MODELS AS INTEGRAL PARTS OF REGIONAL INFORMATION SYSTEMS: Experiences from Italy and Sweden

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PREFACE

This paper has been written as a contribution to the book "Information Systems for Integrated Regional Planning", edited by P. Nijkamp and P. Rietveld. It outlines some future perspectives for regional information systems and the role of socioeconomic models in such systems. In particular, the paper presents the model system which was designed for the Tuscany Case Study which is a joint IIASA-IRPET effort. The paper also compares experiences from Italy and Sweden and refers more generally to a series of case studies carried out within the Regional and Urban Development group at IIASA.

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CONTENTS

1. THE DEMAND FOR INFORMATION IN CURRENT REGIONAL PLANNING

Regional planning has different connotations and traditions in different countries. Its role in the political arena depends on how the political power is distributed among decision-making bodies at various geographical levels in a nation. Firstly, the intensity of regional planning efforts varies considerably between countries. Secondly, the regional planning may be exercised mainly by the central government and its planning agencies or it may be placed with local and regional decision-making organizations. This paper focuses on the role of information as an input to the planning activity and policy analysis of regional authorities. It does so from the perspective of open economic regions which are vulnerable to external influences. In particular, the presentation concentrates on experiences from the design of an information and forecasting system constructed for the Tuscany region in Italy. Comparisons are also made between Italian and Swedish experiences.

Changing Conditions for Regional Planning

In many industrialized nations the trend during recent decades has been a gradual replacement of local economic linkages by international ones. At the same time technical change has been labor-saving in the industrial sectors, while the service production has remained labor-intensive. Also, the industry has increased its demand for technical and business services. As a consequence, in the post-industrial society a larger share of the employment is dependent on local and regional production.

Simultaneously, existing ties to the industrial sectors imply prevailing indirect dependence on the local economy of world market changes. Specialization and associated economies of scale have led to an increased vulnerability. In a situation of global technological transitions, the processes emphasized above have increased local and regional authorities' demand for information. Moreover, the development path implies that the scope of regional planning has increased.

Absence of a Theoretical Foundation

Comparing Italy and Sweden, one may conclude that the development trend stressed above is shared in those two nations. This similarity is strong in spite of important differences between the countries with regard to the organization of local and regional planning. Other observations suggest that the above trend takes place throughout a major part of the industrialized nations. As a result, regional authorities in many countries are experiencing an increased incompatibility between planning requirements and existing information systems.

Local and regional planning has traditionally had a weak analytic background. Practical relevance in a narrow sense has been used as a guideline at the expense of comprehensiveness and consistency. This may be related to the following fundamental characteristics of regional plan-making and policy analysis as these activities emerge in practice:

- o Planning strategies do not stem from analysis but rather from preconceptions;
- o Policy generation does not rest on formal evaluation of alternative courses of actions but rather from qualitative judgements;
- o Policy implementation is not assessed by means of efficient monitoring procedures.

With regard to Italy, Bianchi (1981) identifies prevailing political traditions as a fundamental reason for an inefficient use of information in public planning at the regional level. Quantitative analysis has not been able to break that tradition so far. This predicament which has been phrased as a "divorce between knowledge and government" is largely independent of the planning philosophy adopted. Information processing by means of modern information technology is equally relevant for planning concepts ranging over the scale of rational, incremental, learning-adaptive and pure monitoring paradigms (Wilson, 1980). However, the role played by models and the type of information generated from the information system will indeed not be invariant with respect to the adapted planning concept.

2. THE ORGANIZATION OF INFORMATION SUPPLY

The local and regional demand for information varies with regard to its content over regions and over time within a region. This raises the question whether the information collection and production should be regionalized or centralized.

Central, Overall Perspectives

It is obvious in most countries that currently a decentralized, heterogeneous demand for information from the regional planning levels is basically met by centralized, homogeneous supply. In this context one should observe that the central government and connected authorities also have a demand for regional information. From their point of view, regional homogeneity is a desirable property.

In Italy most regional data are provided by the ISTAT (Italian National Institute of Statistics). In Sweden the SCB (Central Bureau of Statistics) has a strong position in offering the municipalities regular data for planning. Designed some fifty years ago, ISTAT still operates in the same principal way as SCB. There is a flow from the centre to the periphery of questionnaires and instructions. The opposite flow mainly consists of collected data. Decisions about production, processing and publication of data are made at the central level --with due notice being taken as to the quality and relevance of the data at that level.

