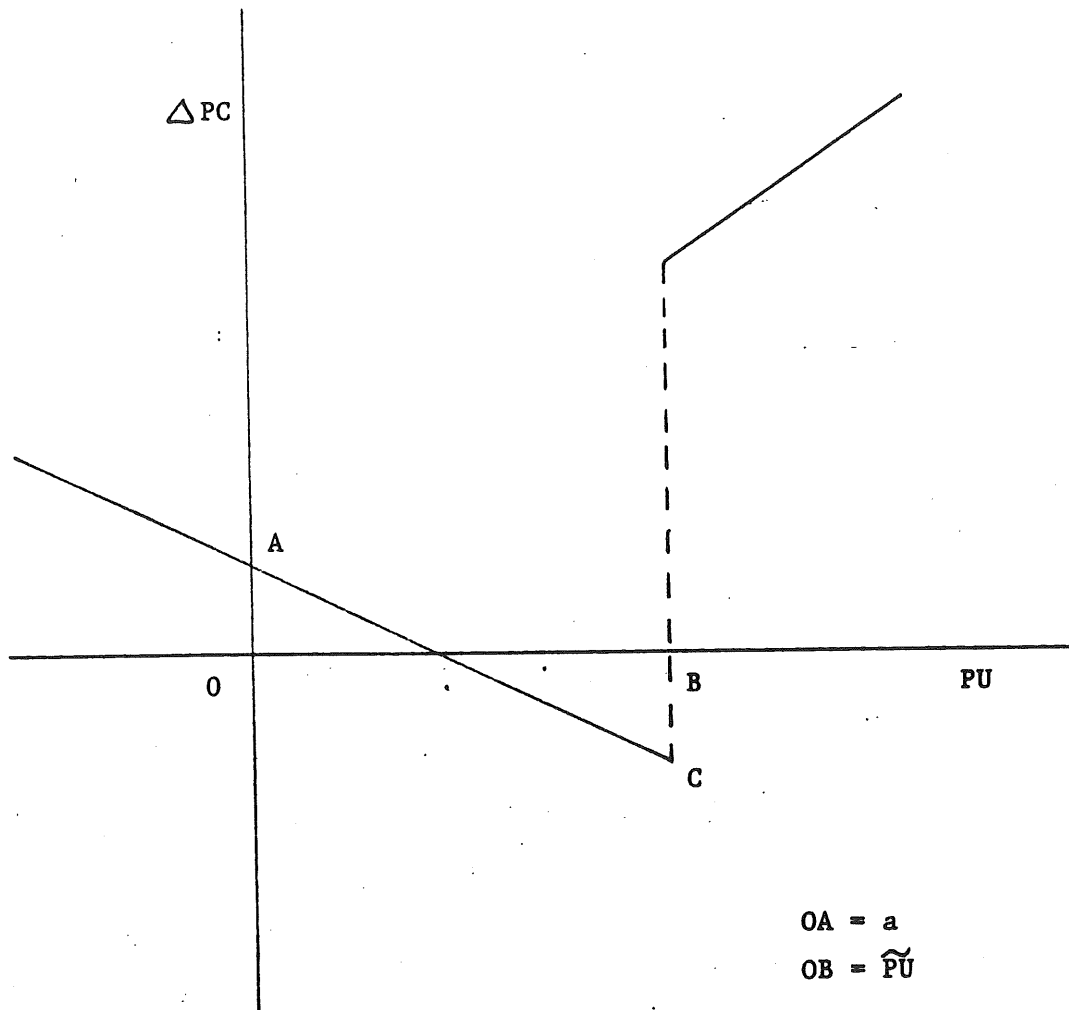


Fig. 2. The relationship between political unrest and changes in political centralisation.

Political centralisation in turn affects economic centralisation.
We define:

EC = Index of economic centralisation = the number of centrally allocated ("funded") commodities, or alternatively the number of compulsory indicators given to the enterprise.

N = The fall in economic centralisation that occurs when both economic efficiency EF (defined below) is on the increase and shortages SH, defined below, are equal to or less than zero.

$$(2) \quad EC_t = h + i.PC_t + N_{t-1} \quad \text{where } h, i > 0; N < 0$$

Economic centralisation affects the level of capital investment:

$$(3) \quad I_t = m + n.EC_t \quad \text{where } m > 0 \text{ and } n > 0.$$

SH = Shortages = excess demand (negative in the presence of excess supply, in which case inventories pile up above desired levels), in absolute terms;

Z = Random factor (≥ 0) reflecting the net combined effect of exogenous factors (such as world trade volume, terms of trade, volume and terms of external credit, external security requirements, technical advance, resource exhaustion and discovery) on resources available for internal use, in absolute terms. (Obviously the longer the period considered the greater is the need to make at least some of these factors endogenous).

EF = Economic efficiency = the ratio of actual to theoretically available output, x 100, or alternatively such a ratio divided by its previous value, x 100.

