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MODERN INPUT-OUTPUT MODELS AS SIMULATION TOOLS FOR POLICY-MAKING

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PREFACE

Current policy issues require economic models to play the role of rational decision schemes. The problems we face today are more complex than those of the past and the progressive fragmentation of the policy maker's role makes it increasingly necessary to have a coherent scheme forecasting and simulating alternative types of behavior.

There has been a tradition of 'macro' model-building in which the demand side is privileged. However recent events have focused interest on economic variables defined at a more detailed level, and have emphasized the need for policies to be specified at a greater level of disaggregation but consistent at the macro level. In fact macro models provided information on each final demand component but do not describe the structure of each variable. However the sectoral composition of these components is often crucial in indicating the pattern of either technological or behavioral structural change in the economy.

The study to be presented is part of the research work by the INTIMO group to build a modern I/O model of the INFORUM type for Italy. Some results obtained in the estimation of the investment function and in the simulation of the real side of the model are presented.

Work on input-output modeling at IIASA begun in 1979 with Clopper Almon and Douglas Nyhus. During this period there has been considerable progress in the construction, linking and use of input-output models. With substantial help from IIASA and the Inter-Industry Forecasting project (INFORUM) at the

University of Maryland, a self organizing network of collaborating institutions has been built up to work on the development and linkage of input-output models. A Task Force Meeting is held each year at IIASA to draw together the results obtained by the collaborating groups and to discuss future research.

Maurizio Grassini
REGIONAL DEVELOPMENT
GROUP and
SYSTEM AND DECISION
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CONTENTS

MODERN INPUT-OUTPUT MODELS AS SIMULATION TOOLS FOR POLICY MAKING

Maurizio Ciaschini

1. INTRODUCTION

Current policy issues require economic models to play the role of national decision schemes (Caffè 1977, Rey 1965). Since the problems we face today are more complex and the policymaker's role more fragmented than formerly, it has become increasingly necessary to have a coherent scheme for forecasting and simulating alternative types of economic behavior. This naturally implies that the methodological principles underlying economic model building should be carefully examined. Many of the fundamental dichotomies assumed in the past for the sake of simplification appear to be inappropriate for present-day policy problems.

The main distinction between stabilization and growth models is in their statistical and mathematical basis, from which it is easy to find a unique mathematical generating trends and a unique statistical cause generating fluctuations. However, when considering these models from an economic viewpoint, it is more difficult to find a unique cause generating trends and fluctuations (Hicks 1965). Such a distinction, be it explicit or implicit, is based on the idea that stabilization problems should be dealt with by short run demand-oriented models and growth problems by medium run supply-oriented models (Fox et. al 1973). The ultimate implication of such a methodological approach is to neglect the interaction between stabilization and growth aspects, omitting a consistency criterion coordinating short- and medium-term policies.

There has been a tradition of 'macro' model building in which the demand side is privileged. However, recent events have focused interest on economic variables defined in more detail and have emphasized the need for policies to be specified at a greater level of disaggregation but consistent with the macro level. Macro models provide information on each final demand component, such as imports, exports, and domestic consumption but do not describe the structure of each variable. Yet the sectoral composition of these components is often crucial in indicating the pattern of either technological or behavioral change in the economy.

This issue seems to reveal the indadequacy of the concept of the macro-variable (Pasinetti 1975). The internal dynamics of such variables seem to compromise not only the very concept of macro-variables but also their macro inter-relations (Spaventa and Pasinetti 1970). Nor is the solution to be found in disaggregating macro models in a nonsystematic way, such as by introducing additional sectoral equations or splitting the macro results by means of a given set of weights.

To deal with these and other issues Almon (1982) proposes that modern input-output models be used as rational decision schemes for economic policy making. This implies changing the way of looking at the economic process. Although it does not mean that macro aspects of the economy should be ignored, they are no longer considered central to the explanation of the individual's economic behavior. Rather they are the result of an aggregation of the behavior that has been defined and simulated at a more detailed level, for example the level of the input-output sector for total output and intermediate demand, the items of expenditure from household budgets for final consumption, and the appropriate disaggregation for each particular item for the remaining items of final demand.

Such a framework can be used to address a set of issues that are currently relevant to policymaking. In the past these issues were not tackled satisfactorily for a number of reasons.

First, a great part of interest was devoted to the aggregate control of expenditure and taxation. Second, there was a lack of flexible computing programs for estimating sectoral behavioral equations and for operating multisectoral simulation models. Finally, theoretical advantages were not so developed to tackle conveniently the integration of the input-output side with the demand side.

2. MACROECONOMIC and INPUT-OUTPUT MODELS

Steady progress in economic modeling has been stimulated by the increasing complexity of economic problems. For some time analytical tools have been developed independently in two methodological frameworks: input-output models and macroeconomic models.

Traditional input-output models have influenced the field of applied modeling in two ways. First, they have stressed the need to refer to the economic system by means of detailed categories. For such a purpose the producing sector is defined as a component of the system having a homogeneous output for a given technology. Second, they made it clear that production must satisfy not only final demand but also intermediate demand, which can be identified when the technical coefficients (such as those indicating the intermediate demand for the output of a certain sector) have been defined. The main contribution of traditional input-output models is that they allow the list of final demands to be transformed into a vector of sectoral outputs.

Given a vector x representing n outputs, a vector f representing the list m of final demands and a (n x n) matrix A of technical coefficients, the problem of the supply/demand equilibrium is solved by finding a value of vector x such that the following relation is fulfilled:

$$x = Ax + f \quad , \qquad (1)$$

or

$$x_i = \sum_{j=1}^{n} a_{ij}x_j + f_i \quad , \qquad i = 1,\ldots,n \quad , \tag{2}$$

the coefficients a_{ij} were traditionally considered as constants.

Less importance has been devoted to the vector f of final demand. It represents the total final demand for the specific good produced by each sector. Thus, the disaggregation of the final demand components, in general, does not allow their behavioral functions to be adequately specified.

Conversely, macro models have completely ignored the interindustrial aspects since they emphasize Gross Domestic Product only. Nevertheless, they were able to specify the behavirol functions for each demand component with great accuracy.

The supply-demand equilibrium macro-relation is represented by:

$$Y = C(\bullet) + I(\bullet) + G(\bullet) + X(\bullet) - M(\bullet) \quad , \tag{3}$$

where Y represents GDP (Siesto 1977), $C(\bullet)$ is the consumption function, $I(\bullet)$ is the investment function, $G(\bullet)$ is public expenditure, and $X(\bullet)$ and $M(\bullet)$ are exports and imports, respectively. Each final demand component is explained by a set of variables, denoted by $(\bullet)$, among which Y may also appear. The only point of intersection between the two schemes is:

$$\begin{aligned} Y &= \sum_{i=1}^{n} x_i - \sum_{i=1}^{n} \sum_{j=1}^{n} a_{ij}x_j \quad , \\ C + I + G + X - M &= \sum_{i=1}^{n} f_i \quad . \end{aligned} \tag{4}$$

The points of contact between the two approaches have steadily increased and in particular input-output models have begun to explain the final demand formation process without compromising on the multisectoral approach.

The Interindustrial Italian Model--INTIMO (Ciaschini and Grassini 1981)--is a modern input-output model of the INFORUM family

(Almon 1974 and 1981, Young and Almon 1978, Nyhus 1981). The final demand components are explained by behavioral equations econometrically estimated. Each final demand component is explained at a level of disaggregation which allows for a correct specification of the sectoral demand functions. The disaggregated consumption vector is composed of n_1 expenditure items according to the items appearing in the household budget accounts. In fact, the effects of the consumer's behavior through those items can be correctly observed. Investments (F_2) are explained in terms of the n_2 investing industries, and so on for the remaining components of final demand. In this way we obtain:

$$\begin{aligned} F_1 &= F_1(\ldots) \;, \\ F_2 &= F_2(\ldots) \;, \\ &\vdots \\ F_k &= F_k(\ldots) \;, \end{aligned} \qquad (5)$$

where F_1 is the vector of disaggregated consumption functions, F_2 is the vector of disaggregated investments, and so on up to the k^{th} component of final demand.

The multisectoral supply-demand relation is to be fulfilled at the input-output level. We therefore need to transform consistently the $F_1,\ldots,F_k$ demand vector and to do so we make use of bridge matrices $B_1(t)$ - $B_k(t)$ such that

$$\begin{aligned} f_1 &= B_1(t)F_1 \;, \\ f_2 &= B_2(t)F_2 \;, \\ f_k &= B_k(t)F_k \;, \end{aligned} \qquad (6)$$

The B matrices express the consistency between the input-output accounts and the final demand accounts. In this model the equilibrium relation analogous to (1) and (2) is given by:

$$\begin{bmatrix} F_1 \\ \cdot \\ \cdot \\ \cdot \\ F_k \\ X \end{bmatrix} = \begin{bmatrix} & & C_1 \\ & & \cdot \\ & & \cdot \\ & 0 & \cdot \\ & & C_k \\ B_1(t),\ldots,B_k(t) & & A(t) \end{bmatrix} \begin{bmatrix} F_1 \\ \cdot \\ \cdot \\ \cdot \\ F_k \\ X \end{bmatrix} + D_1 + D_2 \quad , \qquad (7)$$

where

$$D_1 = \begin{bmatrix} H_{11} & H_{12} \\ & \\ H_{21} & H_{22} \end{bmatrix} \begin{bmatrix} F_1 \\ \vdots \\ F_k \\ X \end{bmatrix} \quad , \qquad (8)$$

$$D_2 = \begin{bmatrix} K_1 \\ K_2 \end{bmatrix} Z \quad . \qquad (9)$$

Equation (7) shows the simultaneity in the simulation of the model. The $B_1,\ldots,B_k$ bridge matrices allow the purchasing sectors to be connected to the producing sectors. The supply demand equation is solved at the input-output level. This means that we can obtain the solution for final demand according to the purchasing sectors and to the input-output sectors. While the first result allows a change in the demand structure to be analyzed effectively, the other provides information on the destination of output at the input-output level.

$C_1,\ldots,C_k$ matrices represent the parametric structure, econometrically estimated, of the simultaneous relationship between the final demand vectors and sectoral output. Equation (8) shows the lagged effect and equation (9) the exogenous variable effect.

Such is the logical scheme that connects matrices and variables within the model. We now give a detailed example of how demand functions are introduced in the input-output structure, of the type of *a priori* information that can be provided for the model, and of the type of result that can be expected.

3. THE INTEGRATION OF DEMAND: THE ROLE OF INVESTMENT FUNCTIONS

The integration of interindustrial and demand aspects, achieved by means of equation (7), enables us to construct a flow table between the intermediate and final sectors that is much richer in information than traditional flow tables (Ciaschini 1982; M. Grassini 1932; and L. Grassini 1981). Table 1 presents the flow table for the INTIMO model.

Table 1. The flow table for the INTIMO model.

A	B	C	D	E	F	G
INTERMEDIATE FLOWS	CONSUMPTION	INVESTMENT	INVENTORIES	PRIVATE AND PUBLIC EXPENDITURES	IMPORT	EXPORT

Each row of the table referes to a product of the input-output list and each column refers to a purchasing sector. Such sectors, summing to 114, are specified as in Table 2.

Table 2. The flow table for the INTIMO model: purchasing sectors.

MATRIX	PURCHASING SECTOR	CONTENT
A	44	Intermediate demands
B	40	Expenditure items in household budgets
C	23	Investment by investing sector
D	1	Inventory change
E	4	Public administration and private social institution expenditures: 1. Health 2. Education 3. Other public expenditures 4. Private institutions
F	1	Imports
G	1	Exports

Table 2 shows the type of item for which the INTIMO model produces information for each year along the time horizon. The computational algorithm constructs such tables by solving equation (7) iteratively. A given output vector for the input-output sectors is transformed into a vector of total output consistent with final demand equations x. With such a vector and with a vector of exogenous variables y, the set of final demand vectors F_i, i = 1,...,k is determined. These demands are transformed into the input-output demand vectors $f_1,\ldots,f_k$. Then, using the technical coefficients, we can determine the new vector of total output $\hat{x}_{IO}$. If significant differences are found between the vectors x_{IO} and x_{IO}, the procdure is repeated. Within such a loop there exists a further loop that determines the total output vector given the final demand vector.