In Italy the feedback of information to the regional level (regional and local governments, local authorities, etc.) is extremely meager. Currently, ISTAT annually handles about 180 surveys and more than 450 questionnaires. Thus a huge gathering of data (which are regionally specified in their original form) results in several thousands of published pages. Few of them report municipal data. Moreover, only in some cases are local respondents like authorities allowed to keep the data they collect. This reveals a contradiction between the old centrally oriented statistical system in the country, and its more recent decentralized government system, in which the number of decision centres has multiplied.

Options for Decentralization

As shown in Guteland and Nygren (1983), in Sweden the centralized statistical bureau also has a monopoly situation. In this case there is a feedback. However, the information sent "downwards" in the system is not designed to reflect the specific demands each regional decision-making body may have.

New planning ambitions have altered the demand pattern as regards regional information. New communication technologies have transformed the conditions for processing and retrieving information. Each region may in principal look for an individually designed solution, since technically it is now possible to deliberate a complete decentralization of statistical information systems. This does not imply that the responsibility for collecting micro-data should be transferred to regional agencies. However, there is a need to carefully examine various options.

The capability of regional authorities and statistical offices to operate and utilize advanced information systems varies considerably between different regions and municipalities both in Italy and in Sweden. With regard to systems providing supporting information for comprehensive regional planning, the development has been weak and fragmentary in both countries. From this perspective, the information system created for the Tuscany region constitutes a pathbreaking forerunner.

3. PURPOSES OF REGIONAL INFORMATION SYSTEMS

The tensions between existing information systems and requirements derived from regional decision-making are not unidimensional. They relate both to the role and ambitions of analysis and methods for policy evaluation, and to the shortcomings of the official statistics service (reliability, updating, coverage, disaggregation, etc.). Therefore, the tensions cannot be removed by a single measure. We shall illuminate this problem from the perspective of a regional planning and information processing body providing background information and analysis in the form of decision support to comprehensive regional economic planning.

Interdependencies Between Information and Planning Systems

Statistical, information and planning systems are coupled. For example, changes made in the second will have impacts on the third part. A modification of the planning system cannot be considered independently from the possibilities of redesigning the initial information system.

The primary purpose of information systems in regional planning has traditionally been to store data for multipurpose use in large computer systems. The data aspect has been stressed at the expense of planning relevance. This is the case in both Italy and Sweden, and the observation can probably be generally applied to other industrialized countries. Huge amounts of resources have been allocated to setting up, maintaining and updating data bases. Considerable resources have also been allotted to developing stream-lined tools for extracting arbitrary combinations of data in numeric or graphic form. This development is partly explained by a persistent lack of sufficient contacts between designers of information systems and planners using the information.

Figure 1 illustrates already observed or potential shifts in the demand for information and decision support at the local and regional levels. Those characteristic shifts are in contrast to the above description of the historical situation.

FROM	TO
Large multipurpose data bases	Selected strategic data items
Administrative data	Policy-oriented information
Relevant statistics of the most frequent events	Pertinent information for causal analysis (and understanding)
Quantitative data in tabular form	Interpreted information and qualitative signals

Figure 1. Emerging emphasis as regards the design of information systems.

Purposeful Information Processing and Strategic Applications

The main criticism of data processing during recent decades to support local and regional governments is that tactic rather than strategic applications have been given priority. Computer systems have been used for mass storage and book-keeping rather than as active tools in the decision-making process.

Figure 1 illustrates a transition to a situation in which the computer technology has increased the potential of underpinning plan-making with analysis. Does this have any implications for the future balance between market solutions and planning efforts? One may note that market solutions need little centralized information but give rise to external effects which have to be coped with by the public sector. This presupposes more efficient monitoring. Planning on the other hand needs more information to become efficient but may, with proper supply of decision support, increase the possibility of internalizing the external effects in the plan-making process. Potentially, more developed information systems will increase the scope and pertinence of planning.

