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POLITICAL AND ECONOMIC FLUCTUATIONS

IN THE SOCIALIST SYSTEM

by

Domenico Mario NUTI

BADIA FIESOLANA, SAN DOMENICO DI FIESOLE

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
European University Institute
Florence

1. Political and economic interactions

It is widely recognised that there are strong and important inter-
actions 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

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 centra-
lised 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 ineffi-
ciency 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 inflexi-
bility 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 ineffi-
ciencies 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 decentrali-
sation 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

POLITICAL CENTRALISATION

+ or -

POLITICAL UNREST

POLITICAL CENTRALISATION

ECONOMIC CENTRALISATION ——— ACCUMULATION BIAS

SUCCESSFUL REFORM

PRESSURE TO REFORM

NO REFORM OR REFORM FAILURE

PRESSURE TO CENTRALISE

INSTABILITY AND INEFFICIENCY

FULL EMPLOYMENT

ECONOMIC GROWTH

WAGE DRIFT

EXCESS DEMAND

+ or -

SHORTAGES

SYSTEMIC COMMITMENT TO PRICE STABILITY

WORLD TRADE TERMS OF TRADE
AGRICULTURAL OUTPUT
INTERNATIONAL CREDIT (AVAILABILITY AND TERMS)
DEFENCE
TECHNICAL ADVANCE
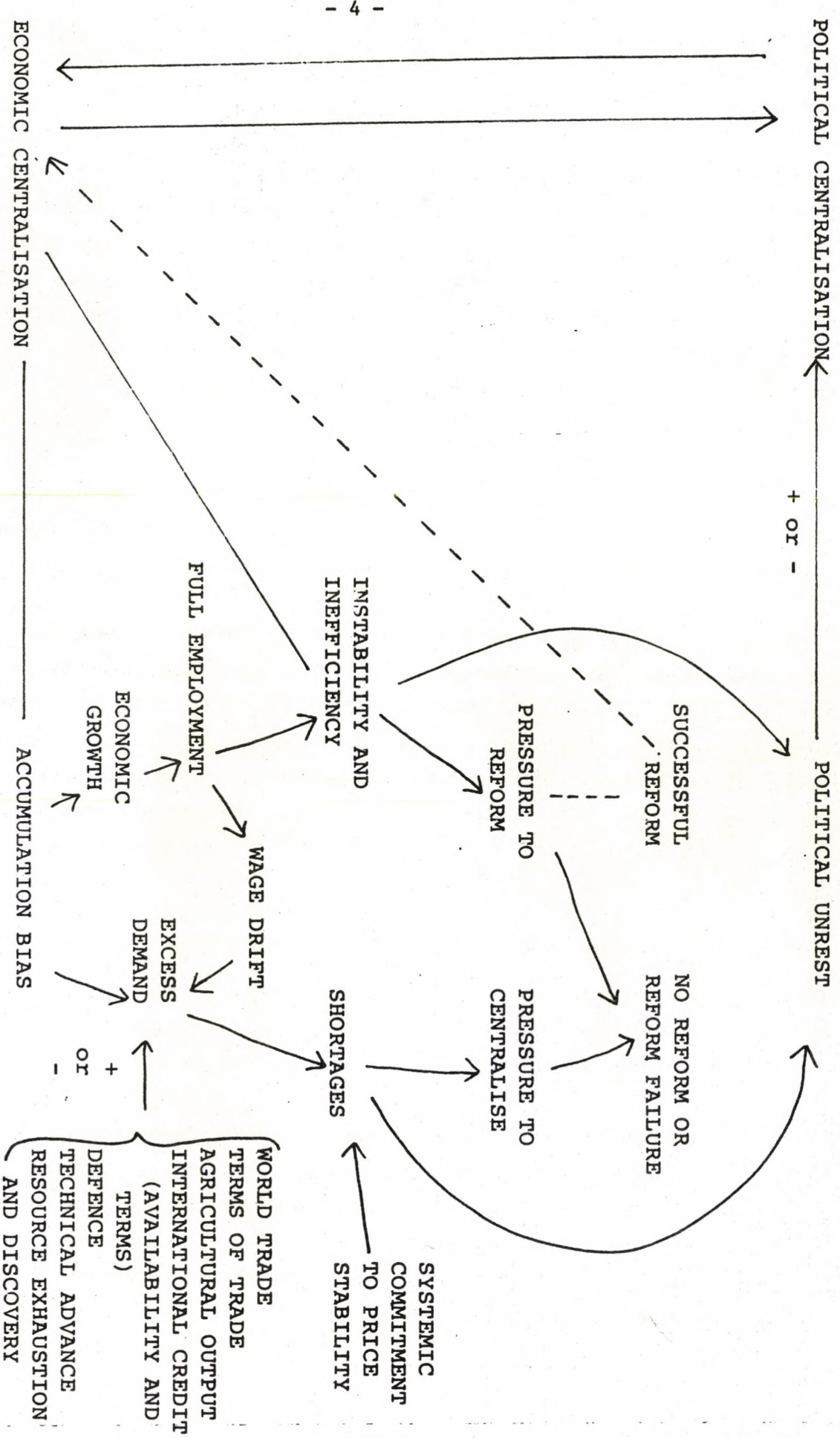RESOURCE EXHAUSTION AND DISCOVERY