Intermediate and final demand can be determined simultaneously on the basis of total output because some final demand equations, such as the investment equations, show total output among their arguments. The logical scheme of such a process is shown in Figure 1. The sectoral investment function used is the following. Total investment I is given by expansion investment V and substitution investment S, so that

$$I = V + S \quad . \tag{10}$$

Substitution investment is given by a replacement rate that is r times the capital stock K .

$$S = rK \quad , \tag{11}$$

where the capital stock K is determined as the capital-output ratio k times the smooth output $\bar{Q}$:

$$K = k\bar{Q} \quad . \tag{12}$$

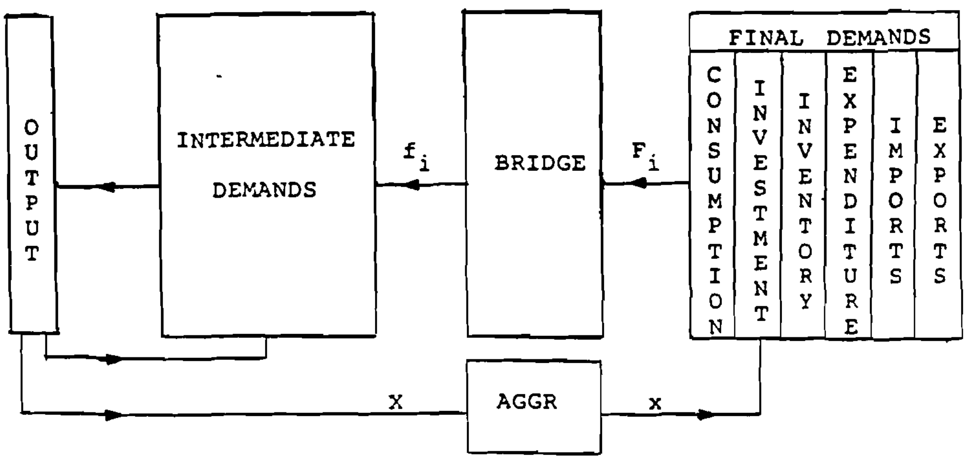


Figure 1. Scheme of the simulation procedure.

Expansion investment is equal to the capital-output ratio k times a distributed lag on changes in output:

$$E = k \sum_{i=0}^{n} w_i \ \Delta Q_{t-i} \quad , \tag{13}$$

where

$$\sum w_i = 1 \quad .$$

The sectoral investment function is then given by:

$$I_t = rk\overline{Q} + k \sum_{i=1}^{n} w_i Q_{t-1} \quad . \tag{14}$$

At this stage the capital cost is not considered within the arguments of the sectoral investment functions. Even if such an element were to be taken into consideration, we do not have available reliable sectoral data on such a variable. Given the limited length of the variable series, the hypothesis of equality between the marginal and the average capital-output ratio was preferred to a more elaborate one.

In the estimation

$$\overline{Q} = 0.5Q_t + 0.3Q_{t-1} + 0.2Q_{t-2} \quad , \tag{15}$$

and

$$I_t = rk\overline{Q} + k(w_0 \Delta Q_t + w_1 \Delta Q_{t-1} + w_2 \Delta Q_{t-2}) \quad , \tag{16}$$

where w_2 is not estimated but calculated according to:

$$w_2 = 1 - w_0 - w_1 \quad . \tag{17}$$

The sectoral investment function estimated for 23 investing industries is then given by:

$$I_t = k(r\overline{Q} + \Delta Q_{t-2}) + kw_0(\Delta Q_t - \Delta Q_{t-2}) + kw_1(\Delta Q_{t-1} - \Delta Q_{t-2}) \quad . \tag{18}$$

The statistical data base for the regression is given by:

1. Investment by producing and investing sectors for 23 investing sectors from 1970 to 1979 in constant and current prices (ISTAT 1970 - 1980).
2. Total output for 44 input-output sectors from 1966 to 1979 determined on the basis of the industrial production index and services' value only.

The relation (18) was imposed on available data, assuming a replacement rate of 10 percent and a distributed lag of the third and fourth order. Selected plots of the regression are shown in Tables A1 - A4 of the Appendix. The results obtained are summarized in Tables 3 and 4. The estimation was performed earlier (Ciaschini 1981), but has been repeated since better information on total output prior to 1970 for the industrial sectors is now available. The goodness-of-fit, in terms of the average absolute percentage error (AAPE), is slightly better in the 4 period lag estimation. However, in such a case the percentage of negative w_i is higher. Some sectoral functions show a reasonable fit. For one third of the sector the AAPE is less than 10 percent, in the second third it is between 10 and 20 percent and in the final third it is greater than 20 percent. All the capital-output ratios show a standard error that makes the estimation look reasonable on statistical grounds, but in at least one third of the w_i estimations the capital-output ratio seems to be too low.

Additional estimations were performed allowing the value of r to vary parametrically. The results relating to the goodness-of-fit in terms of the AAPE are shown in Table 5.

The 23 sectoral investment equations are an example of how a final demand component was introduced consistently in an input-output scheme. For the remaining items of final demand see Ciaschini and Grassini (1982) and Alessandroni (1981).

4. EXOGENOUS INFORMATION

Having introduced the final demand components into the input-output structure (Almon 1979, Nyhus and Almon 1977), we need to define how the model deals with external information.

From a system's viewpoint external inputs may affect the

-- exogenous variables,
-- endogenous variables,
-- parametric structure of the model.

Table 3. Results of estimating sectoral investment functions given a replacement rate of 10 percent and a third order distributed lag.

SECTORS	see	rho	aape	cap/out	t-test	dq(t)	t-test	dq(t-2)	t-test
1 agriculture,for,fishery	220.47	0.499	9.69	1.149	28.21	0.355	1.83	0.549	3.31
2 energy	150.04	0.274	5.86	0.878	46.04	0.354	5.10	0.235	3.41
3 ferrous&non ferrous ores	416.70	0.653	32.44	0.743	7.34	0.568	1.83	0.090	0.27
4 non metal min.&prod.	78.36	0.064	13.61	0.654	19.60	0.540	4.42	-0.135	-0.75
5 chemical products	349.64	0.802	30.24	0.690	10.08	0.191	1.15	0.310	2.21
6 nonmachinery metal products	69.38	0.039	16.28	0.376	14.83	0.269	3.06	0.017	0.14
7 agricultural machinery	73.72	0.144	16.59	0.336	15.91	0.111	2.77	0.056	1.27
8 office, precis,opt instr.	24.61	0.425	25.57	0.331	9.86	0.147	4.08	0.034	0.66
9 electrical goods	61.33	0.330	16.05	0.378	17.16	0.103	1.70	0.154	2.85
10 transport equipment	24.25	0.346	10.38	0.689	27.28	0.437	6.33	0.128	1.92
11 food,beverages&tobacco	54.70	0.373	9.21	0.166	27.59	0.085	4.50	0.048	2.70
12 textiles,clothing,shoes	107.02	0.445	17.40	0.221	13.88	0.089	2.56	0.051	1.48
13 paper&printing	21.77	0.072	7.39	0.285	35.41	0.150	8.44	0.065	3.30
14 rubber & plastics	70.86	0.770	24.26	0.434	9.81	0.272	2.65	0.023	0.21
15 wood & furniture	41.34	0.447	22.17	0.107	13.85	0.089	4.06	-0.034	-1.06
16 construction	41.52	0.505	10.39	0.144	23.67	0.197	5.82	-0.129	-2.88
17 trade	239.99	0.703	12.36	0.575	20.49	0.518	3.44	0.000	0.00
18 hotels & restaurants	42.94	0.469	9.14	0.418	29.68	0.193	2.84	-0.078	-0.81
19 transport	115.73	0.081	5.08	1.448	54.02	0.667	7.21	0.120	1.05
20 communications	256.87	0.693	24.39	3.134	13.03	0.218	0.15	1.339	1.52
21 banking & insurance	88.61	0.772	18.09	0.389	16.98	0.051	0.35	0.185	1.42
22 other services	955.44	0.392	6.99	3.165	31.79	1.684	1.75	1.529	2.01
23 other non dest. serv.	360.74	0.710	10.24	1.399	22.44	1.382	1.67	-0.365	-0.27

Table 4. Results of estimating sectoral investment functions given a replacement role of 10 percent and a forth order distributed lag.

INVESTING SECTORS	SEE	RHO	AAPE	CAP/OUTP	t-test	DQ(t)	t-test	DQ(t-1)	t-test	DQ(t-3)	t-test
1 agriculture,for,fishery	171.17	0.313	7.25	1.139	35.73	0.356	2.37	0.213	1.16	0.363	2.56
2 energy	145.89	0.216	5.74	0.877	47.13	0.386	4.82	0.241	3.57	-0.060	-0.75
3 ferrous&non ferrous ores	389.43	0.760	35.19	0.762	7.94	0.574	1.98	-0.001	-0.00	0.321	1.20
4 non metal min.&prod.	74.63	0.191	12.46	0.655	20.61	0.649	4.10	-0.285	-1.26	-0.119	-1.01
5 chemical products	319.22	0.788	26.36	0.720	10.91	0.022	0.11	0.226	1.59	0.311	1.41
6 nonmachinery metal products	69.12	0.080	16.24	0.376	14.98	0.286	2.64	-0.000	-0.00	-0.022	-0.27
7 agricultural machinery	61.02	0.291	13.25	0.335	19.15	0.032	0.64	0.065	1.77	0.096	2.14
8 office, precis,opt instr.	22.85	0.682	21.99	0.342	10.53	0.118	2.91	0.042	0.86	0.064	1.26
9 electrical goods	48.38	0.586	10.27	0.380	21.86	0.019	0.32	0.101	2.12	0.139	2.46
10 transport equipment	79.38	0.467	9.97	0.689	28.97	0.347	3.37	0.106	1.61	0.106	1.12
11 food,beverages&tobacco	52.44	0.279	9.13	0.165	27.02	0.103	3.93	0.053	2.97	-0.029	-0.93
12 textiles,clothing,shoes	104.78	0.475	17.24	0.228	12.01	0.058	0.98	0.039	0.99	0.065	0.65
13 paper&printing	13.96	-0.098	4.84	0.288	55.18	0.133	10.7	0.055	4.20	0.048	3.78
14 rubber & plastics	59.16	0.642	15.84	0.418	11.10	0.448	3.72	0.052	0.57	-0.296	-2.08
15 wood & furniture	33.61	0.622	17.41	0.105	16.35	0.141	4.87	-0.081	2.44	-0.077	-2.26
16 construction	39.87	0.639	10.80	0.143	24.32	0.170	3.87	-0.087	-1.39	0.030	0.91
17 trade	239.33	0.706	12.30	0.577	19.51	0.510	3.29	0.003	0.01	0.038	0.23
18 hotels & restaurants	22.99	0.528	3.78	0.420	55.52	0.143	3.79	-0.023	-0.44	0.167	4.97
19 transport	93.25	-0.157	4.07	1.460	65.78	0.504	4.92	0.180	1.89	0.232	2.32
20 communications	168.42	0.379	15.73	3.198	20.16	0.729	0.77	-0.193	-0.27	2.268	3.64
21 banking & insurance	88.44	0.767	18.01	0.388	16.51	0.069	0.40	0.189	1.44	-0.026	-0.19
22 other services	883.32	0.138	7.16	3.149	33.94	1.745	1.96	2.040	2.53	-0.926	-1.30
23 other non dest. serv.	280.40	0.255	8.27	1.345	26.33	1.897	2.82	-0.492	-0.47	-1.862	-2.55

Table 5. The Average Absolute Percentage Error for sectorial investment functions with various depreciation rates.

	D E P R E C I A T I O N					R A T E S				
INVESTING SECTORS	0.025	0.050	0.100	0.125	0.150	0.175	0.200	0.225	0.250	0.500
1 agriculture/for/fishery	21.530	14.812	9.685	8.535	7.876	7.386	7.042	6.858	6.709	6.393
2 energy	17.427	10.667	5.863	5.342	4.938	4.616	4.357	4.539	4.690	6.434
3 ferrous&non ferrous ores	34.342	31.819	32.442	32.896	33.201	33.416	33.574	33.693	33.787	34.165
4 non metal min.&prod.	16.674	13.317	13.608	14.103	14.459	14.727	14.935	15.101	15.237	15.879
5 chemical products	32.899	31.590	30.243	29.847	29.547	29.318	29.239	29.249	29.258	29.307
6 nonmachinery metal products	29.516	21.158	16.278	16.103	16.142	16.171	16.193	16.210	16.224	16.291
7 agricultural machinery	26.272	21.466	16.587	15.199	14.163	13.361	12.723	12.202	11.770	9.655
8 office, precis/opt instr.	30.745	28.587	25.573	24.502	23.650	23.055	22.558	22.136	21.774	19.815
9 electrical goods	24.838	20.690	16.054	14.653	13.583	12.859	12.298	11.837	11.452	9.511
10 transport equipment	13.484	11.331	10.384	10.871	11.292	11.777	12.186	12.517	12.789	14.105
11 food/beverages&tobacco	10.054	9.045	9.208	9.525	9.757	9.935	10.076	10.190	10.284	10.744
12 textiles/clothing/shoes	27.241	21.374	17.397	16.543	15.915	15.435	15.055	14.748	14.494	13.616
13 paper&printing	17.391	12.294	7.386	6.109	5.232	4.978	4.982	4.985	5.167	6.310
14 rubber & plastics	27.514	26.003	24.257	23.714	23.294	23.023	22.848	22.848	22.888	24.056
15 wood & furniture	30.147	26.201	22.165	21.010	20.145	19.474	18.938	18.501	18.137	16.407
16 construction	26.057	16.325	10.392	9.306	8.530	7.947	7.491	7.126	6.828	6.332
17 trade	24.140	17.606	12.359	11.121	10.375	9.815	9.379	9.030	8.745	7.390
18 hotels & restaurants	26.296	17.702	9.137	7.362	6.758	6.640	6.696	6.969	7.262	8.912
19 transport	13.157	8.901	5.080	4.127	3.424	3.280	3.337	3.489	3.710	4.836
20 communications	35.502	30.556	24.385	22.397	20.843	19.806	18.976	18.287	17.707	15.155
21 banking & insurance	19.907	18.506	18.094	17.974	17.984	17.813	17.757	17.710	17.672	17.477
22 other services	10.114	7.358	6.991	7.263	7.788	8.218	8.556	8.829	9.054	10.143
23 other non dest. serv.	12.925	11.275	10.239	9.969	9.774	9.648	9.604	9.569	9.541	9.510

With respect to the exogenous variables, this consists mainly in defining the trajectories of a set of exogenously determined variables either as being under the control of a decision maker or as being outside the set of variables the model can influence. In this sense they constitute the traditional exogenous variables, i.e. instruments and data, of the policy problem (Tinbergen 1952).