Such improvements in the regional planning process may be achieved by addressing at least three control issues:

- o The organization of useful data through selection from a variety of data bases needs to be ameliorated.
- o Tools must be constructed for generating information from these special purpose data bases in such a way that they fit into the planning process. In this case combined forecasting and scenario analysis models may be considered of special interest.
- o Networks and dissemination structures of information flows must be constructed for the planning system in order to speed up the technical phases of the planning process. This represents an integration of information processing and the planning process.

4. REGIONAL INFORMATION AND PLANNING SYSTEM MODELS

In the sequel we will give an example of a possible way of organizing a combined information and planning system for a regional economy. Thus, in this context we do not refer to a planning system in general terms but to a specific combination of the two components. The example involves a collaborative effort between the Tuscany region in Italy[1] and the Regional and Urban Development Group of the International Institute for Applied Systems Analysis (IIASA) in Austria.

The complete information system is described in Bianchi and Baglioni (1982) while the core of the planning system in the form of a set of regional economic models is described in Cavalieri, Martellato and Snickars (1983).

Specifying the System: Three Categories of Models

The considerations leading to the regional information system for the economic planning of Tuscany identify three major variants for the framework of such an information and planning system. They are termed the logical model, the functional model, and the information model, respectively.

The *logical model* identifies the logical components or phases of planning in terms of operational steps in the plan-making process as well as in terms of the content of the plan as a written document. This model provides guidelines for the plan preparation. The weakest links of the process involve the introduction of tools for effective recording of the regional reality, for policy generation, as well as for monitoring the consequences of policies.

The *functional model* describes interactions among various agents of the regional and local planning systems (regional government, regional agencies, local authorities and sectoral bodies). During the plan-making and decision phase those interactions take the forms of (i) command from regional government to its departments, (ii) co-decision between regional and local authorities, (iii) agreement between the regional government and higher levels of government such as the state of the EEC, (iv) bargaining between regional and sectoral bodies such as trade unions. The implementation may be direct, i.e., by means

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[1] Regional Institute for Economic Planning of Tuscany (IRPET).

of regional departments or agencies or indirect by means of task delegation to local authorities or to other agencies. In those cases information can be regarded as the only material circulating through the network of links in the planning system. The emphasis is on the two-way flow connecting centre and periphery. The bottom-up flow of data referring to processes and plan accomplishments is complemented by a top-down feedback of information in the form of forecast, indicators, reports and comparisons.

The *information system model* refers to the information functions within the planning system. Therefore, it does not relate to any specific decision-making unit or agency. The information function is diffused through the regional government departments and through agencies and offices of local authorities. There is, however, a special role to be played by the departments for statistics and information at the regional level as well as the research institute or department in charge of the overall regional planning activity. Figure 2 shows a configuration of the information system model.

System Design and Information Tools

The set-up of the information system illustrated in Figure 2 may be explained by referring to the three levels of data flows, data stocks, and information tools.

Data flows stemming from current statistical surveys and administrative records feed and update multipurpose databases. These constitute a data pool contributed to by regional and local authorities, other public and private institutions as well as national statistical agencies. According to a set of criteria, data can be selected from multipurpose data bases and organized in working data bases. Together with data collected through specific surveys and field research the latter form *data stocks*, to be updated for retrieval and for further processing by means of *information tools*. These transform data into information which is useful for planning purposes.

The information tools are used for analyzing the data and produce various kinds of information such as

