A REVIEW OF MULTIREGIONAL ECONOMIC MODELS

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PREFACE

This survey of 50 operational multiregional economic models is one of the outputs of a collaborative study between the Regional Development Group, IIASA, Laxenburg and the Department of Regional Economics, Free University, Amsterdam. The survey provided the background material for the IIASA conference on "Practice and Prospect of Multiregional Economic Modeling", held at Laxenburg, November 25-27, 1981.

Other IIASA papers which have appeared (or will shortly appear) in connection with this study are:

1. P. Nijkamp and P. Rietveld, Towards a Comparative Study of Multiregional Economic Models, WP-80-172.

2. P. Rietveld, Causality Structure in Multiregional Economic Models, WP-81-50.

3. F. Snickars, Interregional and International Linkages in Multiregional Economic Models, WP-82-00 (forthcoming).

4. P. Nijkamp and P. Rietveld, Measurement of Effectiveness of Regional Policies by Means of Multiregional Economic Models, WP-82-00 (forthcoming).

5. B. Issaev, Multiregional Economic Models in Different Planning and Management Systems, WP-82-00 (forthcoming).

We refer to the first Working Paper for a discussion of the aims and delimitations of the study.

The final results of the comparative study will be published in book form before the end of 1982. The exact reference reads: B. Issaev, P. Nijkamp, P. Rietveld and F. Snickars, Practice and Prospect of Multiregional Economic Modeling, North-Holland Publishing Co., Amsterdam, 1982.

Boris Issaev
Leader
Regional Development
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Laxenburg, February 1982

Introduction

At the end of 1980, a comparative study of multiregional economic models was started at IIASA, Laxenburg and the Free University, Amsterdam. The aims of the project have been formulated as follows*:

1. The development of a framework describing relevant features of multiregional models.
2. The collection of information about a set of multiregional models from various types of countries.
3. A comparative study to trace the well-developed and underdeveloped aspects of the models and to find the common difficulties in developing and operating the models.
4. The formulation of suggestions for further activities to improving modeling and policy-making in a multiregional setting.

The present paper is devoted to the second aim. It contains a summary description of 45 models. The descriptions are mainly based on the responses of the pertaining model-builders to a questionnaire designed for this purpose. In addition, certain items are based on publications on the models. The descriptions have not yet been authorized by the model builders.

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* P. Nijkamp and P. Rietveld, Towards a Comparative Study of Multiregional Models, IIASA WP 80-172, 1980.

We have constrained our attention to models with the following features :

1. Number of regions : At least two regions have to be described in the model.
2. Size of regions : The regions should be so large that commuting is relatively insignificant. Hence, urban models are excluded.
3. Economic System : The model should contain a more or less complete description of the economic system. Obviously, in addition, other systems may be contained in the model.
4. Development stage : Models developed before 1970 have been excluded : Only operational models and models not far from being operational are included.

In all, we have received 57 responses to the questionnaires sent to model builders in the survey. In 6 cases, the models do not satisfy the criteria mentioned above (see Table 1).

In another 6 cases, the models appear to be closely related to other models built by the same (group of) model builder(s) which are included in the overview (see Table 2). These models are not presented separately in the overview : they are noted in the description of the related model.

The remaining 45 models will be presented by country (see Table 3). The summary descriptions consist of two pages for each model, which means that only the main features of the models can be covered.

1.	Burniaux (Belgium), Agricultural World Model : not yet operational.
2.	Isard et al. (U.S.A.), Integrated Multiregional Model : not yet operational.
3.	Kwon (Korea), Input-Output Model for Seoul Region : only one region.
4.	Lányi (Hungary), Demographic Model for Matészalka Region : no economic model.
5.	Lányi (Hungary), Gravity model for Urban Influence Areas : size of regions is too small.
6.	Rechnitzer (Hungary), Input-Output Model for South-Transdanubia : only one region

Table 1 : Models not included in the summary description

1.	Courbis (France), REGIS : see description of REGINA.
2.	Fukuchi (Japan), Four Region Econometric Model : see description of Nine Region Politico Economic Model.
3.	Fukuchi (Japan), Nine Region Model: see description of Nine Region Politico Economic Model.
4.	Hoffman (Canada), Canada/US Input-Output Model : see description of statistics Canada Interprovincial Input-Ouput Model.
5.	Molle et al. (Netherlands), RESPON : see description of FLEUR.
6.	Sevaldson et al. (Norway), DRØM : see description of REGION.

Table 2 : Models closely related to models contained in the overview.