The effects on the endogenous variables consist in the possibility of substituting the simulated values with observations. This turns out to be particularly useful for the forecasting period that starts with the base year, i.e., the year in which the forecast begins. As we approach the current year from the base year, the available statistical data become gradually less numerous. Thus, the statistical data covering the current year is incomplete.

For all such periods of the forecasting horizon, the model takes the observed values and simulates those values for which there are no statistical data. Only the total output vector cannot be imposed on the observed values but should be simulated. Thus, the initial values for the endogenous variables are always the most recent ones. If there are no data available for a particular variable, it is simulated according to the most recent observations on the other variables.

The effect of exogenous information on the parameter structure allows for a time-change in the technological coefficients and bridge-matrices. This is possible because of the flexibility of the computing routines, which enables us to include time-varying technological coefficients. The trajectories of changes in the exogenous coefficients can be forecasted and imposed on the model. For this purpose we can assume that technological coefficient C varies over time so that the present change is proportional, together with constant b, to the distance between the actual value of C and a given constant value a. In algebraic terms:

$$\frac{1}{c}\frac{dc}{dt} = b\ (a-C) \quad , \tag{19}$$

which admits as a solution the logistic curve

$$c_t = a \;/\; (1+Ae^{-bat}) \quad , \tag{20}$$

where A is an integration constant.

For estimation purposes, equation (20) can be written as

$$\log \left(\frac{a}{C_t} - 1\right) = \log A - bat, \text{ if } \frac{a}{C_t} \geq 1 \quad , \tag{21}$$

or

$$\log \left(1 - \frac{a}{c_t}\right) = \log (-A) - bat, \text{ if } \frac{a}{c_t} \leq 1 \quad .$$

Equation (20) is used for coefficients with increasing values, whereas equation (21) is used for those with declining values.

Unfortunately, we have only one flow matrix for intermediate goods. We therefore apply (20) and (21) to a complete row of the matrix rather than to each coefficient. In this way we are able to identify the dependepent variable C_{it} as an index that shows the volume of intermediate goods provided by a sector for the whole economy as a percentage of the total volume of intermediate goods produced by that sector.

$$C_{it} = U_{it} / V_{it} \quad , \tag{22}$$

where

$$U_{it} = (1 - a_{ij})\, x_{it} - F_i \quad , \tag{23}$$

$$V_{it} = \sum_{j=1}^{n} a_{ii} x_{it} \quad . \tag{24}$$

Such a method of introducing changes in the coefficients is not exhaustive because the price substutution effect on intermediate goods is neglected. This effect can be dealt with by means of Leontief generalized production function (Dewiert 1971), once the price formation process has been modeled. Work on this aspect of the model, which is underway (Ciaschini 1982), is based on Belzer (1978).

The effects of the exogenous information considered above can be classified (Figure 2) in relation to economic policy according to:

(1) assumptions,
(2) demand controls,
(3) structural hypothesis,
(4) forecasting hypothesis.

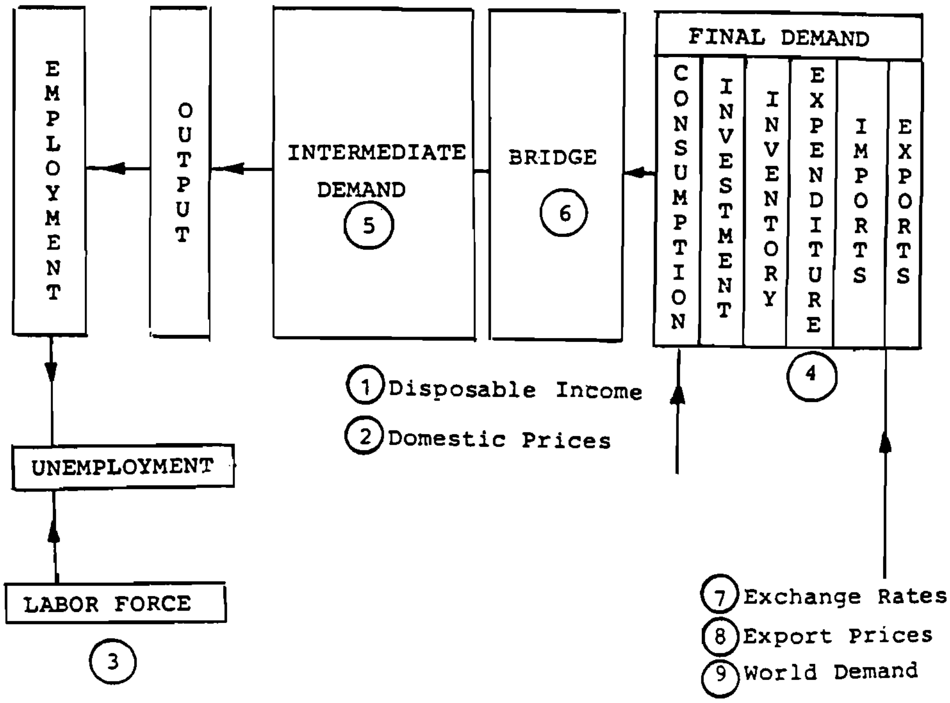


Figure 2. The impact of exogenous information.

The assumptions are represented by the set of variables that makes the output section of the model independent of the price and income side. If the former operates autonomously, we have to specify the trends in domestic prices (2), and in disposable income (1). We have also to forecast the labor force (3).

The demand controls mainly relate to simulation of the effects of different public expenditure paths (5). The disposable income trajectory can also be used in simulating different trends in taxation.

The structural hypothesis allows exogenous changes in the elements of the intermediate coefficients (5) and in the bridge matrices (6) to be taken into account in the model.

The forecasting hypothesis allows us to include in the model information on the exchange rate (7), the vector of international prices for competing exports (8), and world demand (9).

All this exogenous information enables us to formulate a detailed scenario which forms the basis of the forecast. The results obtained are thus a function of the scenario that has been chosen.

5. INFORMATION PRODUCED BY THE MODEL

The exogenous inputs affect the macro and sectoral variables in the model. Having defined a base scenario that takes into account the hypothesis of change in the technological structure of the economic system by means of (20) and (21) and a trajectory of energy demands consistent with the national energy plan, we obtained the macro results shown in Table 6. This table presents the forecasts of the macro variables in the supply-demand equation for a 10-year period together with the associated macro assumptions.

We should stress that these macro results have been obtained using a procedure that aggregates the sectoral results. First, the sectoral forecasts are obtained; they are then aggregated into the macro variables. This process is dependent on the model

Table 6. Aggregated results for a simulation of the base scenario.

	AGGREGATED RESULTS (prices 1975) growth rates									
	75- 79	79- 81	81- 82	82- 83	82- 85	82- 88	82- 90	83- 84	85- 90	75- 90
GROSS DOMESTIC PRODUCT	4.11	1.90	-2.32	3.18	4.56	3.38	3.27	5.52	2.53	2.96
Private Consumption	7.44	2.20	0.12	3.41	3.30	2.94	2.81	3.30	2.52	2.72
Foodstuffs	1.98	1.41	0.39	1.75	1.73	1.60	1.56	1.73	1.45	1.57
Goods	4.10	2.49	-0.11	3.74	3.52	3.03	2.86	3.48	2.47	2.94
Services	4.26	2.62	0.09	4.63	4.52	4.02	3.84	4.54	3.44	3.55
Fixed Investment	1.76	4.64	-12.18	-0.40	7.39	3.80	3.71	12.99	1.20	2.25
Inventory Change										
Exports	9.29	0.71	-1.51	3.34	5.10	4.53	4.49	5.82	4.12	4.86
Goods	9.93	0.70	-0.86	3.58	5.45	4.78	4.74	6.21	4.31	5.21
Services	5.59	0.78	-5.69	1.74	2.75	2.78	2.71	3.18	2.69	2.66
Imports	6.13	0.93	-3.56	3.57	5.21	3.53	3.47	6.52	2.43	3.37
Goods	6.20	0.81	-3.78	3.59	5.31	3.56	3.50	6.69	2.42	3.38
Services	5.41	2.04	-1.56	3.31	4.28	3.27	3.18	4.95	2.53	3.31
Public and Social Private Expenditure	2.29	1.93	2.07	2.03	1.99	2.01	2.00	1.99	2.00	2.07
Government	2.30	1.93	2.08	2.04	2.00	2.02	2.00	2.00	2.00	2.08
Education	2.23	1.93	2.09	2.04	2.00	2.02	2.00	2.00	2.00	2.06
Health	2.34	1.92	2.05	2.01	1.97	2.00	1.98	1.97	1.98	2.07
Social Private Expenditure	2.18	2.07	2.02	1.98	1.94	2.00	1.98	1.94	2.01	2.05
Employment	0.67	0.64	-1.38	-1.13	1.57	1.16	1.08	2.50	0.79	0.75
ASSUMPTIONS										
Disposable Income(per cap)	3.46	0.00	2.65	3.34	3.24	2.87	2.74	3.23	2.45	2.56
Unemployment	5.01	21.40	40.33	19.93	-15.91	-9.78	-9.33	-21.87	-5.38	1.90
Exchange Rate	2.94	1.96	1.69	1.67	1.64	1.45	1.39	1.64	1.24	1.90
Foreing Demand	5.26	-1.90	0.96	1.74	2.75	2.78	2.71	3.18	2.69	2.66

operating at the sectoral level without the assistance of the macro part that 'drives' it.

The unemployment variable is the result of the difference between the labor force forecast, which is exogenously given, and total employed. Such a variable provides a first check at the macro level of the consistency of the model inputs.

A selection of plots of the sectoral results that generated the aggregated information given in Table 6 is given in the Appendix. These results show the sectoral structure of each macro variable and the path followed within the forecasting horizon. In particular Tables A5 to A7 in the Appendix show results obtained for employment in 7 employment sectors and the consumption for 4 items of household budgets in the 'base' scenario. Sectoral results are also available at the input-output disaggregation level; this is particularly useful when a detailed analysis of a single input-output sector is required. Table A8 shows the forecasts for total output, imports, exports, and consumption for input-output sector 4. Tables A9 and A10 show the same items for input-output sectors 11 and 27.

A detailed analysis of the tables produced in one simulation thus shows the results on three different levels: the macro level, the purchasing sector, and the selling sector.

The forecasting method using the scenario approach not only enables us to evaluate the effects of exogenous inputs on the set of specific trajectories, it also allows us to take full advantage of the information generated by comparing the results of various scenario hypotheses. Table 7 presents the macro results of the 'base' scenario plus scenarios ALT 1 and ALT 2.

In ALT 1 the energy hypothesis was maintained while assuming a constant technological structure. In ALT 2 the technical coefficient change was maintained while dropping the energy hypothesis.

Table 7 summarizes the results obtained from the three scenarios and compares the average growth rates for the aggregated results over the periods 1985 - 1990 and 1975 - 1990.

Table 7. The aggregated results obtained from the base scenario and ALTs 1 and 2.