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):

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

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 $\underline{a}$ and $\underline{b}$ 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: $\underline{a}$ measures the natural tendency of the system in the absence of political unrest; $\underline{b}$ 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).
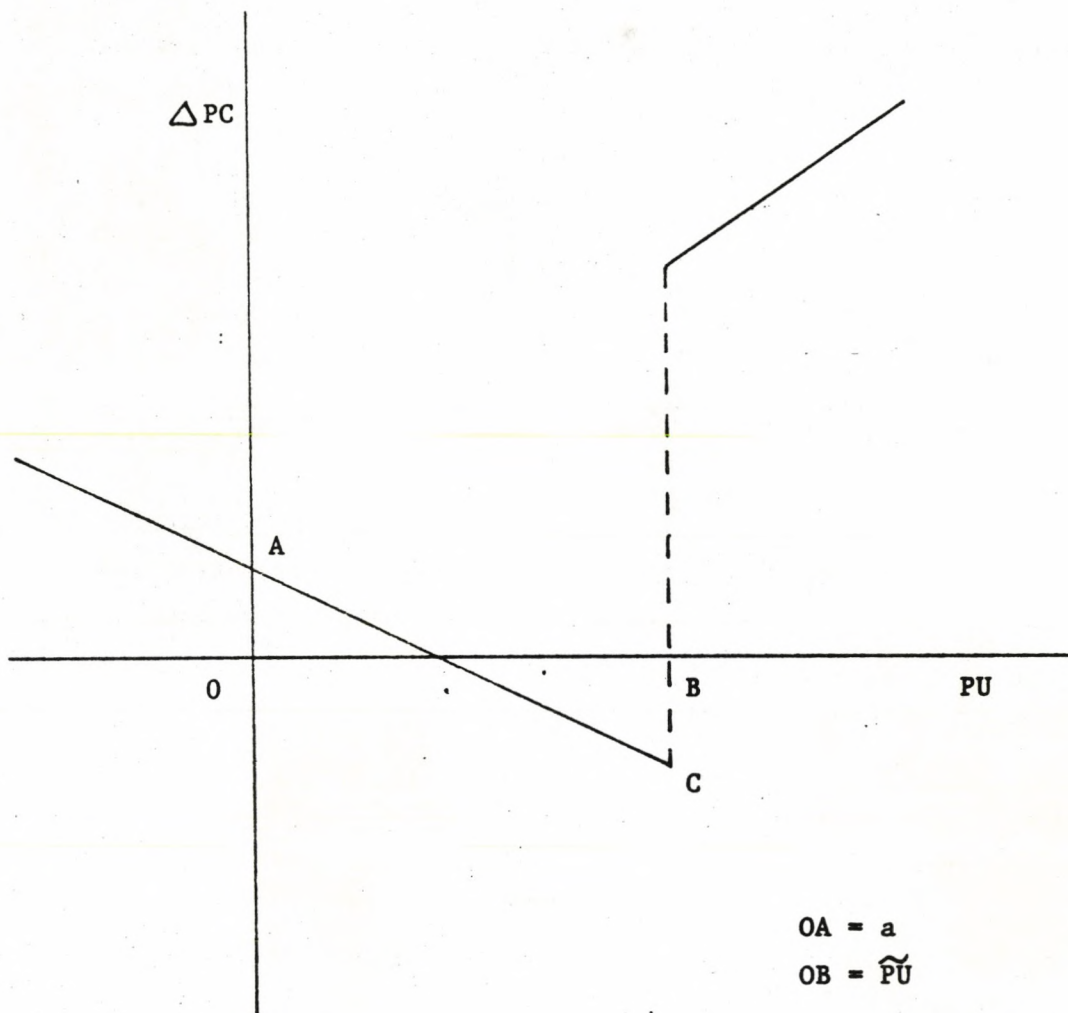
Fig. 2. The relationship between political unrest and changes in
political centralisation.

