PLANNING IN A DEVELOPING ECONOMY (GREECE)

BY NICHOLAS TSORIS
Centre of Planning and Economic Research, Athens

A B S T R A C T

Greece is a developing economy which has tried to promote its national and regional development by constructing and following the Five Year Development Plans. One such plan was build for the period 1978 - 82. For the construction of this Plan there was not used a macroeconomic model. This work tries to formulate the «implicit econometric model» i.e. the model which is behind the macroeconomic framework of the Plan as described is the relevant Report. Grosso modo examination of the «implicit model» reveals that it is deficient. In turn this has led to a deficient Plan which might be one of the causes of the deterioration of the economy during this Five Year Plan.

I. INTRODUCTION

The cornerstone of an economic development plan is undoubtendly, the macroeconomic framework of the plan. This framework usually includes the forecast values of the main economic magnitudes during the time span of the plan, e.g. total available resources, targets of the plan, policy instruments, the constraints in achieving the targets etc.

Since the main macroeconomic variables of an economy are directly or indirectly interrelated, and since the relationship between the economic variables can best be studied with the construction and use of an econometric model, it follows, that the construction of a five year plan is highly facilitated with the use of an econometric model. Provided that the econometric model forecasts satisfactory within and outside the sampling period, it can be used for simulations covering the time span of the plan, which highly facilitate the construction of the plan, Tsoris [3ï.

The construction of the five year development plan of Greece for 1978 - 82 (Plan hereafter) was not based on an econometric model. The Report[1] of the team for the macroeconomic framework of the Plan describes the way in which the projected values of the different economic magnitudes were derived. In this paper we try to express statistically the functional relationships of the variables of the macroeconomic framework of the Plan taking into account the relevant Report[1]. This, in addition to being valuable per se, it could help identify some possible shortcomings of the Plan.

II. THE IMPLICIT MODEL OF THE PLAN

21 General

Before we cast the relations of the «implicit model» it is necessary to mention the following. First, for the purpose of the Plan the economy was divided in ten sectors. Second, as we know, the Gross Domestic Product (GDP) can be measured **in three** ways: (a) from the supply side i.e. the sum of value added in the different sectors of the economy, (b) from the sum of aggregate final demand and (c) from the sum of the incomes of the different income groups.

For the purpose of the Plan, neither of these approaches was used to derive the GDP. Instead, it was taken as a target variable i.e. given the real GDP in 1977, a target rate of increase 6 % per annum was applied in order to derive its absolute value, during the period of the Plan. Given the target values of the real GDP, there were calculated the corresponding magnitudes of the value added by sector, according to the elasticities which prevailed in the recent past([1]).

(1). The elasticity, n, of the value added of a given sector, Y, with respect to GDP is

$$n = \frac{\Delta Y / Y}{\frac{\Delta GDP}{GDP}}$$

$\frac{\Delta Y}{\quad}$ is the rate of change in the sector's value added. Hence its development through time is

$Y_t = Yt\text{-}_1\ [1 + 0.06.n]t$ where 0.06 is the rate of change in the real GDP.

2.2. THE «MODEL»

Gross Domestic Product(2), GDP

(1) $GDP_t = GDP_{t-i} \quad (1.06)^t \quad t = 1 \ldots 5, (1978 \ldots 1982)$

Gross Value added by sector, Y

(2) Agriculture $A^A_t = Y^A_{t-1} \quad (1 + 0.06.n_1)^t$

(3) Mining etc. $Y^{min}_t = Y^{min}_{t-1} \quad (1+0.06.\%)^t$

(4) Manufacturing $Y^M_t = Y^M_{t-t} \quad (1 + 0.06.n_3)t$

(5) Electricity etc. $Y^E_t = Y^E_{t-1} \quad (1 + 0.06.n_4)*$

(6) Construction $Y^c_t = Y^C_{t\ 1} \quad (1 + 0.06.n_5)t$

(7) Transportation-Com/ion $Y^{TC} = Y^{TC} \quad (1 + 0.06.n_6)t$

(2). Variables bearing a prime, and all the items of government revenue are in current prices; the remaining variables are in constant prices.

(8) Trade-Banking $Y^{TB}_t = Y^{TB}_{t-1} (1 + 0.06.n_7)t$

(9) Dwellings $Y^R_t = Y^R_{t-1} (1 + 0.06.n_8)t$

(10) Services $Y^S_t = Y^{\delta}_{t-1} (1 + 0.06.n_9)t$

(11) Public Services $Y^{PS}_t = Y^{PS}_{t-i} (1 + 0.06.n_{10})^t$

Labour supply, LS

It was assumed that the active population, which was 3420 thousand persons in 1977, will grow at a rate eqal to 0.8 % per year i.e.