	(base) 75-81	(base) 81-82	(base) 82-85	(base) 85-90	(alt1) 85-90	(alt2) 85-90	(base) 75-90	(alt1) 75-90	(alt2) 75-90
GROSS DOMESTIC PRODUCT	3.41	-2.32	4.56	2.53	2.50	2.49	2.96	2.96	2.95
Private Consumption	3.03	0.12	3.30	2.52	2.52	2.52	2.72	2.72	2.72
Foodstuffs	1.79	0.39	1.73	1.45	1.45	1.45	1.57	1.57	1.57
Goods	3.56	-0.11	3.52	2.47	2.47	2.47	2.94	2.94	2.94
Services	3.74	0.09	4.52	3.44	3.44	3.44	3.55	3.55	3.55
Fixed Investment	2.72	-12.18	7.89	1.20	1.49	1.49	2.25	2.59	2.61
Inventory Change									
Exports	6.43	-1.51	5.10	4.12	4.12	4.12	4.86	4.86	4.86
Goods	6.85	-0.86	5.45	4.31	4.31	4.31	5.21	5.21	5.21
Services	3.98	-5.69	2.75	2.69	2.69	2.69	2.66	2.66	2.66
Imports	4.39	-3.56	5.21	2.43	2.72	2.76	3.37	3.70	3.76
Goods	4.40	-3.78	5.31	2.42	2.72	2.77	3.38	3.73	3.79
Services	4.29	-1.56	4.28	2.53	2.71	2.74	3.31	3.42	3.46
Public and Private Social Expenditure	2.17	2.07	1.99	2.00	2.00	2.01	2.07	2.07	2.05
Administration	2.18	2.09	2.00	2.00	2.00	2.01	2.08	2.08	2.05
Education	2.13	2.09	2.00	2.00	2.00	2.01	2.06	2.06	2.05
Health Care	2.20	2.05	1.97	1.98	1.98	2.01	2.07	2.07	2.05
Social Private Expenditures	2.14	2.02	1.94	2.01	2.01	2.01	2.05	2.05	2.05
EMPLOYMENT	0.66	-1.38	1.57	0.79	0.95	0.88	0.75	0.91	0.88
ASSUMPTIONS									
Disposable income (per cap)	2.31	2.65	3.24	2.45	2.45	2.45	2.56	2.56	2.56
Unemployment	10.47	40.33	-15.91	-5.38	-21.86	-14.51	1.90	-6.43	-3.78
Exchange Rate	2.62	1.69	1.64	1.24	1.24	1.24	1.90	1.90	1.90
Foreign Demand	2.87	0.96	2.75	2.69	2.69	2.69	2.66	2.66	2.66

Note that the average growth rate in consumption and total exports is the same in all three simulations. This is because in the model consumption depends on disposable income and relative domestic price trend assumptions, which were kept the same for all the simulations. The effects of prices on the consumption structure can be simulated when the price side of the model is complete. The interaction between output and prices can thus be adequately taken into account. Exports depend on the forecasting hypothesis related to the exchange rate, world demand, and the vector of international prices for competing exports, which were also kept the same for all three simulations. The average growth rate of Gross Domestic Product throughout the forecasted period is almost identical in all three simulations. Such a growth rate is compatible with the different unemployment growth rates of the three scenarios and is explained by the fact that the sectoral structure of total output appears to be significantly more important than GDP in determining employment through productivity equations.

The sectoral results, which are presented in aggregated form in Table 7, are given in Tables A11 to A14 of the Appendix. They show the growth rates for sectoral output, employment, consumption and investment. The complete set of such tables is of particular interest for policy forecasting since it describes the growth in the sectoral structure of the most relevant economic variables. These results can also be used for defining new scenarios and for verifying the consistency of those already defined. The tables indicate how the dynamics of the macro variables sectoral composition affects both their structure and level. By measuring the time change in the sectoral composition of the relevant economic variables, we are able to evaluate the simultaneous effect of changes in the technological and behavioral structure of the given economic system. This is one of the main issues of present-day policy making.

6. CONCLUSIONS

In recent years economic policy problems have outgrown the instruments designed to support the policy makers's activity. Modern input-output models constitute an attempt to provide schemes for dealing with such problems.

The applications that can be made of the theoretical results obtained go through two main stages: (i) the integration of the input-output side of the model with the demand side so that sectoral demand equations can be consistently specified in the real part of the model, and (ii) the formulation of the price side of the model so that all information on sectoral prices and value added components can be conveniently exploited.

In this paper some characteristics of a real part of a modern input-output model for Italy have been described and some results of the simulations presented. In particular it has been shown how a simple investment theory was used for estimating sectoral investment functions and under which assumptions the input-output technical coefficients were made to change according to forecasted patterns.

A price side is also being developed for the Italian economy so that the relative price vectors shall be simulated simultaneously with the remaining endogeneous variables. This shall improve the effectiveness of the whole scheme; for example, in the case of the price substitution effect on technical coefficients, the availability of a price side is essential for the endogenous determination of the coefficient change.

The theoretical and applicative improvements that can be attained are heavily influenced by the quality and coherence of the statistical data available. An increasing effort is required to the data sources in order that a greater quantity of information on input-output data, as well as sectoral demands be provided in a greater detail and with an higher degree of coherence.

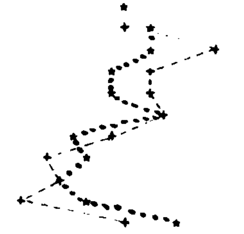
APPENDIX

Table 1A. Results of the estimation of investment function for energy sector.

```
sector    2 energy                                buildings

   2  see =  150.0204   rsqr =-0.3217 . rbarsqr =-0.6993
rho = 0.274 aape =    5.06

 variable     regres-coef      std.error          t-value
 capital/outp        0.873244        0.019074         46.0434
 dq(t)               0.354266        0.069406          5.1042
 dq(t-1)             0.235808        0.068980          3.4181
 gross invest dependent variable
 date actl=*  predic=+ miss=p-a*
  70   2215.00  2098.48  -116.52
  71   2216.00  2417.04   201.04
  72   2091.00  2194.40   103.40
  73   2072.00  2222.04   150.04
  74   2224.00  2232.74     8.74
  75   1963.00  2067.25   104.25
  76   2011.00  1859.72  -151.28
  77   1901.00  1902.95     1.95
  78   2008.00  1770.58  -237.42
  79   2239.00  2129.41  -158.59
 date actl=*  predic=+ miss=p-a*
                                 0.      419.6     839.2    1258.7    1678.3    2097.9    2517.5    2937.1    3356.6    3776.2
non-neg coef    0.03752   0.35427   0.23591   0.28817   0.
```



```
   3  see =  145.8948   rsqr =-0.2500   rbarsqr =-0.2750
rho = 0.216 aape =    5.74

 variable     regres-coef      std.error          t-value
 capital/outp        0.877125        0.018609         47.1356
 dq(t)               0.326955        0.079119          4.8298
 dq(t-1)             0.241232        0.067473          3.5753
 dq(t-3)            -0.062504        0.079393         -0.7573
 gross invest dependent variable
 date actl=*  predic=+ miss=p-a*
  70   2215.00  2153.99   -56.01
  71   2216.00  2444.14   228.14
  72   2091.00  2161.57    80.57
  73   2072.00  2206.26   134.26
  74   2224.00  2192.64   -31.36
  75   1963.00  2068.77   105.77
  76   2011.00  1836.61  -174.39
  77   1901.00  1861.56   -39.44
  78   2008.00  1774.28  -233.72
  79   2288.00  2173.58  -114.42
 date actl=*  predic=+ miss=p-a*
                                 0.      419.6     839.2    1258.7    1678.3    2097.9    2517.5    2937.1    3356.6    3776.2
non-neg coef    0.03771   0.36199   0.22566   0.28943   0.
```

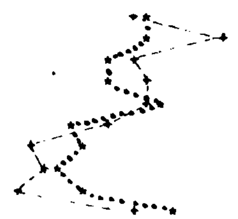


Table A2. Results of the estimation of investment function for paper and forestry sector.

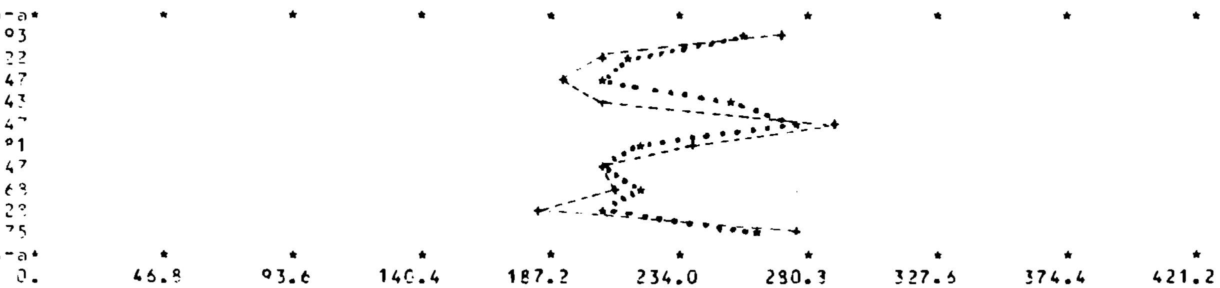
sector 13 paper&printing buildings

2 see = 21.7740 rsqr = 0.3439 rbarsqr = 0.1564
rho = 0.072 aape = 7.39

variable	regres-coef	std.error	t-value
capital/outp	0.285639	0.008066	35.4107
dq(t)	0.150710	0.017852	8.4422
dq(t-1)	0.065720	0.019907	3.3014

gross invest dependent variable

date	actl=*	predic=+	miss=p-a*
70	258.00	275.93	17.93
71	217.00	207.78	-9.22
72	206.00	194.53	-11.47
73	255.00	210.57	-44.43
74	279.00	294.47	15.47
75	220.00	242.91	22.91
76	208.00	209.47	1.47
77	224.00	212.32	-11.68
78	210.00	186.72	-23.28
79	263.00	280.75	17.75
date	actl=*	predic=+	miss=p-a*



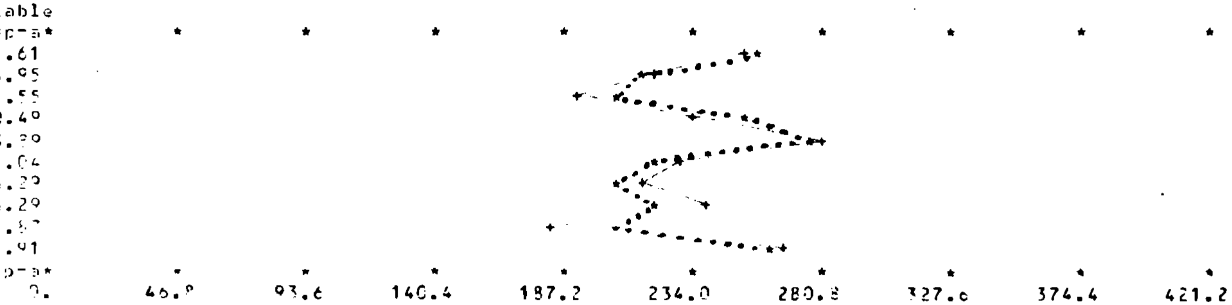
non-neg coef 0.02356 0.15071 0.06572 0.06921 0.

3 see = 13.9617 rsqr = 0.7303 rbarsqr = 0.5954
rho =-0.097 aape = 4.94

variable	regres-coef	std.error	t-value
capital/outp	0.288526	0.005228	55.1873
dq(t)	0.133155	0.012351	10.7811
dq(t-1)	0.055029	0.013073	4.2094
dq(t-3)	0.048134	0.012713	3.7847

gross invest dependent variable

date	actl=*	predic=+	miss=p-a*
70	258.00	256.39	-1.61
71	217.00	220.95	3.95
72	206.00	194.45	-11.55
73	255.00	234.51	-20.49
74	279.00	282.90	3.90
75	220.00	231.04	11.04
76	208.00	216.29	8.29
77	224.00	242.29	18.29
78	210.00	185.13	-24.87
79	263.00	267.91	4.91
date	actl=*	predic=+	miss=p-a*



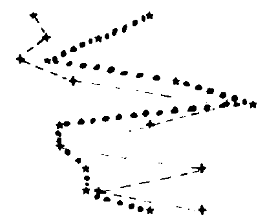
non-neg coef 0.02885 0.13315 0.05503 0.05221 0.04913

Table A3. Results of the estimation of investment function for food, beverages, and tobacco sector.

```
sector  11 food/beverages&tobacco          buildings

   2  see =   54.7097   rsqr =-0.3960   rbarsqr =-0.7820
rho = 0.373 aape =   9.21

 variable     regres-coef      std.error          t-value
 capital/outp        0.166853       0.006046          27.5962
 dq(t)               0.085447       0.013957           4.5073
 dq(t-1)             0.048572       0.017974           2.7023
 gross invest dependent variable
 date actl=*  predic=+ miss=p-a*
  70    476.00   393.15   -82.85
  71    440.00   409.91   -30.09
  72    409.00   391.39   -17.61
  73    499.00   420.32   -78.68
  74    555.00   534.50   -20.50
  75    417.00   479.13    62.13
  76    412.00   413.98     1.98
  77    432.00   515.79    83.79
  78    437.00   444.67     7.67
  79    479.00   515.13    36.13
 date actl=*  predic=+ miss=p-a*
                               0.      91.1     182.2     273.4     364.5     455.6     546.7     637.3     729.0     820.1
non-neg coef   0.01669   0.03545   0.04357   0.03283   0.
```



```
   3  see =   52.4470   rsqr =-0.2737   rbarsqr =-0.9106
rho = 0.279 aape =   9.13

 variable     regres-coef      std.error          t-value
 capital/outp        0.165045       0.006109          27.0228
 dq(t)               0.103156       0.026194           3.9382
 dq(t-1)             0.053548       0.018023           2.9703
 dq(t-3)            -0.029784       0.031724          -0.9389
 gross invest dependent variable
 date actl=*  predic=+ miss=p-a*
  70    476.00   412.79   -63.21
  71    440.00   409.77   -30.23
  72    409.00   387.10   -21.90
  73    499.00   411.01   -37.99
  74    555.00   546.54    -8.46
  75    417.00   482.66    65.66
  76    412.00   395.56   -16.44
  77    432.00   490.51    58.51
  73    437.00   441.20     4.20
  79    479.00   533.43    54.43
 date actl=*  predic=+ miss=p-a*
                               0.      91.1     182.2     273.4     364.5     455.6     546.7     637.3     729.0     820.1
non-ney coef   0.01650   [illegible]   0.04536   0.03230   0.
```

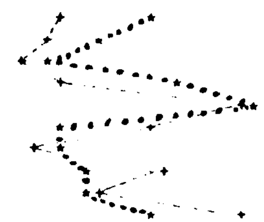


Table A4. Results of the estimation of the investment function for transport sector.