Country	Number of Models	Page
Federal Republic of Germany	4	5
The Netherlands	3	12
Belgium	5	23
France	1	35
Italy	3	39
United Kingdom	2	47
European Economic Community	1	53
Sweden	5	57
Norway	1	69
Austria	1	73
Yugoslavia	1	77
Czechoslovakia	1	81
Poland	1	85
U.S.S.R.	2	89
Canada	2	95
U.S.A.	8	101
Japan	3	119
Australia	2	127
Kenya	1	133
Korea	1	137

Table 3. Countries included in the survey.

FEDERAL REPUBLIC OF GERMANY

1.	GENERAL INFORMATION	
1.1.	Model Name	Interregional Multilevel Population-Employment Model for the F.R.G.
1.2.	Model Builders	Herwig Birg
1.3.	Responsible Organizations	German Institute for Economic Research, Berlin (W), Federal Republic of Germany
1.4.	Publication	An Interregional Population-Employment Model for the Federal Republic of Germany : Methodology and Forecasting Results for the year 2000, Papers of the Regional Science Association, vol. 47, 1981
1.5.	Development Stage	Operational since appr. 1980.
1.6.	Time Period	Regional data is available from 1961 to 1970; national data is more up to date; the model is meant for the medium and long term: it yields predictions for 1990 with 1970 as the base period.
1.7.	Country	Federal Republic of Germany
2.	MODEL PURPOSE	
2.1.	General Purpose	1. Forecasting studies, 2. Analytical studies, 3. Planning studies (ex-ante)
2.2.	Specific Purpose	Generation of reliable forecasts as a basis for investment decisions in the framework of interregional traffic planning.
3.	MODEL ELEMENTS	
3.1.	Model Size	regions : 79 (the model also contains partitionings into 11 and 2 regions) industries : 44 exogenous variables : 766 endogenous variables : 753 equations (and inequalities) : 2940
3.2.	Exogenous Variables	National : sectoral growth rates of production and employment; foreign migration; mortality rates Regional : natural increase of the initial population stock; upper and lower boundaries for activity rates
3.3.	Endogenous Variables	National : population size, employment, activity rate, unemployment Regional : population size, employment, activity rate, unemployment, in-and outmigration to other regions and countries, commuter balance, number of employees due to the regional-share-component of shift analysis.
4.	MODEL STRUCTURE	
4.1.	Production Technology	The model does not contain an explicit production function or input-output relationships. Labour is the only production factor considered. The regional demand for labour is determined by means of exogenous national growth rates applied to employment in the base period plus a regional share component.
4.2.	Interregional and International Trade	Not present

4.3.	Other Interregional Linkages	Much attention is paid to migration of labour. The explanatory variables for regional immigration are the regional increase of jobs and regional outmigration (which can be considered as a proxy for vacant dwellings).
4.4.	National-Regional Links	A top-down approach has been adopted for employment and foreign migration, while a bottom-up approach has been applied to variables such as : population, activity rate, unemployment, interregional migration and commuting.
4.5.	Supply and Demand Considerations	Regional labour demand is only marginally influenced by labour supply while on the other hand regional labour supply is largely influenced by labour demand. Hence the model is mainly demand oriented.
4.6.	Equilibrium Assumptions	On the labour market various adjustment processes of supply have been specified, international and interregional migration, changes of activity rates, commuting. The number of vacancies is zero by definition. The number of unemployed is not necessarily equal to zero.
4.7.	Treatment of Prices	Prices do not play a role in the model
4.8.	Dynamics	The model is dynamic
4.9.	Functional Forms	All relationships are linear (or have been linearized)
4.10.	Solution Techniques	The model has been formulated as a linear programming model, the objective being the minimization of national unemployment. It appears that the set of feasible solutions is very small, which means that the outcomes of the model are rather insensitive for the choice of the objective function.
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Behavioural equations have been estimated by means of least squares; in order to arrive at a set non-empty of feasible solutions, some parameters had to be modified.
5.2.	Validation	Econometric test criteria are fulfilled at satisfactory levels. The quality of predictions depends heavily on the correctness of the national exogenous variables.
6.	MODEL USE	
6.1.	Model Users	The model was designed for (and the results have been used by) the Federal Ministry for Traffic and Transportation.
6.2.	Main Applications	Investments decisions for interregional roads and railways.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available
7.	DISTINGUISHING FEATURES	Use of a programming model for prediction purposes