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

Economic centralisation affects the level of capital investment:

(3) $\qquad I_t = m + n.EC_t$ where m$\geqslant$0 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 ($\gtrless$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) $\qquad EF_t = EF_{t-1} - p.SH_{t-1}$ 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) $\qquad SH_t = q + r \cdot (I_t - Z_t)$, where $q \geqslant 0$, $1 > r > 0$

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

Finally, political unrest is fuelled by shortages and inefficiency:

(7) $\qquad PU_t = v \cdot SH_t + w \cdot (EF_{t-1} - EF_t)$ 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_o, N_o, EF_o, SH_o and PU_o, 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') $\qquad SH_t = q' - k \cdot I_t - r \cdot Z_t$, 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 contribu-
tion 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 progamme, 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
$PC_o = 100$, $EF_o = 100$, $EF_{-1} = 100$, $PU_o = 0$, $SH_o = 0$, $N_o = 0$; 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 alterna-
tive 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.

```
1Ø REM "SOCDYN"
12 BORDER 1: INK Ø: PRINT AT 4
,6;"SOCIALIST DYNAMICS": PAUSE 1
ØØ
13 PRINT AT 8,6; "Copyright D.
M. Nuti": PAUSE 1ØØ
14 PRINT: PRINT "European Univ
ersity Institute  S.Domenico di
Fiesole          Florence, Ita
ly                Tel.Ø55-477 9
31": PAUSE 15Ø: 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/40),0; "EC": PRINT AT 21-
INT(I/8),0;"I": PRINT AT 21-INT
(EF/32+5),0;"EF": PRINT AT 21-IN
T(5+0.025*PU),0;"PU": LET t=3:
RETURN
 200 PRINT "Democratic Market So
cialism has been successfully in
troduced.   Comrades of all worl
d, rejoice!": STOP
 300 PRINT "The economy has coll
apsed."
 400 PRINT "A popular revolution
has          restored capitalism.
 THE END".
```

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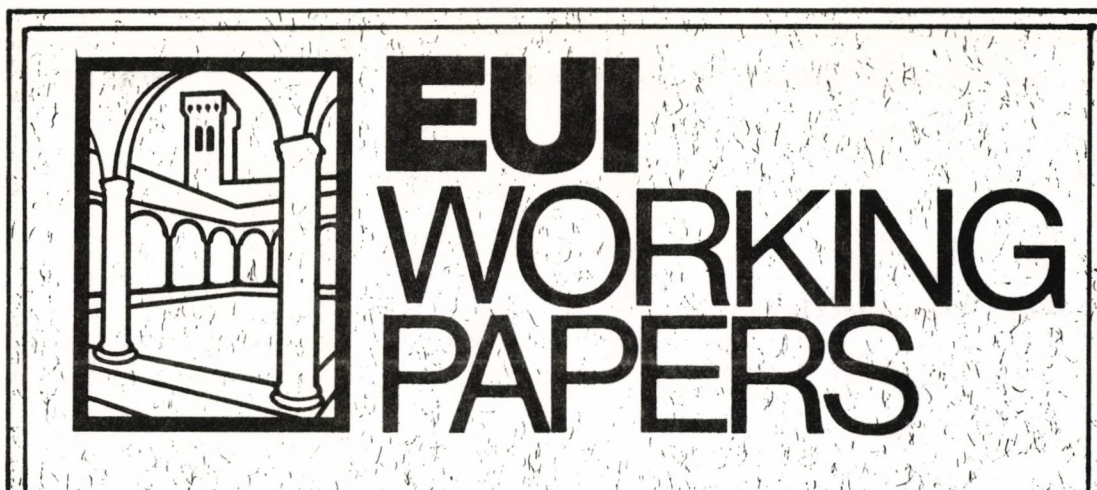
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