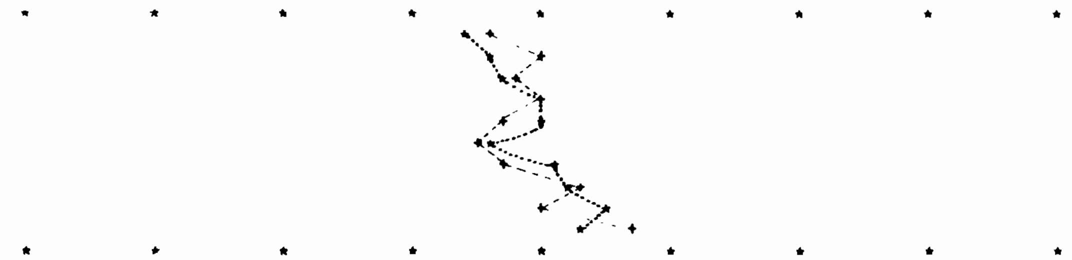
sector 19 transport buildings

2 see = 115.7305 rsqr = 0.1936 rbarsqr =-0.0365
rho = 0.031 aape = 5.08

variable	regres-coef	std.error	t-value
capital/outp	1.448951	0.026822	54.0218
dq(t)	0.667251	0.092529	7.2112
dq(t-1)	0.120879	0.114055	1.0598

gross invest dependent variable

date	actl=*	predic=+	miss=p-a*
70	1676.00	1747.66	71.66
71	1759.00	1904.33	145.33
72	1765.00	1833.36	68.36
73	1901.00	1878.41	-22.59
74	1911.00	1789.53	-121.47
75	1754.00	1716.48	-37.52
76	1943.00	1798.45	-144.55
77	1984.00	2015.51	31.51
78	2065.00	1894.07	-170.93
79	1998.00	2145.79	147.79
date	actl=*	predic=+	miss=p-a*



0. 375.1 750.2 1125.4 1500.5 1875.6 2250.7 2625.8 3001.0 3376.1

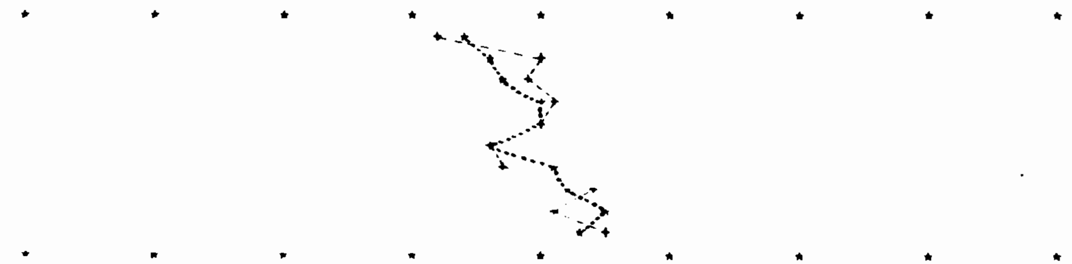
non-neg coef 0.14490 0.66725 0.12033 0.66092 0.

3 see = 93.2516 rsqr = 0.4765 rbarsqr = 0.2148
rho =-0.157 aape = 4.07

variable	regres-coef	std.error	t-value
capital/outp	1.460811	0.022205	65.7881
dq(t)	0.504363	0.102314	4.9296
dq(t-1)	0.180405	0.095393	1.8911
dq(t-3)	0.232301	0.099932	2.3246

gross invest dependent variable

date	actl=*	predic=+	miss=p-a*
70	1676.00	1602.86	-73.14
71	1759.00	1884.13	125.13
72	1765.00	1839.29	74.29
73	1901.00	1935.33	34.33
74	1911.00	1892.60	-18.40
75	1754.00	1730.00	-24.00
76	1943.00	1786.84	-156.16
77	1984.00	2034.77	50.77
78	2065.00	1939.53	-125.47
79	1998.00	2030.97	32.97
date	actl=*	predic=+	miss=p-a*



0. 375.1 750.2 1125.4 1500.5 1875.6 2250.7 2625.8 3001.0 3376.1

non-neg coef 0.14608 0.50436 0.13241 0.54374 0.23230

Table A5. Employment forecasts for sectors 7, 8, 9, and 31.

graphs of selected sectors for run: intimo - simulation1: base

the following items are being plotted:

sect-#:	titles:	type:	mark: sector detail:
7	ferrous&non ferrous ores	employment	(*)
8	non metallic min.&prod	employment	(+)
9	chemical products	employment	($)
31	inland tranportation	employment	(#)

year	emp 7 (*)	emp 8 (+)	emp 9 ($)	emp 31 (#)
1970	241.10	427.80	282.20	638.30
1971	242.10	420.10	291.40	646.80
1972	250.00	404.30	291.20	659.60
1973	258.20	407.50	293.40	674.80
1974	275.50	414.50	306.60	688.40
1975	280.70	414.10	307.90	703.00
1976	286.70	413.70	306.70	724.70
1977	293.40	412.70	305.70	733.80
1978	293.80	405.60	300.20	738.50
1979	295.10	403.90	297.60	742.20
1980	293.20	403.40	294.00	749.90
1981	291.10	396.10	288.80	762.80
1982	290.94	385.21	277.35	734.34
1983	288.16	369.96	269.94	728.92
1984	306.65	387.41	269.67	749.52
1985	336.29	413.84	270.50	774.02
1986	348.24	424.05	268.75	784.57
1987	343.57	418.96	264.98	786.29
1988	344.11	410.18	260.80	785.84
1989	354.97	404.87	256.89	789.32
1990	381.11	406.42	253.71	799.65

1975 = 100%

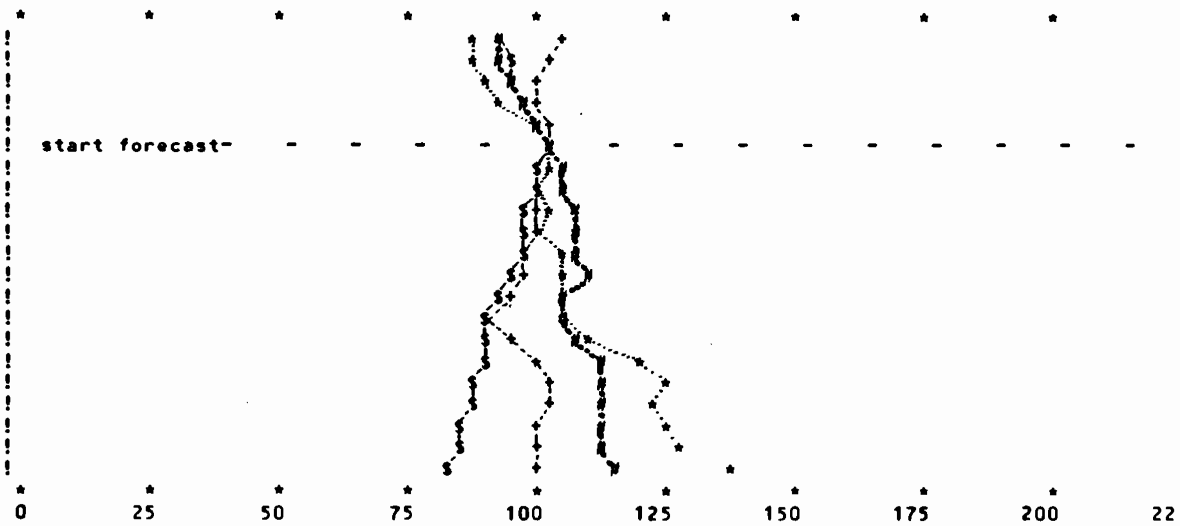


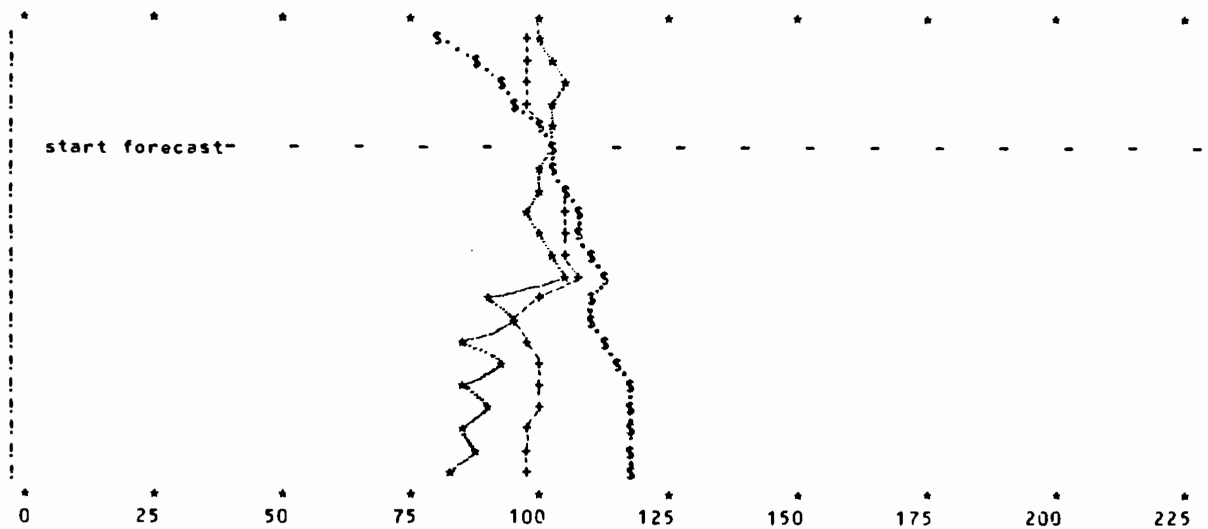
Table A6. Employment forecasts for sectors 32, 33, and 34.

1 graphs of selected sectors for run: intimo - simulazione1: base

the following items are being plotted:

sect-#:	titles:	type:	mark: sector detail:
32	sea & air transport	employment	(*)
33	transport services	employment	(+)
34	communications	employment	($)

year	emp 32 (*)	emp 33 (+)	emp 34 ($)
1970	64.00	134.30	179.00
1971	65.40	135.50	196.50
1972	66.40	135.10	204.70
1973	65.40	133.80	211.10
1974	65.60	139.80	222.10
1975	64.10	140.40	226.30
1976	63.10	143.90	231.50
1977	62.50	145.20	233.80
1978	62.20	144.10	237.90
1979	63.30	145.20	239.50
1980	65.60	147.40	246.50
1981	66.90	149.70	251.50
1982	57.48	138.79	247.04
1983	60.62	133.35	244.52
1984	54.43	134.86	249.83
1985	58.93	137.43	256.52
1986	54.35	138.29	260.62
1987	57.26	137.52	261.83
1988	53.26	136.12	262.01
1989	55.10	135.02	262.33
1990	51.93	134.36	263.77



1975 = 100%

Table A7. Private consumption forecasts for sector 1, 2, 3, and 4.