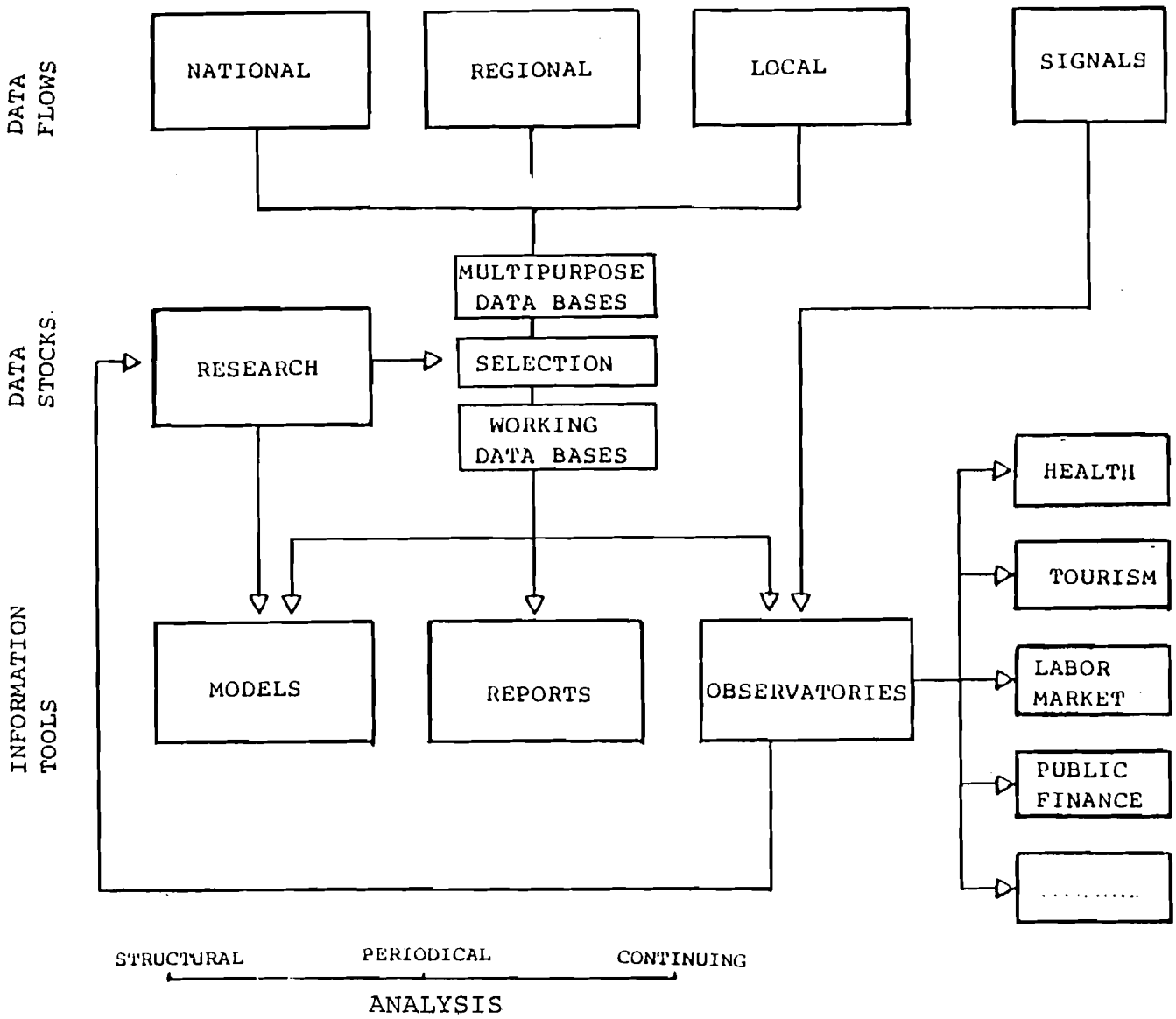

Figure 2. Outline of the Information System Applied in Tuscany (IRPET).

- o A "continuous" flow of information through monitoring in observatories
- o Periodic information in the form of reports;
- o Structural information from models supporting forecast and impact analysis.

Observatories are the key-components of the system. They rely upon small working teams in charge of organizing and maintaining sectoral data flows and files; they produce with a high frequency sets of indicators (sectoral trends and policy perfor-

mance); they also stimulate novel research when indicators show anomalous or surprising values with regard to observed performance levels. Therefore, these observatories are essential and peculiar tools for monitoring planning activities and results.

Reports normally contain analyses of trends of regional development in order to annually give a comprehensive view of the regional system; the reports also assess policy implementation and achievements. In this way, they contribute to monitoring functions. They consequently exert a positive impulse to improve the information system as a whole, as they require the reporting group to mobilize every possible information resource.

Models represent the very core of the information system, and they are organized as an interlinked system of models. This does not mean that they are rigidly composed into a large super-model. Instead, they are constructed as individual modules which can be connected with each other in various ways. The models can help in prolonging current trends and cycles into forecasts of different time horizons. Hence, historical, current and projected information is looked upon in the same way within the information system. Of course, the models produce results which are used for the reports and observatories. Signals about new developments may therefore originate both from working data bases and model exercises.

The model system is not a rigid construction, but a flexible collection of submodels with a varying level of sophistication. Over time submodels and their interlinkage is being renewed. At any time signals from the monitoring system may generate incitements to further restructure and refine some set of submodels.