Shortages have an adverse effect on economic efficiency:

$$(4) \quad EF_t = EF_{t-1} - p.SH_{t-1} \quad \text{where } p > 0.$$

We could introduce a lower limit for EF (especially if defined according to the first of the alternative definitions above), below which economic collapse would occur (leading to total disruption of production and distribution of goods). Alternatively, we could imagine a lower limit to EF (especially if defined according to the second definition above) beyond which the system could not fall, because of the greater ease with which output levels already experienced can be recovered. The introduction of limits of this kind would model one's convictions about the economic viability of the socialist system which one is considering. No limits of either kind are introduced here.

$$(5) \quad SH_t = q + r. (I_t - Z_t) , \text{ where } q \geq 0, 1 > r > 0$$

$$(6) \quad N_t = \begin{cases} s + u \cdot EC_t & \text{for } SH_t = 0 \text{ and } EF_t > EF_{t-1} \\ 0 & \text{, otherwise.} \end{cases}$$

Finally, political unrest is fuelled by shortages and inefficiency:

$$(7) \quad PU_t = v \cdot SH_t + w \cdot (EF_{t-1} - EF_t) \quad \text{where } v, w > 0$$

This completes the model. The seven equations in seven unknowns (PC, PU, EC, N, I, SH, EF), given initial values PC_0, N_0, EF_0, SH_0 and PU_0 , as well as 15 parameters (a, b, c, g; h, i; m, n; p; q, r; s, u; v, w), and a randomly generated variable Z, are capable of determining the dynamics of the whole system.

For the model to embody the differences in system behaviour with and without the availability of labour reserves it would be necessary to replace equation (5) with (5') for periods in which labour reserves are available:

$$(5') \quad SH_t = q' - k \cdot I_t - r \cdot Z_t \quad , \text{ where } k > 0$$

because in that case investment reduces current shortages through its positive effect on supply rather than add to the pressure of demand. It would also be necessary to add a labour supply and a labour demand function, in order to discriminate whether equation (5) or (5') should apply.

This model is capable of generating economic and political fluctuations, of the kind actually observable in Soviet-type systems. For it to represent the possibility of take-off into democratic market socialism it is necessary to define critical lower bounds for EC and PC below which a reformed socialist system is achieved (presumably altering the applicable parameters, functions and possibly the model itself). For the model to represent the possibility of political and economic collapse it is necessary to define critical upper bounds for PU and SH, and possibly a lower bound for EF, beyond which economic anarchy prevails and a revolution (or at any rate a potentially revolutionary situation) would occur.

The Appendix to this paper presents a computer programme which can be used to simulate the dynamics of this model for given values of parameters, initial variables and critical thresholds for EC, PU and EF. It is not difficult to think of further refinements; the use of machine code and sound could easily turn this programme into an academics' video-game. The purpose of this exercise, however, remains that of exploring the political and economic interactions between major variables in a socialist system, and from that viewpoint it is doubtful whether mathematical or programming refinements could add much to the simplified structure presented here. The model, however, is making use of variables which are carefully defined in such a way as to be quantifiable and measurable. For some of the variables (such as PC, or EC, or PU) data are not available from statistical publications, but the problem of collecting time series for suitably selected proxies is now difficult, but not conceptually or practically insurmountable. Once suitable data are available, it should be possible to test the explanatory power of a model of this kind, to improve and develop it, and to turn from the production of a

plausible picture to actual forecasting. Meanwhile, the main contribution of this type of model should be the realisation that in spite of central control of economy and society the socialist system is a complex structure with its own internal dynamics, and does not lend itself to facile predictions about either its progress or its collapse.

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APPENDIX: A programme for the simulation of socialist dynamics (SOCDYN)

The following programme has been written in BASIC for a Sinclair SPECTRUM; it will work with both the 16K and the 48K versions. It can be easily translated into other languages.

Programme lines 10-14 label the programme, named "SOCDYN" for Socialist Dynamics. Lines 15-19 describe it briefly, give notation and ask the operator to indicate whether a numerical printout or a graphic display are required.

Lines 20-21 give initial values to some of the variables, namely $PC_0 = 100$, $EF_0 = 100$, $EF_{-1} = 100$, $PU_0 = 0$, $SH_0 = 0$, $N_0 = 0$; t is a counter and is set to 1.

Lines 20-120 give the whole model. Parameters are set at the following values: $a = c = 0$; $b = g = 0.1$; $h = 100$, $i = 1$; $m = 0$, $n = 0.1$; $p = 0.1$; $q = -125$; $r = 5$; $s = 0$; $u = 0.2$; $v = w = 1$. These values, obtained after a few tentative iterations, describe fairly well the operation of the model; for $PU = 60$ there appears to be no need for upper or lower bounds for any variables; for lower values of PU it would be necessary to introduce an upper limit for PC . The programme generates a political and economic cycle. Lines 65, 112 and 115 set critical values to EF , PU and EC ; if EF falls below 85 the economy collapses; if PU raises beyond 80 or if the economy collapses the system ends. If economic decentralisation occurs at a time when the economy goes very well (i.e. if EC falls below 160 when $N > 0$), the system is deemed to have been successfully reformed. Alternative beliefs about political reformability, economic viability and the success of reforms, as well as degrees of pessimism or optimism, can be reflected in alternative values for these parameters and critical values. Greater and more lifelike instability is generated by deleting line 70, in which case critical limits for EF , PU and EC are necessary.