1 graphs of selected sectors for run: intimo - simulazione1: base

the following items are being plotted:

sect-#:	titles:	type:	mark: sector detail:
1	bread and cereals	private consumption	(*)
2	meat	private consumption	(+)
3	fish	private consumption	($)
4	milk and cheese	private consumption	(#)

year	pce 1 (*)	pce 2 (+)	pce 3 ($)	pce 4 (#)
----	------	------	------	------
1970	3143.6	7028.5	888.24	2920.9
1971	3171.5	7385.8	884.50	2929.4
1972	3246.0	7521.9	908.86	3070.5
1973	3307.4	8083.3	867.63	3170.8
1974	3404.3	8010.2	854.51	3167.4
1975	3354.0	7903.0	877.00	3164.0
1976	3378.0	8223.0	924.00	3169.0
1977	3348.0	8385.0	909.00	3303.0
1978	3359.0	8878.0	933.00	3443.0
1979	3402.0	9101.0	963.00	3574.0
1980	3477.0	9445.0	1020.00	3632.0
1981	3439.0	9492.0	1123.00	3608.0
1982	3454.6	9597.7	1035.46	3700.0
1983	3465.3	9857.4	1047.99	3772.5
1984	3478.8	10104.2	1059.52	3837.2
1985	3492.2	10351.6	1071.01	3901.9
1986	3505.0	10566.7	1081.80	3956.8
1987	3516.0	10791.0	1093.23	4016.9
1988	3527.0	11015.6	1104.63	4076.8
1989	3537.9	11240.3	1116.00	4136.7
1990	3548.8	11465.2	1127.35	4196.4

1975 = 100%

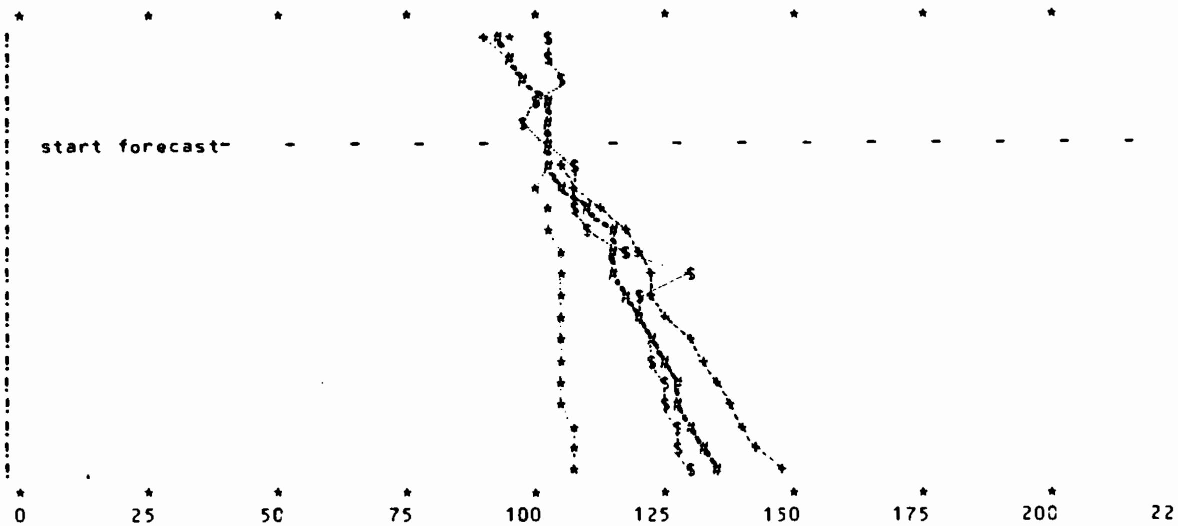
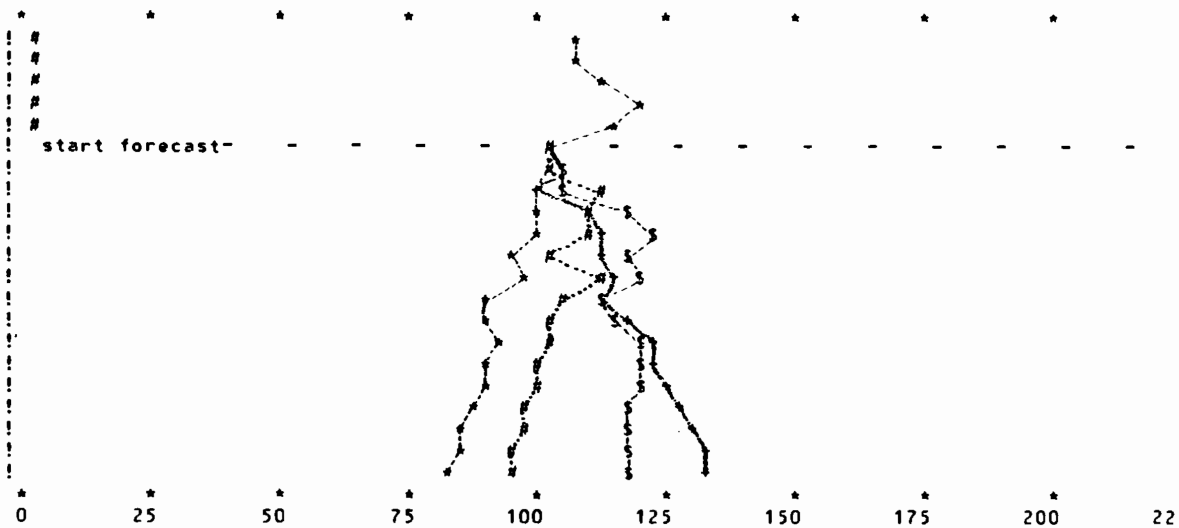


Table A8. Total output, consumption (I-O), import, and export forecasts for sector 4.

the following items are being plotted:

sect-#:	titles:	type:	mark: sector detail:
4	petroleum,gas refining	total output	(*)
4	petroleum,gas,refining	consumption io	(+)
4	petroleum,gas,refining	imports	($)
4	petroleum,gas,refining	exports	(#)

year	rdi 4 (*)	pio 4 (+)	imp 4 ($)	exp 4 (#)
1970	10756.	0.0	0.0	0.0
1971	10943.	0.0	0.0	0.0
1972	11251.	0.0	0.0	0.0
1973	12036.	0.0	0.0	0.0
1974	11520.	0.0	0.0	0.0
1975	10154.	3521.6	6202.0	1230.0
1976	10492.	3611.3	6396.0	1252.0
1977	11232.	3513.5	6413.0	1356.0
1978	9932.	3795.3	7205.3	1352.7
1979	10139.	3928.5	7462.7	1337.9
1980	9627.	3937.3	7263.7	1256.1
1981	9748.	4020.8	7328.8	1376.1
1982	8945.	3953.4	6965.2	1271.3
1983	9063.	4114.4	7111.8	1255.2
1984	9248.	4276.3	7299.6	1239.4
1985	9128.	4243.5	7300.0	1223.7
1986	8995.	4337.0	7292.4	1208.3
1987	8820.	4424.2	7259.3	1193.0
1988	8629.	4507.0	7215.8	1177.9
1989	8466.	4585.4	7189.8	1163.1
1990	8322.	4659.4	7174.9	1148.4



1975 = 100%

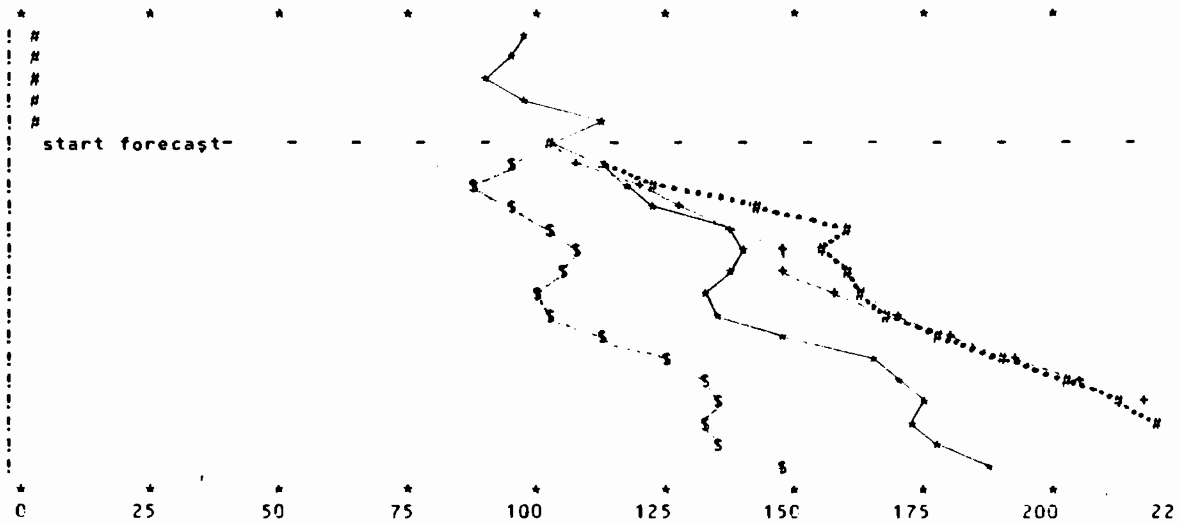
Table A9. Total output, consumption, import, and export forecasts for sector 11.

graphs of selected sectors for run: intimo - simulation1: base

the following items are being plotted:

sect-#:	titles:	type:	mark: sector detail:
11	agric.&industr.machinery	total output	(*)
11	agric.&industr.machinery	consumtion io	(+)
11	agric.&industr.machinery	imports	($)
11	agric.&industr.machinery	exports	(#)

year	rdi 11 (*)	pio 11 (+)	imp 11 ($)	exp 11 (#)
1970	7229.8	0.00	0.0	0.0
1971	6940.7	0.00	0.0	0.0
1972	6687.7	0.00	0.0	0.0
1973	7172.9	0.00	0.0	0.0
1974	8249.9	0.00	0.0	0.0
1975	7475.8	30.74	1734.0	3490.0
1976	8018.3	32.90	1644.0	3855.0
1977	8602.6	36.74	1517.0	4192.0
1978	9122.4	38.76	1643.0	4894.8
1979	10122.3	42.15	1734.5	5545.3
1980	10368.1	44.99	1858.4	5388.0
1981	10267.6	45.12	1817.5	5579.5
1982	9775.6	48.15	1723.5	5595.4
1983	10001.3	51.65	1759.8	5787.8
1984	11025.2	55.26	1948.4	6179.6
1985	12149.4	59.00	2157.5	6620.9
1986	12687.3	62.49	2262.8	7001.3
1987	12930.2	66.12	2302.2	7347.7
1988	12887.0	69.37	2268.4	7670.0
1989	13185.7	73.74	2331.0	8000.3
1990	13968.3	77.76	2539.9	8352.2



1975 = 100%

Table A10. Total output, consumption, import, and export forecasts for sector 27.

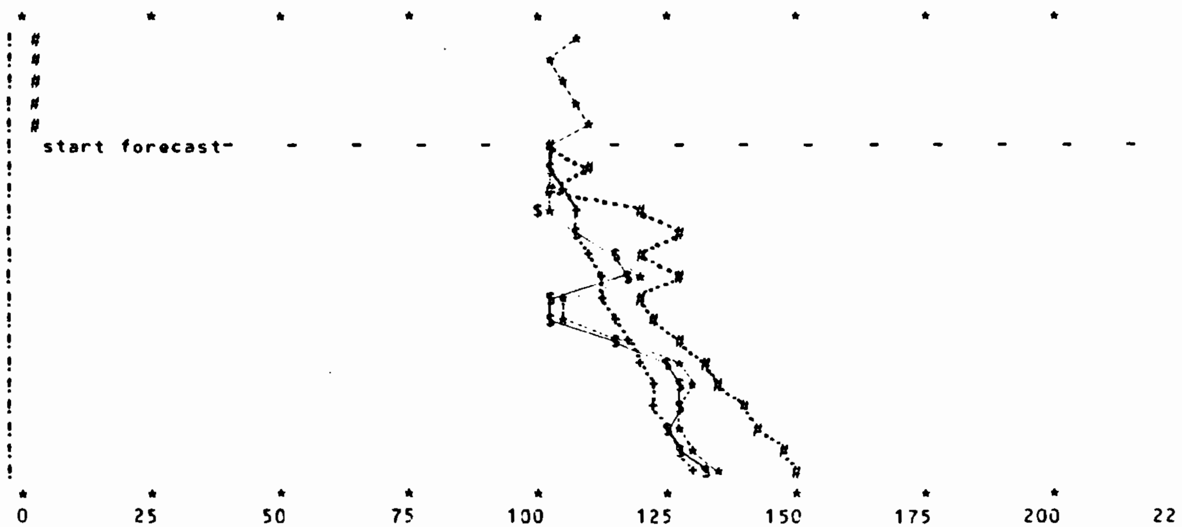
graphs of selected sectors for run: intimo - simulazione1: base

the following items are being plotted:

sect-#:	titles:	type:	mark: sector detail:
27	constructions	total output	(*)
27	construstions	consumptions	(+)
27	constructions	imports	($)
27	constructions	exports	(#)

q

year	rdi 27 (*)	pio 27 (+)	imp 27 ($)	exp 27 (#)
1970	19101.	0.00	0.00	0.00
1971	18236.	0.00	0.00	0.00
1972	18428.	0.00	0.00	0.00
1973	18993.	0.00	0.00	0.00
1974	19383.	0.00	0.00	0.00
1975	17931.	160.39	6.00	1.00
1976	18064.	163.65	6.00	1.08
1977	18019.	166.15	6.00	1.00
1978	18160.	168.84	5.99	1.18
1979	19124.	171.81	6.31	1.25
1980	20502.	175.06	6.77	1.18
1981	21111.	176.76	6.97	1.27
1982	18549.	178.85	6.12	1.20
1983	18478.	182.27	6.10	1.22
1984	20748.	185.88	6.85	1.26
1985	22663.	189.48	7.48	1.30
1986	23053.	192.85	7.61	1.34
1987	22757.	196.10	7.51	1.38
1988	22510.	199.35	7.43	1.42
1989	22865.	202.59	7.55	1.45
1990	23846.	205.83	7.37	1.49



1975 = 100%

Table 11. Total output vector forecasts comparison for simulations 'base' Alt 1 and Alt 2.