5. OUTLINE OF THE REGIONAL MODEL SYSTEM

The core model of the Tuscany information system relies on the availability of recent regional input/output tables. These tables are derived by direct survey methods, and this makes the input/output information more interesting than in cases where such direct data are not available. In contrast to this, the associated capital coefficient matrix (describing investment inputs and capacity outputs) has been derived only from national data (see Westin, Johansson, Grassini, 1982).

In fact, the model system has a biregional input/output component as its core. The regions are Tuscany and the rest of Italy; the information about the latter part has been obtained by combining data about the Tuscany economy and the national economy. The model system is also complemented by a national econometric model.

An Overview of the Model System

The traits of the system of interlinked models may be summarized as follows:

- o It is a biased two-region system in the sense that although both Tuscany and the rest of Italy are represented by complete economic models, the economy of Tuscany is modeled in more detail than the economic system of the second region:
- o The system contains a stronger emphasis on international trade than similar multi-regional economic models;
- o The public sector plays a more pertinent role in the system than can be found in the current main stream of this type of modeling. The public sector is represented both as a provider of public goods and services (including income transfers), and as a supplier of public infrastructure.

Figure 3 gives a description of the seven modules of the model system. To these must be added at least two further components which comprise the links for interregional trade, and the regional-national-international links. These interregional and international relationships are of special importance to the Tuscany region in view of its openness and export-orientation. The international aspect does not only concern exports of goods such as leather and textile products, but also international tourist flows into the region.

The "core" model of the system is the biregional input/output model (TIM) which provides, both for Tuscany and the rest of Italy, matrices of intermediate consumption and of (interregional and international) trade coefficients.