1. GENERAL INFORMATION

1.1.	Model Name	Hessen-Model (A Multiperiod, Multiregional, Multisectoral Decision Model)
1.2.	Model Builders	R. Thoss, M. Agnew, G. Bougioukos, G. Erdmann, A. Hermann, B. Spiekermann
1.3.	Responsible Organizations	Sonderforschungsbereich 26, Raumordnung und Raumwirtschaft, Westfalische Wilhelms Universität
1.4.	Publication	G. Bougioukos, and G. Erdmann, An Evaluation of Spatial Planning Objectives by Means of a Multiperiod, Multiregional and Multisectoral Decision Model - Presentation and Discussion of certain results for the State of Hessen, Working Paper No. 28, Sonderforschungsbereich 26 Raumordnung und Raumwirtschaft, Münster, 1980 (in German)
1.5.	Development Stage	The model is operational since appr. 1976.
1.6.	Time Period	The model is based on data from 1960 to 1975.
1.7.	Country	Federal Republic of Germany (State of Hessen)

2. MODEL PURPOSE

2.1.	General Purpose	1. Planning studies (ex-ante), 2. Planning studies (ex-post), 3. Analytical studies
2.2.	Specific Purpose	To calculate the opportunity costs of socio-economic targets for regional development.

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 6 (5 sub-regions of the state of Hessen and the rest of the FRG)
		sectors	: 15
		exogenous variables	: appr. 350
		endogenous variables	: appr. 1150
		equations (inequalities)	: $\leq$ 1330
3.2.	Exogenous Variables	National : expenditures for public finance Regional : population forecasts (without migration), technical progress	
3.3.	Endogenous Variables	National : production, imports, exports, private consumption, public consumption, private investments, public investments, population Regional : idem (plus employment and financial transfers between national and regional authorities)	

4. MODEL STRUCTURE

4.1.	Production Technology	Input-output. Productionfunctions of the Cobb-Douglas type with capital and labour (and land, in case of agriculture) as productionfactors have been estimated. In the model, a linearlized version of the productionfunction is employed.
4.2.	Interregional and International Trade	Interregional and international trade are taken into account. For each region the volume of imports and exports to the aggregate of all other regions is determined.

4.3.	Other Interregional Linkages	Interregional migration. (Interregional diffusion of pollution is included in one of the extensions of the Hessen-Model.)
4.4.	National-Regional Links	The model uses a bottom-up approach to almost all variables. A top-down approach is applied to the financial transfers between national and regional authorities.
4.5.	Supply and Demand Considerations	Regional production is determined simultaneously with the regional supply of production factors and with regional final demand components. Hence, the model is characterized by a mixed supply-demand orientation.
4.6.	Equilibrium Assumptions	On the labour and product markets, demand and supply are not necessarily equal.
4.7.	Treatment of prices	Prices are not included
4.8.	Dynamics	The model is dynamic
4.9.	Functional Forms	The relationships are linear (non-linear functions are linearized)
4.10.	Solution Techniques	Linear programming
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Coefficients have been estimated by means of OLS
5.2.	Validation	The model has been simulated for the period 1970-1985. Simulated growth rates of production volumes are clearly higher than realized growth rates. This is not surprising, since the model aims at describing the most desirable, rather than the most probable regional developments.
6.	MODEL USE	
6.1.	Model Users	The model has been used by a national and a regional planning authority, as well as by the model builders.
6.2.	Main Applications	Determination of effects of transfers between national and regional authorities, evaluation of effects of infrastructure investments, analysis of consequences of technical change on regional policy targets.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available to a certain extent

1. GENERAL INFORMATION

1.1.	Model Name	Nordrhein-Westfalen Model
1.2.	Model Builders	C. Schönebeck
1.3.	Responsible Organizations	Sonderforschungsbereich 26, Raumordnung and Raumwirtschaft, Münster, Federal Republic of Germany
1.4.	Publication	C. Schönebeck, Regionale Arbeitsplatzentwicklung und interregionale Mobilität : Ein Simulationsmodell für Nordrhein-Westfalen. In : Mitteilungen des Informationskreises für Raumplanung, Heft 16, Dortmund, Universität Dortmund, 1981
1.5.	Development Stage	The model building is still ongoing
1.6.	Time Period	The main data is based on 1970 - 1979. The model is meant for the medium and long term.
1.7.	Country	Federal Republic of Germany : state of Nordrheinland-Westfalen

2. MODEL PURPOSE

2.1.	General Purpose	1. Planning studies (ex-ante), 2. Forecasting Studies, 3. Planning studies (ex-post)
2.2.	Specific Purpose	Explanation and forecasting of regional development based on attractiveness differentials between regions. Computing the spatial consequences of economic/social/technical change. Computing the effects of public policies on regional development.