(12) $L^S_t = L^S_{t-1} (1 + 0.008)t$

Demand for labour, L^D

Relations 2-11 above indicate, in absolute terms, the expected change in the sectoral value added. On the other hand, it was projected (for the period of the Plan) the absolute value of real productivity of labour by sector. From the relation of value added and prouctivity, is was derived the sectoral (and total) demand for labour necessary to support the target of GDP i.e.

(13) $L^D = \frac{Y^A}{\Pi^A} + \frac{Y^{min}}{Ymin} \ldots \frac{VPS}{Tps-}$ where

Y^A, ... Y^{PS} is the value added in the different sectors and Π^A, ... n^{min} ... n^{PS} is the labour productivity per sector.

Unemployment, U_n

$$(14)\ U_n = L^S_{t-1}\ (1+0.008)^t - \left[\frac{Y^A}{\Pi^A_t} + \frac{Y^{min}_t}{\Pi^{min}_t} + \cdots \frac{Y^{PS}_t}{\Pi^{PS}_t}\right]$$

Investment by sector, It

Given the annual level of sectoral value added necessary to support (or achieve) the target GDP, the necessary sectoral investment in fixed capital was calculated from the (historical) incremental capital-output ratio in each sector i.e.

$$K = \frac{Y_t - Y_{t-4}}{\sum_{t-4}^{t-1} I}$$

where it was assumed a four year cycle in production, and one year gestation lag of investment. The annual total fixed investment (private and puplic) is given by the relation

(15) $I_t = It\text{-}i + (\Delta I^A + \Delta IM\acute{\eta} + \ldots. + \Delta I^S)$ where

$\Delta I^A = I^A_t - I^A_{t-1} = \Delta Y^A \,.\, K^A = (Y^A_t - Y^A_{t-1}) \,.\, K^A$ and K^A is the incremental output-capital ratio in agriculture. . . . .

$\Delta I^s = (Y^S_t - Y^S_{t-i}) \; K^S$

Imports and Exports

The imported goods are split in four categories and their volume was calculated from the following relations ([3]) :

Consumption goods, M^c

(16) $M^c = A_1$ GDPal or $\log M^c = \log A_1 + a_1 \log$ GDP

Raw materials—intermediate goods, M^{r-m}

(17) $M^{rm} = A_2 (Y^M)^{a2}$ where Y^M is the value added in manufacturing.

Capital goods, M^k

(18) $M^k = A_3 . I^{a3}$, where I = total investment in fixed capital.

Fuels, M^f

(19) $M^f = A_4$(GDP)a4

Total volume of imported goods, M

(20) $M = M^C + M™ + M^k + M^f$

Exports of goods, E

The exports of goods were split in two categories.

Exports of primary products, E_1

(21) $E_1 = A_5 (Y^A$ + YMin)a5

(3). All the A, S are constants whereas the small a, s are elasticities.

Exports of manufactured ([4]) goods, E_2

(22) $E_3 = A_e(Y^M - DM)a6$

DM = home demand for home produced manufacturing goods.

Total exports, E

(23) $E = E, + E_2$

Balance of Payments

The projected price indices of imported and exported goods were used to convert imports and exports to current prices. In turn, these items were converted to dollars using the relation 1$ = 37.21 drs. In order to determine the invisible receipts (revenue from tourism, shipping, remittances and other), and also the invisible payments, projections of time trends were used with upward or downward corrections of the trend coefficients in order to rake into account some expected changes([5]). The needs of the economy for external borrowing were calculated as difference between the expected movements in the balance on current accounts and the expected movement in the private capital inflows.

Public sector

The determination of the public revenue was based on the historical (1958 - 1975)incime elasticities of the different kinds of revenue(ô). The direct and indirect taxes were split in the following categories and their elasticities with respect to GNP in current prices were calculated([7]).

(4) Alternative projections of the value of E_2 took place under different assumptions regarding the demand for manufactured goods in the world's market.

(5) For example, the average drachma expenditure of tourists was supposed to increase 9 % per year. The trend coefficient of remittances was decreased in order to take into accound the expected decline in the rate of growth of the European economies (mainly W. Germany) where most of the Greek workers are employed, whereas the trend coefficient of other invisible receipts was increased, in order to take into account the rapid growth of the Greek construction industries which have undertaken big projects in Middle East and North Africa.

(6) Some corrections of the elasticities were made in order to take into account the proposed changes and/or the targets of the Plan.