TOTAL OUTPUTS (prices 1975)
rates of change

	base) (5- 81	base) (81- 82	base) (82- 85	base) (85- 90	alt1) (85- 90	alt2) (85- 90	base) (75- 90	alt1) (75- 90	alt2) 75- 90
TOTAL OUTPUT	3.59	-2.81	4.76	2.41	2.59	2.57	3.01	3.10	3.10
1 agriculture,for,fishery	0.61	-4.35	2.30	0.37	2.01	2.01	0.53	2.31	2.36
INDUSTRY	4.43	-2.64	5.46	2.70	2.86	2.88	3.59	3.55	3.64
ENERGY PRODUCTS	2.12	-5.11	3.50	1.31	2.41	2.42	1.65	2.82	2.79
2 coal	3.53	0.35	12.43	6.80	3.87	3.89	6.19	2.85	2.80
3 coke	4.92	0.19	14.23	0.65	4.08	4.11	5.04	4.64	4.60
4 petroleum,gas,refining	-0.69	-3.60	0.67	-1.85	2.07	2.12	-1.33	2.42	2.41
5 electricity,gas,water	5.93	-1.59	5.29	4.02	2.76	2.71	4.66	3.25	3.24
MANUFACTURING	4.78	-2.30	5.72	2.87	2.93	2.95	3.86	3.66	3.77
8 non metal min,min prod	4.14	-4.98	8.90	4.23	4.64	4.65	4.51	5.14	5.09
9 chemical products	4.91	-8.30	7.13	2.42	2.51	2.37	3.65	3.33	3.05
10 metal products	4.85	1.17	4.72	3.39	3.28	3.28	4.09	3.87	3.90
11 agric.& indus.machinery	7.74	-4.91	7.77	2.55	2.43	2.58	5.17	4.75	4.87
12 office,precis,opt instr.	5.29	-4.91	7.25	2.79	2.99	2.85	4.17	4.59	3.98
13 electrical goods	4.41	-4.02	7.18	2.28	2.34	2.65	3.69	3.81	4.05
14 motor vehicles	5.01	-0.89	6.56	4.18	4.34	4.31	4.65	4.47	4.78
15 other transport equipment	8.39	-3.66	7.51	3.44	3.57	3.59	5.76	5.69	6.05
16 meat	2.09	-4.04	6.18	3.45	3.41	3.82	2.96	2.92	3.28
17 mill	2.80	0.90	2.64	2.10	2.10	2.10	2.41	2.41	2.41
18 other foods	1.33	1.52	1.97	1.42	1.53	1.53	1.50	1.68	1.69
19 non alcohol,alcoh.beverages	1.46	-0.53	2.41	1.83	1.67	1.67	1.64	1.53	1.54
20 tobacco	3.95	-1.75	3.67	2.23	2.23	2.23	2.94	2.30	2.31
21 textiles & clothing	3.47	4.08	4.78	3.99	3.99	3.99	3.95	3.95	3.95
22 leather & shoe	3.14	-1.74	2.53	1.80	1.80	1.80	2.25	2.21	2.23
23 wood & furniture	4.01	1.61	3.70	3.32	3.33	3.34	3.56	3.56	3.56
24 paper & printing prod	9.80	-3.48	9.24	2.39	1.85	2.20	6.33	3.26	5.12
25 rubber & plastic prod	4.11	-2.33	4.79	2.83	3.21	3.21	3.39	3.72	3.74
26 other manufact. prod	6.26	-2.21	5.90	2.80	2.55	2.59	4.47	3.50	3.64
CONSTRUCTION	6.04	1.63	4.11	3.18	3.18	3.20	4.41	4.41	4.41
27 construction	2.72	-12.94	6.68	1.02	1.55	0.88	1.90	2.45	1.49
HOTELS,COMMERCE & REPAIRS	2.72	-12.94	6.68	1.02	1.55	0.88	1.90	2.45	1.49
28 recovery & repair serv.	3.02	-1.23	3.87	2.39	2.56	2.61	2.70	2.80	2.87
29 trade	2.23	-2.69	4.46	2.26	3.27	3.28	2.36	3.52	3.51
30 hotels & restaurants	3.31	-1.12	3.74	2.36	2.37	2.45	2.78	2.67	2.77
TRANSPORT & COMMUNICATIONS	2.62	-0.67	3.91	2.59	2.64	2.64	2.65	2.72	2.72
31 inland transport	3.78	-2.83	4.31	2.65	2.65	2.67	3.07	2.96	2.97
32 sea & air transport	3.46	-2.62	4.48	2.47	2.52	2.56	2.93	2.92	2.94
33 transport services	3.93	-4.57	3.18	2.72	2.66	2.66	2.81	2.74	2.74
34 communication	3.48	-3.61	4.25	2.51	2.69	2.70	2.83	2.95	2.95
SERVICES	4.57	-1.21	4.94	3.08	2.87	2.88	3.76	3.25	3.26
35 banking & insurance	3.33	-1.44	4.12	2.73	2.53	2.53	2.97	2.68	2.69
36 other private services	4.64	-1.81	5.62	3.31	2.59	2.58	3.96	3.03	3.07
37 real estate	3.67	-2.36	4.20	2.52	2.61	2.60	2.99	3.00	3.00
38 private education services	1.71	0.35	2.21	1.69	1.85	1.86	1.71	1.92	1.94
39 private health services	3.23	-3.56	5.17	3.22	2.78	2.80	3.16	2.62	2.66
40 recreation & culture	2.85	3.24	4.71	3.69	3.71	3.70	3.53	3.59	3.59
44 domestic services	4.04	-4.06	4.29	3.01	2.95	2.95	3.21	2.85	2.85
PUBLIC SERVICES	1.94	-14.32	1.72	1.20	1.20	1.20	0.52	0.52	0.52
41 government services	2.10	2.08	2.01	2.01	2.01	2.01	2.05	2.05	2.05
42 public education	2.14	1.82	2.09	2.05	2.05	2.05	2.08	2.08	2.08
43 public health	1.79	0.42	2.29	2.07	2.07	2.07	1.89	1.89	1.89
45 government wages,etc	2.09	2.08	2.01	2.01	2.01	2.01	2.05	2.05	2.05

Table A12. Employment forecasts comparison for simulations 'base' Alt 1 and Alt 2.

	EMPLOYMENT rates of growth								
	base) 5- 81	(base) 81- 82	(base) 82- 85	(base) 85- 90	(alt1) 85- 90	(alt2) 85- 90	(base) 75- 90	(alt1) 75- 90	(alt2) 75- 90
TOTAL EMPLOYMENT	0.66	-1.38	1.57	0.79	0.95	0.88	0.75	0.91	0.88
1 agriculture,for,fish	-2.30	-11.13	-3.98	-4.30	-2.42	-2.42	-3.89	-1.66	-1.61
INDUSTRY	-0.13	2.80	2.33	0.70	0.77	0.76	0.84	0.57	0.68
2 coal	0.37	0.45	3.59	1.96	1.60	1.57	1.75	1.24	1.21
3 coke	-0.63	35.66	27.63	17.79	15.07	15.05	13.56	10.08	10.04
4 petroleum,gas,refining	0.88	3.98	11.39	-0.37	2.67	2.66	2.77	2.22	2.20
5 energy	1.01	-1.77	2.18	0.76	4.81	4.85	0.98	4.37	4.35
MANUFACTURING	0.87	0.11	2.80	1.05	-0.32	-0.37	1.26	-0.04	-0.09
7 ferrous&non ferrous min	-0.16	2.88	2.34	0.65	0.74	0.73	0.81	0.55	0.66
8 non metal min.& prod.	0.61	-0.06	4.83	2.50	2.95	2.94	2.04	2.67	2.62
9 chemical products	-0.74	-2.79	2.39	-0.36	-0.32	-0.49	-0.12	-0.39	-0.69
10 metal prod.exl.transp.	-1.07	-4.05	-0.83	-1.28	-1.40	-1.41	-1.29	-1.52	-1.49
11 agric.&industr.machinery	-0.07	27.34	8.77	3.14	3.01	3.13	4.59	4.17	4.29
12 office,precis,opt.instr.	0.23	15.31	4.80	2.07	2.27	2.09	2.76	3.17	2.59
13 electrical machinery	-1.22	-18.86	-11.55	-10.27	-10.21	-9.86	-7.48	-7.38	-7.17
14 motor vehicles	-0.46	1.75	5.82	3.42	3.38	3.52	2.24	2.06	2.35
15 other transport equipment	0.80	23.82	6.35	2.48	2.60	2.62	4.00	3.92	4.25
16 meat	0.82	-13.36	-2.75	0.05	-0.01	0.40	-1.10	-1.13	-0.80
17 milk	2.03	-9.72	-2.75	-1.42	-1.41	-1.41	-0.86	-0.86	-0.85
18 other food prod.	-0.34	-9.62	-3.68	-2.25	-2.15	-2.15	-2.26	-2.11	-2.10
19 beverages	-0.42	-11.30	-3.87	-1.90	-2.07	-2.07	-2.33	-2.44	-2.43
20 tobacco	-0.31	-2.35	-0.41	-0.95	-0.93	-0.93	-0.68	-1.17	-1.17
21 textiles&clothing	3.37	2.66	4.25	3.60	3.60	3.60	3.58	3.58	3.58
22 leather,shoes	-0.51	-6.81	-0.70	-0.86	-0.87	-0.87	-1.09	-1.12	-1.11
23 wood & furniture	-0.23	1.79	0.30	-0.10	-0.10	-0.09	0.06	0.05	0.06
24 paper & printing prod.	0.31	7.88	2.15	-2.22	-2.83	-2.42	0.34	-2.72	-0.90
25 rubber & plastics	-0.11	-4.50	0.60	0.76	1.13	1.13	0.03	0.34	0.36
26 other manufact. ind.	-0.36	13.71	2.23	0.76	0.47	0.51	1.47	0.51	0.65
CONSTRUCTION	0.40	-10.10	-4.26	-2.39	-2.39	-2.38	-2.16	-2.16	-2.16
27 constructions	0.20	-4.98	3.93	0.67	1.28	0.35	0.76	1.30	0.36
HOTELS,COMMERCE & REPAIRS	0.20	-4.98	3.93	0.67	1.28	0.35	0.76	1.30	0.36
28 recovery & repair serv.	1.76	-4.29	0.99	0.82	1.04	1.09	0.89	1.01	1.08
29 trade	3.93	-6.79	0.18	1.08	2.28	2.27	1.51	2.64	2.62
30 hotels&restaurants	1.34	-3.35	1.01	0.77	0.77	0.85	0.77	0.65	0.75
TRANSPORT & COMMUNICATIONS	1.44	-5.76	1.78	0.75	0.77	0.77	0.80	0.85	0.86
31 inland transports	1.37	-4.42	1.37	0.33	0.37	0.40	0.65	0.56	0.58
32 maritime&air transport	1.36	-3.80	1.75	0.65	0.70	0.73	0.86	0.85	0.87
33 transport	0.71	-15.17	0.83	-2.53	-2.69	-2.69	-1.40	-1.49	-1.49
34 communications	1.07	-7.57	-0.33	-0.33	-0.20	-0.20	-0.27	-0.16	-0.16
SERVICES	1.76	-1.79	1.25	0.56	0.33	0.34	1.02	0.55	0.56
35 banking&insurance	2.43	2.49	2.58	2.52	2.45	2.45	2.49	2.41	2.41
36 other private services	4.42	1.10	4.89	3.88	2.85	2.85	4.11	3.24	3.27
37 education	4.74	0.46	2.61	2.65	2.81	2.82	3.33	3.46	3.47
38 health	2.70	-5.43	1.36	1.11	0.67	0.68	1.36	0.82	0.85
39 recreatio&cultur.serv.	5.82	-1.26	3.31	4.10	4.13	4.13	4.27	4.34	4.34
40 government	2.75	-2.53	1.10	1.39	1.24	1.24	1.61	1.26	1.26
41 other services	1.96	5.81	3.27	2.73	2.78	2.78	2.75	2.75	2.75
UNEMPLOYMENT	-0.23	-5.29	-2.66	-0.45	-0.45	-0.45	-1.13	-1.13	-1.13

Table A13. Investment forecasts comparison for simulations 'base' Alt 1 and Alt 2.