Lines 121-146 print a sequence of values for PC, EC, I, EF, Z, SH, N and PU, which goes on until critical limits for EF, PU and EC are reached, or otherwise indefinitely to the exhaustion of memory, filling the screen, clearing it and filling it again if required.

Lines 150-170 give a graphic colour display for PC, EC, I, EF and PU, which also goes on as the numerical printout. Graphs are labelled, but often graph patterns become confused and it may be preferable to display two variables only at once, i.e. choosing only two among lines 150-156 at any time.

Lines 200-400 print messages if and when critical values for EF, PU and EC are reached.

```
10 REM "SOCDYN"
12 BORDER 1: INK 0: PRINT AT 4
,6;"SOCIALIST DYNAMICS": PAUSE 1
00
13 PRINT AT 8,6; "Copyright D.
M. Nuti": PAUSE 100
14 PRINT: PRINT "European Univ
ersity Institute S.Domenico di
Fiesole Florence, Ita
ly Tel.055-477 9
31": PAUSE 150: CLS
15 BORDER 2: PRINT "This progr
amme will simulate theinternal d
ynamics of a socialistsystem, ba
sed on the interactionof economi
c and political factors."
16 PRINT: PRINT "The followin
g notation is used: PC=political
centralisation EC=economic
centralisation I=investment
EF=efficiency Z=exogenous
random factor SH=shortages
N=endogenous economic dec
entralisation PU=political
unrest"
17 PRINT : PRINT "This program
me will give you a printout of
sequential values of the varia
bles indicated above. If yo
u want a graphic display inst
ead, press 1, otherwise pr
```



```
ess Ø. Press ENTER"
18 INPUT A
19 CLS
2Ø LET PC=1ØØ: LET EF=1ØØ: LET
EFS=1ØØ: LET PU=Ø: LET SH=Ø: LE
T N=Ø
25 LET t=1: PRINT "SOCIALIST D
YNAMICS - by D.M. Nuti"
3Ø LET PC=PC+(PU<=6Ø)*(-Ø.1*PU
)+(PU>6Ø)*(Ø.1*PU)
4Ø LET EC=1ØØ+PC-N
5Ø LET I=Ø.1*EC
6Ø LET EF=EF-Ø.1*SH
65 IF EF<85 THEN GO TO 3ØØ
7Ø RANDOMIZE
8Ø LET Z=RND*2Ø-1Ø
9Ø LET SH=5*(1-25-Z)
1ØØ LET N=(SH<=Ø AND EF>EFS)*Ø.
2Ø*EC
11Ø LET PU=SH+EFS-EF
112 IF PU>8Ø THEN GO TO 4ØØ
115 IF (N>Ø)+(EC<16Ø)=2 THEN GO
TO 2ØØ
12Ø LET EFS=EF
121 IF A=1 THEN GO TO 15Ø
125 LET y=t+4
13Ø BORDER 1: INK Ø: PRINT AT 3
,Ø;"PC": PRINT AT 3,5;"EC": PRIN
T AT 3,1Ø;"I": PRINT AT 3,14;"EF
":PRINT AT 3,18;"Z": PRINT AT 3
,21;"SH": PRINT AT 3,25;"N": PRI
NT AT 3,29; "PU"
135 PRINT AT y,Ø; INT PC: PRINT
AT y,4; INT EC: PRINT AT y,9;INT
I: PRINT AT y,13;INT EF: PRINT A
T y,17; INT Z: PRINT AT y,21;INT
SH: PRINT AT y,25;INT N: PRINT A
T y,28; INT PU
14Ø IF t>15 THEN GO TO 146
145 LET t=t+1: GO TO 3Ø
146 PAUSE 4Ø: CLS: GO TO 21
15Ø IF t=2 THEN GO SUB 17Ø
151 INK 2: PLOT t+15,PC/2
152 INK Ø: PLOT t+15,EC/5
153 INK 6: PLOT t+15,I
154 INK 3: PLOT t+15, EF/4+4Ø
155 INK 5: PLOT t+15, 4Ø+Ø.2*PU
16Ø LET t=t+1: IF t>24Ø THEN GO
SUB 17Ø
165 GO TO 3Ø
17Ø PAUSE 6Ø: CLS: PRINT AT 21-
INT(PC/16),Ø; "PC": PRINT AT 21-
```

```
INT(EC/4),Ø; "EC": PRINT AT 21-  
INT(I/8),Ø; "I": PRINT AT 21-INT  
(EF/32+5),Ø; "EF": PRINT AT 21-IN  
T(5+Ø.Ø25*PU),Ø; "PU": LET t=3:  
RETURN  
2ØØ PRINT "Democratic Market So  
cialism has been successfully in  
troduced. Comrades of all worl  
d, rejoice!": STOP  
3ØØ PRINT "The economy has coll  
apsed."  
4ØØ PRINT "A popular revolution  
has restored capitalism.  
THE END".
```