(7) Elasticities of the different taxes with respect to the private consumption in current prices (C^r) were also calculated

Kind of Public revenue		Elasticity with respect to GNP'
(24) Direct taxes on households, R^p,		1.31
(25) Direct taxes on corporations, R^c		1.35
26) Taxation of death duties R^d		a_7
(27) Social insurance contributions by employers	SIC!	1.16
(28) Social insurance contributions by employees	SIC_2	1.41
(29) Tariffs	Tar	0.48
(30) Business turnover tax	Tax^{bt}.	1.15
(31) Stamp duties	St^d.	1.10
(32) Taxation of tobacco	$Taxt^{ob}$.	0.79
(33) Taxation of fuels	Tax^f.	0.76
(34) Transportation dues	Tax^{veh}	1.08
(35) Taxation of capital transfers	Tax^{lr}.	1.22
(36) Issue of licenses for new buildings	Tax^{bufld}	1.20
(37) Taxation of lubricants	Tax^{lub}.	0.75
(38) Other general indirect taxes	OGIT	0.96
(39) Other special indirect taxes	OSIT	0.23
(40) Indirect taxes arrear	ITA	1.35

Government revenue from property and entrepreneurship, GRP^E

This revenue is assumed to depend in the GNP in current prices i.e.

(41) GRPE = a + b GNP"

Interest on public debt, ig

The following relation was adopted

(42) $ig = 0.018\ GDP'$

Subsidies, Sub

IT was supposed that in order to achieve the modernization of agriculture, the subsides per unit of product must increase. The Report 1 does not mention the way this variable was calculated. A plausible assumption is to relate subsidies to the share of agricultural income in the total income i.e.

(43) $Sub = a + b\left(Y^{A}_{VA} . P\right)$

where Y^{A} = value added in agriculture and P = the implicit deflater of GDP.

Tranfers to households, Tr.

From the analysis of the Report[1] for the macroeconomic framework it is not clear how the projected value of this variable was derived. We think that it is highly related to the total public revenue from taxes i.e.

44) $Tr = a + b\ Tax$

where Tax = direct and indirect taxes

Government expenditures

Public investment. I^{g}

In order to derive the public investment (including that of public enterprises and public entities) a questionaire was send to the relevant public agencies. The

answers were based on the investment projects which had started in 1977 and were still under construction. The Report says that for the determination of the necessary public investment, account has also been taken of the main targets of the Plan, the financing requirements and the desired magnitude of public sector. All these considerations led to the adoption of a 7.51 % average real rate of increase of the public investment i.e.

(45) $f_t = f_{t-1}(1 + 0.0751)t.$

Public consuption C^g

It was assumed that with a target of 6 % increase of the real GDP the real public consumption will (must) grow at a rate equal to 7.05 % i.e.

(46) $(f_t = C^g_{t-i} \quad (1+0.0705)t$

Private Consumption C

Given the target values of real GDP, the necessary investment in order to support this target and the public consumption, the level ofp rivate consumption was derived as a residual. It was calculated that its average rate of increase is 4.5 % i.e.

(47) Ct=Ct-1 (1 +0.045)t

Stocks, ST

According to the Report the change in Stocks during the period of the Plan is difficult to be calculated because this variable includes the statistical discrepancies. The adopted rate of increase in stocks is 30.6% i.e.

(48) $ST_t = ST_{t-1}$ (1 +0.306)t

Public saving, Pu^{sa}.

(49) Pu^{sa} = total taxes (direct and indirect) + government income from property and entreprenership — public consumption in current prices,— subsidies — transfers — interest on public debt.

Depreciation, De

Depreciation of the real fixed capital, K, was calculated to be 2.6 % per annum. Therefore

50) $De' = 0.026\ K_{t-1}.p^{inv}$.

where p^{inv} is the implicit deflator of gros investment.

and

(51) $K_t = 0.974K_{t-1} + I_{1t} + I^g_t$

where Ijt = private fixed investment in period t, and

I^g_t = government fixed investment.

Financing from abroad, FFA

Each year the part of investment which is financed from abroad, FFA, equals the difference of the exported from the imported goods plus the difference between imported and exported services, NSe'. Because the imports and exports of goods (relations 20 and 23) above given in constant prices we use the projected deflators of imports p_m, and exports, p_x and have :

(52) $\dot{FFA}' = M.p_m - E.p_x + NSe'$

Private saving, Pr^{sa}.

Private saving in current prices was determined as a residual from the identity:

(53) Prsa = GDP'— De' + NIA + Tr' + ig' + NTHA' — GRP^{E}— Taxd^{ir2}_C'
where NIA' = net income from abroad, NTHA' = net transfers to households from abroad, Tax^{dir2} = direct taxes (including the contributions to social insurance) and the other symbols have been explained previously.

Financing of gross investment

Relation (15) above gives the real fixed investment (private and public) necessary to support the target rate of growth. Applying the projected price index of fixed investment p^{inv}., we convert the real to current values i.e.

(54) $I_t' = I_t . p^{inv}$.

Similarly, we convert the projected value of stocks to current prices by applying the implicit deflator of stocks p^{st}. i.e.

(55) St'= St.pst.