GROSS FIXED INVESTMENT (prices 1975)
rates of growth

	base) (5- 81	base) (81- 82	base) (82- 85	base) (85- 90	alt1) (85- 90	alt2) (85- 90	base) (75- 90	alt1) (75- 90	alt2) 75- 90
GROSS FIXED INVESTMENT	2.72	-12.18	7.89	1.20	1.49	1.49	2.25	2.59	2.61
1 agriculture,for,fishery	0.76	-14.66	0.00	0.00	0.73	0.59	-0.67	2.98	3.04
MANUFACTURING	1.81	-8.81	9.32	1.47	2.33	2.33	2.49	2.95	2.99
2 energy	0.55	1.27	-0.30	2.54	5.87	5.86	1.09	2.83	2.82
3 ferrous&non ferrous ores	-2.55	-25.35	23.75	4.31	3.71	3.89	3.48	4.23	4.19
4 non metal min.&prod.	4.83	-7.40	5.41	-0.30	-0.10	0.08	2.42	2.29	1.92
5 chemical products	-2.32	-6.56	10.46	3.30	3.20	3.13	1.93	1.56	1.58
6 nonmachinery metal products	7.27	-27.96	11.92	-2.55	-2.60	-2.41	2.58	2.16	2.39
7 agricultural machinery	3.96	2.47	9.29	-1.41	-1.47	-1.09	3.14	3.73	3.00
8 office, precis,opt instr.	3.15	-2.33	1.24	4.64	4.52	4.22	2.90	3.09	3.40
9 electrical goods	2.89	-22.42	17.67	1.11	0.93	0.83	3.57	3.49	3.79
10 transport equipment	12.02	-26.68	12.69	-1.43	-1.46	-1.38	5.09	5.13	5.58
11 food,beverages&tobacco	1.93	0.46	9.58	1.42	1.38	1.37	3.19	3.10	3.11
12 textiles,clothing,shoes	-1.03	-0.97	3.22	1.69	1.74	1.71	0.73	0.71	0.73
13 paper&printing	-4.76	-3.36	14.21	1.83	2.13	2.13	1.32	1.33	1.90
14 rubber & plastics	3.22	-7.23	14.69	0.18	0.87	0.92	3.80	2.75	2.94
15 wood & furniture	2.85	14.96	15.15	-1.66	0.67	-0.46	4.61	3.61	4.66
CONSTRUCTION	4.52	8.15	6.62	-5.29	-4.35	-5.01	1.91	3.59	1.65
16 construction	4.52	8.15	6.62	-5.29	-4.35	-5.01	1.91	3.59	1.65
HOTELS,COMMERCE & COMMUNICATIONS	1.82	-1.39	5.98	2.53	2.54	2.55	2.68	2.54	2.61
17 trade	1.20	-2.51	12.27	0.37	0.58	0.63	2.89	2.80	2.93
18 hotels & restaurants	0.20	18.25	0.28	1.19	1.03	1.04	1.75	1.36	1.86
19 transport	2.35	-6.81	6.06	2.98	3.06	3.11	2.69	2.73	2.76
20 communications	2.29	1.92	-1.27	5.60	5.38	5.38	2.66	2.08	2.08
SERVICES	3.85	-18.64	8.77	0.78	0.83	0.82	2.31	2.28	2.29
21 banking & insurance	6.64	-3.98	7.69	0.70	0.43	0.30	4.16	2.86	2.91
22 other services	4.39	-24.05	10.57	0.50	0.58	0.57	2.44	2.47	2.48
23 other non dest. serv.	1.28	-1.77	2.23	1.93	1.93	1.93	1.49	1.49	1.49

Table A14. Private consumption forecasts comparison for simulations 'base' Alt 1 and Alt 2.

PRIVATE CONSUMPTION IO
rates of change

	base) 5- 81	(base) 81- 82	(base) 82- 85	(base) 85- 90	(alt1) 85- 90	(alt2) 85- 90	(base) 75- 90	(alt1) 75- 90	(alt2) 75- 90
TOTAL OUTPUT	3.03	0.12	3.30	2.52	2.52	2.52	2.72	2.72	2.72
1 agriculture,for,fishery	1.23	-0.72	1.19	1.07	1.09	1.09	1.04	1.07	1.07
INDUSTRY	3.62	0.58	3.56	2.69	2.67	2.67	3.09	3.07	3.07
ENERGY PRODUCTS	4.73	-0.82	3.97	3.03	2.89	2.89	3.64	3.46	3.46
2 coal	2.87	0.58	3.59	0.26	3.15	3.15	1.99	3.98	3.98
3 coke	-0.28	0.59	3.43	0.61	3.15	3.15	0.81	3.98	3.98
4 petroleum,gas,refining	2.21	-1.69	2.36	1.87	2.78	2.78	1.87	3.26	3.26
5 electricity,gas,water	9.36	0.44	6.17	4.44	3.10	3.10	6.49	3.89	3.89
MANUFACTURING	3.43	0.82	3.49	2.63	2.63	2.63	3.00	3.00	3.00
8 non metal min,min prod	5.59	1.85	3.74	1.87	1.87	1.87	3.73	3.73	3.73
9 chemical products	4.36	6.19	4.99	3.95	3.95	3.95	4.47	4.47	4.47
10 metal products	4.95	1.47	4.04	2.22	2.22	2.22	3.63	3.63	3.63
11 agric.& indus.machinery	6.40	6.50	6.77	5.52	5.52	5.52	6.19	6.19	6.19
12 office,precis,opt instr.	6.69	1.88	5.77	4.60	4.60	4.60	5.49	5.49	5.49
13 electrical goods	6.61	6.24	6.64	5.38	5.38	5.38	6.18	6.18	6.18
14 motor vehicles	9.87	-8.35	6.28	3.80	3.80	3.80	5.92	5.92	5.92
15 other transport equipment	9.50	-3.30	6.61	4.62	4.62	4.62	6.44	6.44	6.44
16 meat	3.04	1.10	2.52	2.04	2.04	2.04	2.47	2.47	2.47
17 mill	1.99	2.31	1.71	1.39	1.39	1.39	1.76	1.76	1.76
18 other foods	0.79	-0.25	0.77	0.62	0.62	0.62	0.66	0.66	0.66
19 non alcohol,alcoh.beverages	1.24	-3.33	1.05	0.78	0.78	0.78	0.74	0.74	0.74
20 tobacco	3.60	4.12	4.91	4.14	4.14	4.14	4.07	4.07	4.07
21 textiles & clothing	3.12	-0.05	3.91	2.92	2.92	2.92	3.00	3.00	3.00
22 leather & shoe	1.64	3.65	1.15	-0.07	-0.07	-0.07	1.10	1.10	1.10
23 wood & furniture	2.97	-1.57	3.28	0.76	0.76	0.76	1.99	1.99	1.99
24 paper & printing prod	3.47	-3.11	4.25	3.12	3.12	3.12	3.07	3.07	3.07
25 rubber & plastic prod	4.55	1.78	4.29	2.75	2.75	2.75	3.71	3.71	3.71
26 other manufact. prod	3.93	4.10	4.34	3.50	3.50	3.50	3.88	3.88	3.88
CONSTRUCTION	1.62	1.17	1.92	1.65	1.65	1.65	1.66	1.66	1.66
27 construction	1.62	1.17	1.92	1.65	1.65	1.65	1.66	1.66	1.66
HOTELS,COMMERCE & REPAIRS	2.84	0.24	3.35	2.49	2.52	2.52	2.65	2.69	2.69
28 recovery & repair serv.	4.60	1.36	4.65	3.61	3.61	3.61	4.06	4.06	4.06
29 trade	2.75	0.35	2.97	2.29	2.34	2.34	2.48	2.54	2.54
30 hotels & restaurants	2.55	-0.40	3.86	2.60	2.60	2.60	2.63	2.63	2.63
TRANSPORT & COMMUNICATIONS	3.09	-0.27	3.43	2.56	2.59	2.59	2.76	2.80	2.80
31 inland transport	2.75	0.35	2.97	2.29	2.34	2.34	2.48	2.54	2.54
32 sea & air transport	2.75	0.35	2.93	2.29	2.34	2.34	2.47	2.54	2.54
33 transport services	3.65	-2.37	3.83	2.71	2.71	2.71	2.97	2.97	2.97
34 communication	3.84	-1.16	4.53	3.21	3.21	3.21	3.43	3.43	3.43
SERVICES	2.40	-0.87	3.16	2.49	2.49	2.49	2.37	2.37	2.37
35 banking & insurance	2.98	0.21	4.72	3.29	3.29	3.29	3.25	3.25	3.25
36 other private services	3.97	-0.75	3.59	2.71	2.71	2.71	3.16	3.16	3.16
37 real estate	1.62	1.17	1.93	1.66	1.66	1.66	1.66	1.66	1.65
38 private education services	0.97	-6.12	3.51	2.36	2.36	2.36	1.47	1.47	1.47
39 private health services	3.10	3.55	5.18	3.96	3.96	3.96	3.83	3.33	3.83
40 recreation & culture	3.41	-5.23	4.13	3.03	3.03	3.03	2.85	2.85	2.85
44 domestic services	1.84	-14.32	1.72	1.20	1.20	1.20	0.52	0.52	0.52
PUBLIC SERVICES	1.10	-5.44	3.61	2.43	2.43	2.43	1.61	1.61	1.61
41 government services	2.56	-2.13	3.96	2.72	2.72	2.72	2.58	2.59	2.53
42 public education	0.59	-6.71	3.47	2.32	2.32	2.32	1.26	1.26	1.26

REFERENCES

Alessandroni, A. 1981. Note su esportazioni, importazioni e produttività. Schema dei programmi. Rapporto INTIMO 1.

Almon C. 1982. Utilizzazione dei modelli input/output per la politica economica. Studi e Informazioni. Banca Toscana 5(1).

Almon, C. 1981. An international family of linked input-output models. Paper presented at the International Conference on "Structural Economic Analysis and Planning in Time and Space", held at the University of Umeå, Umeå, Sweden, 21-26 June, 1981. Proceedings forthcoming.

Almon, C. 1979. A system of consumption functions and its estimation for Belgium. Southern Economic Journal 46.

Almon, C. 1966. The American Economy to 1975. New York: Harper and Row.

Almon, C., M. Buckler, L.M.Horwitz, and T.C. Reinbold. 1966. 1985: Industry Forecasts of the American Economy. Lexington, Massachusetts: D.C. Heath.

Belzer, D.B. 1978. An Integration of Prices, Wages, and Income Flows in an Input-Output Model. Ph.D. dissertation, USA, College Park, Maryland: University of Maryland.

Caffè, F. 1977. Politica Economica. Turin: Boringhieri.

Ciaschini, M. 1982. Il sistema dei prezzi e le carateristiche della soluzione prezzi-quantità nel modello INTIMO. INTIMO Report 3.

Ciaschini, M. 1981. The estimation of the investment functions for the Italian Model. Paper presented at the Task Force Meeting on Input-Output Modeling, held at IIASA, in September 1981. CP-82-32. Laxenburg, Austria: International Institute for Applied Systems Analysis.

Ciaschini, M. and M. Grassini. 1981. INTIMO: il modello italiano nel sistem INFORUM. Rapporto preliminare. Memoria presentata alla II Conferenza Italiana di Scienze Regionali. (AISRE), held in Naples, Castel dell'Ovo, October 1981.

Dewiert, W.E. 1971. An application of the Shepherd duality theorem: a gneralized Leontief production function. Journal of Political Economy.

Fox, K., J. Sen Gupta, and E. Thorbecke. 1973. The Theory of Quantitative Economic Policy with Applications to Economic Growth Stabilization and Planning. Amsterdam: North Holland.

Grassini, L. 1981. On the estimation of Engel elasticities with application to Italian data. Paper presented at the Task Force Meeting in Input-Output Modeling, held at IIASA, September 1981. CP-82-32. Laxenburg, Austria: International Institute for Applied Systems Analysis.

Grassini, M. 1982. Un modello macroeconometrico di analisi e previsioni intersettoriali. Paper presented at the 33rd Scientific Reunion of the Italian Statistical Society, held at Torino, Italy, 5-7 April 1982.

Grassini, M. 1981. An estimation of a system of consumption functions for Italy. Preliminary results. Paper presented at the Task Force Meeting on Input-Output Modeling, held at IIASA September 1981. CP-82-32. Laxenburg, Austria: International Institute for Applied Systems Analysis.

Hicks, J. 1965. Capital and Growth. London: Pion.

ISTAT. 1970-1980. Annuario di Contabilità Nationale. Rome.

Nyhus, D.E. 1981. An econometric input-output model of the West German economy. Paper presented at the Task Force Meeting on Input-Output Modeling, held at IIASA, September 1981. CP-82-32. Laxenburg, Austria: International Institute for Applied Systems Analysis.

Nyhus, D.E. and C. Almon. 1977. The INFORUM International System of I/O Models and Bilateral Trade Flows. INFORUM Research Report 21. College Park, Maryland: University of Maryland.

Pasinetti, L. 1975. Lezioni di teoria della produzione. Bologna: Il Mulino.

Rey, G.M. 1965. Schemi razionali di decisione per la politica economica. Milan: Giuffrè.

Siesto, V. 1977. La contabilita nazionale. Bologna: Il Mulino.

Tinbergen, J. 1952. On the Theory of Economic Policy. Amsterdam: North Holland.

Young, S.L. and C. Almon. 1978. An input-output forecasting model of the French economy. INFORUM Research Report 20. College Park, Maryland: University of Maryland.