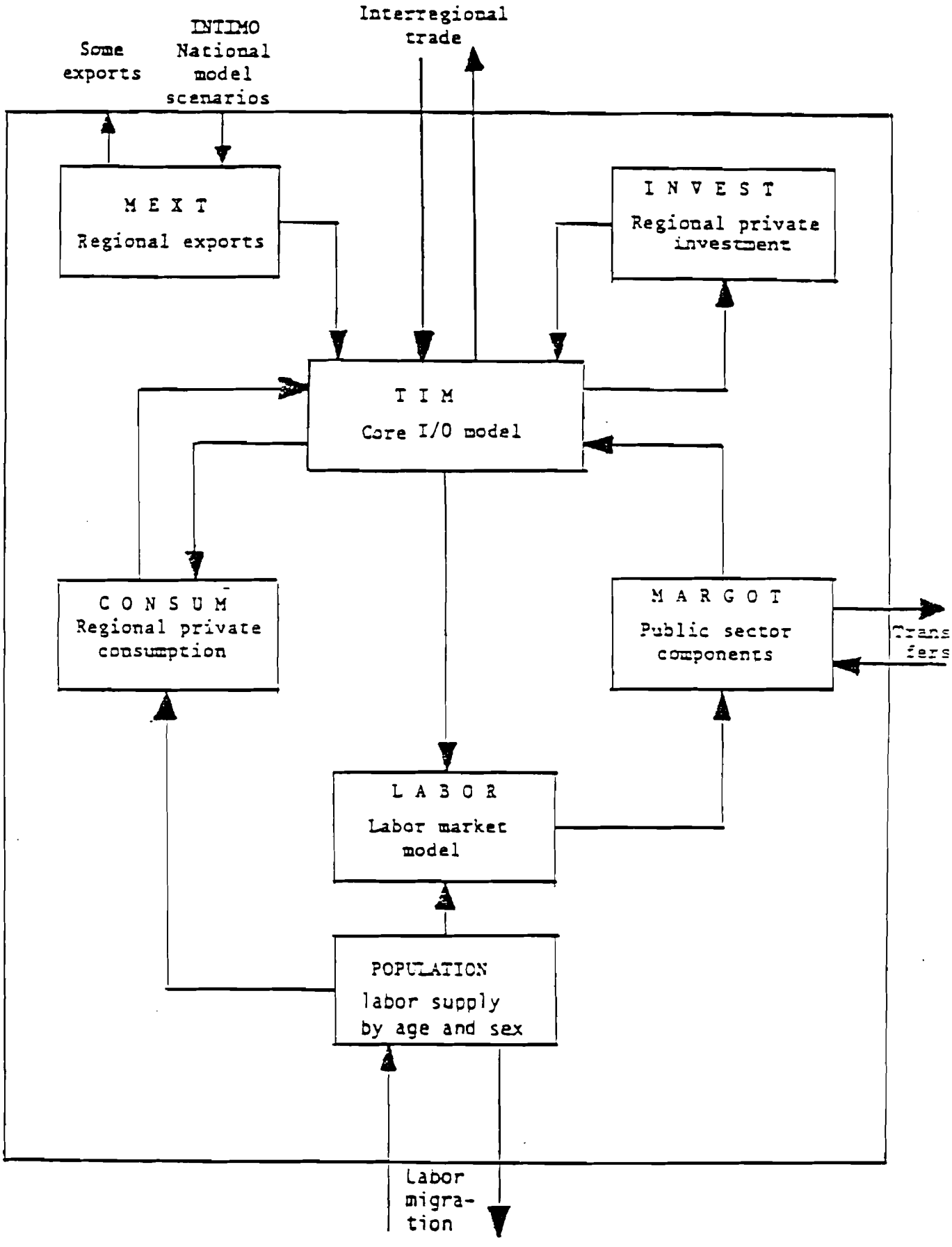

Figure 3. The structure of the regional part of the model system for regional planning in Tuscany.

The export model, (MEXT) is an export demand model, with a destination (importing country) as well as a commodity specification. This means that the economic development in the importing countries will have a direct influence on the economic performance of Tuscany. A certain degree of substitution between interregional and international exports is also possible.

The importance of the capacity concept for a regional economy has led to an indirect modeling of capacity creation (INVEST). This model operates on an annual basis. It is complemented by a five-year variant where investments and capacity creation are treated. These investments are transformed into exogenous annual inputs, yielding capacity limits which cannot be exceeded. Short-term bottlenecks or supply-demand tensions will then have to be resolved by interregional, or even international, trade adjustments.

The labor market model (LABOR) is not only tied to the production system through the labor input process. It also interacts with the population module through labor force participation and unemployment. These variables are determined by a simple form of labor market model which is a balancing mechanism between labor supply and labor demand.

The public sector model (MARGOT) and the private consumption component (CONSUM) are intimately related to each other, because the disposable income policies affect the patterns of final demand both directly and indirectly. The private consumption model is built on the concepts proposed for the INFORUM system (Almon (1981)), and already applied in the INTIMO model for Italy, see Grassini (1982).

Existing Features and Future Options

The model system is primarily aimed at medium term forecasting, policy evaluation, and planning. This is at least true for the version currently conceived and operated. In particular, it does not address long-term problems of technological change.

The model system described here is intended to be a tool for consistent economic forecasting with regard to the regional economy of Tuscany. The scenarios attained with solutions of the system

are consistent in three basic dimensions. There is a consistency between (i) total demand and production capacity, (ii) production and deliveries to consumption and investment, (iii) regional location of production capacity and the structure of regional trade.

The model system is also a tool for policy evaluation, and monitoring of structural change as well as imbalances in the Tuscany economy. In this fashion it may serve several roles in the context of the larger information system. When used as a policy evaluation tool, forecasts are made conditional on policy actions exogenously inserted into the model system. Potentially, the system can also be applied as a planning tool by introducing mechanisms for the selection of policy instruments/decisions which satisfy given performance criteria. The usefulness of this option depends on the room for such design deliberations in the actual planning process. Experience from other kinds of policy-applied modeling shows that such demands evolve as a natural stage in the development process. A modular design will prepare for such options.

Conclusions about Models and Information Processing

Our main conclusion with regard to the long-term viability of information systems for regional planning is that they need to be supplied with analytical capabilities. These should be developed to comprise forecasting, policy assessment, and planning models. Without such equipment, the information systems will lose contact with planning after an initial phase of enthusiasm during the development. On the other hand, regional economic, statistical inference, and other policy/relevant models also need to be brought closer to the special purpose information systems. Otherwise their connection with planning will disappear soon after the construction phase; the latter brings about a necessary interaction between researchers and planners. However, this interaction will not continue without devices which ensure that further development is stimulated. Experiments such as the one we have presented in this paper indicate a viable way to proceed in this respect.

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