The financing now of fixed capital and stocks in current prices is expressed by the identity

(56) It' + St_t' = prsa' + pu^{sa}' + De' + FFA'

It is reiterated that pr^{sa} = private saving $p_a{}^{sa}$ = public saving, De = depresation and FFA" = financing from abroad,

Prices

To determine the implicit deflator of GDP, (p), during the period of the Plan a projection of its value was made using a 10 % average rate of change i.e.

(57) $p_t = p_{t-1}(1 + 0.01)t$

The projection of some other deflators was necessary in order to convert

some real variables to current prices and vice versa. These deflators are: that of private consumption p_c, public consumption p^g, exports p_x, imports p_m and the implicit deflator of GNP, which for implicity, it is the same deflator of the GDP i.e. p,

Therefore, we have the following relations.

(58) $C = C.pc$ = Private consumption in current prices (c.p.)

(59) $GDP' = GDP.p$ = Gross domestic product in c.p.

(60) $GNP' = GNP.p$ = Gross National product and income in c.p.

(61) $NIA' = NIA.\rho$ = Net income from adroad in c.p.

(62) $C^g = C^g p^g$ = public consumption in c.p.

Other variables of the implicit model

Some of the variables included in the previous relations are not specified. These variables are: the GNP in real terms, the net income from abroad NIA, the net tranfers to households from abroad (variable NTHA in relation 53) and the difference between the imported and exported services (variable Nse in relation 52). From these variables the GNP is given by the relation.

(63) $GNP = GDP + NIA$

whereas the remaining variables can be approximated as functions of time (t), i.e.

(64) $NIA = a + b_1 t$

(65) $Nse' = a + b_2 t$

(66) $NTHA' = a + b_3 t$

III. COMMENTS ON THE IMPLICIT MODEL

It is reiterated that the basis for the «implicit model» presented in the previous section i.e. relations (1 - 66), is the macroeconomic framework of the Five

Year Development Plan of Greece (1978 -82) as described in the relevant Report[1]. In other words, the implicit model is not the model one would construct or use for planning purposes.

As the reader realizes most of the relations of the «implicit model» are not estimated. For an evaluation of the «implicit model» all the relations must be estimated and after some technical arrangements the implicit model can be simulated within and outside its sampling period. Provided the «model» passes the traditional tests of performance, it can be used for simulations covering the time span of the development plan. Such simulations could reveal the consistency (or not of the target rate of growth to the exchange requirements, to the balance of the sectoral (and aggregate) demand and supply, to the labour requirements and labour availability etc.

In the following we present some basic points where the «implicit model» according to our view falls short.

(a) The sectoral value added is determined form the historical elasticities of the sectoral production with respect to GDP. A better approach would use sectoral production functions.

(b) There is no mechanism which allocates the fixed investment to the different sectors. More specifically the requirements for sectoral investment are calculated without any information concerning the expected investment by individuals. This could be done by using sectoral investment functions. Because only when we know (with some probability) the expected private investment by sector, we can adopt a powerful fiscal and monetary policy in order to achieve a sectoral allocation of investment consistent to the main targets of the Plan.

From such a kind of analysis we can also have a better idea regarding the necessary direct government intervention to the investment program. In turn, this will give a better picture of the necessary borrowing requirements of the government.

(c) Although it is checked the balance of the aggregate supply and demand, it is not checked the balance at the sectoral level. This could be done by using a technical matrix which would convert the items of final demand, to final demand from each sector of production.

(d) Although it is know the main constraint in the development process of the Greek economy i.e. the balance of payments, it is not given the appropriate attention. However, the lack of foreign exchange may impede the achievement

of the target rate of growth in the GDP, even though there are plentiful savings in the economy.

I V. CONCLUSIONS AND SUGESTIONS

In concluding this work we consider the following: Greece, a developing economy with ten million population and $4.000 per capita (in 1981), is trying to promote its overall and regional economic development through coordinated efforts by constructing and following Five Year Development Plans. One such development Plan was build for the period 1978 - 82 [2].

The construction of the macroeconomic framework of this Plan was not based on an econometric model. On the other hand, the «implicit model» i.e. the model which is formed from the adopted macroeconomic framework, and which we tried to formulate in this paper, does not seem satisfactory. As a consequence we may argue that the macroeconomic framework of the Plan is deficient. In turn, this might be one of the main causes that led to the rapid deterioration of the economy during the time span of the Plan.

The development of economics has reached nowadays such a point beyond which one cannot hold any theory or make policy suggestions if it is not supported by statistical evidence (usually econometric estimations of functional relations). By a similar reasoning the construction of a five year developmental and regional plan, in which targets are set, constraints are tried to be recognized and policy measures are laid down, necessitates the use of an macroeconometric model i.e. a set of functional relations depicted by economic theory and technology. The appropriate use of such a model can facilitate planning and also can help planners avoid pitfalls.

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