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 34 labour market regions in Nordrhein-Westfalen plus 13 external regions. This model has been linked with a location model for the Dortmund region, consisting of 30 Zones. For certain districts within zones landuse models have been developed.
		sectors	: 40
		exogenous variables	:
		endogenous variables	:
		equations	: the model consists of appr. 4000 Fortran statements
3.2.	Exogenous Variables	National : sectoral growth rates of employment, in- and outmigration, demo-economic parameters Regional : none	
3.3.	Endogenous Variables	National : none Regional : population, employment sectoral production, housing, infrastructure, commuting and migration matrices.	

4. MODEL STRUCTURE

4.1. Production Technology

4.2.	Interregional and International Trade	Not included
4.3.	Other Interregional Linkages	Interregional migration and commuting have been modelled by means of the gravity model
4.4.	National-Regional Links	A top-down approach has been adopted for variables such as : employment, housing and infrastructure
4.5.	Supply-Demand Considerations	
4.6.	Equilibrium Assumptions	Demand and supply are not necessarily equal on the labour and housing market
4.7.	Treatment of Prices	Prices do not play an explicit role in the model
4.8.	Dynamics	The model is dynamic
4.9.	Functional Forms	Various forms have been used
4.10.	Solution Techniques	
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	The model has been estimated by means of OLS
5.2.	Validation	Simulations with the model have been compared with real world data. For the demographic variables the results were better than for the economic variables
6.	MODEL USE	
6.1.	Model Users	The model has been used by the model builder
6.2.	Main Applications	
6.3.	Documentation	- Documentation about the structure and limitations : available to a certain extent - User manual, testing data : not available - Documentation enabling one to replicate the model : not available
7.	DISTINGUISHING FEATURES	The model performs the upper level of a hierarchical demo-economic model with three spatial levels

1. GENERAL INFORMATION

1.1.	Model Name	MIO-Model (Multiregional Input-Output Model)
1.2.	Model Builders	Michael Carlberg
1.3.	Responsible Organizations	-
1.4.	Publication	M. Carlberg, A Multiregional Input-Output Forecasting Model the Case of the Federal Republic of Germany, Vandenhoeck, Göttingen, 1979 (in German)
1.5.	Development Stage	Several model versions have been developed, but only the less sophisticated one is operational (since 1979). The operational version should be considered as a pilot study.
1.6.	Time Period	Data is mainly based on 1970. The model is meant for the medium term.
1.7.	Country	Federal Republic of Germany

2. MODEL PURPOSE

2.1.	General Purpose	1. Analytical studies, 2. Forecasting studies, 3. Planning studies (ex-ante)
2.2.	Specific Purpose	Analysis of the effects of national and regional economic growth on interregional trade.

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 6
		sectors	: 12
		exogenous variables	:
		endogenous variables	:
		equations	:
3.2.	Exogenous Variables	National : national production,production by sector Regional : production	
3.3.	Endogenous Variables	National : - Regional : prodction by sector, interregional trade volumes	

4. MODEL STRUCTURE

4.1.	Production	Input-output
4.2.	Interregional and International Trade	Interregional trade is modelled by means of a gravity model
4.3.	Other Interregional Linkages	None

4.4.	National-Regional Links	The MIO-Model has a top-down structure
4.5.	Supply and Demand Considerations	The production levels are determined without explicit references to supply or demand
4.6.	Equilibrium Assumptions	Disequilibria are not taken into account
4.7.	Treatment of Prices	Prices are not included
4.8.	Dynamics	The MIO model is dynamic
4.9.	Functional Forms	The model contains linear relationships and several iterative bi-linear algorithms of the RAS-type
4.10.	Solution Techniques	RAS-procedures are used to determine regional production per sector given total regional and total sectoral production volumes.

5. ESTIMATION AND VALIDATION

5.1.	Estimation	The gravity parameter of the interregional trade model has been estimated by means of OLS
5.2.	Validation	The model has been used to generate a prediction for 1980. An explicit confrontation with the actual development in 1980 has not been carried out.

6. MODEL USE

6.1.	Model Users	The model has been used by the model builder
6.2.	Main Applications	The model has been used to forecast regional development and interregional trade in 1980.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : not available

THE NETHERLANDS

1. GENERAL INFORMATION

1.1.	Model Name	REM (Regional Economic Model)
1.2.	Model Builders	B.A. van Hamel, H. Hetsen, J.H.M. Kok
1.3.	Responsible Organizations	Central Planning Bureau, The Hague, The Netherlands
1.4.	Publication	A. van Delft, B.A. van Hamel, H. Hetsen, A. Multiregional Model for the Netherlands. Occasional Paper 13, C.P.B., The Hague, 1977 (In Dutch)
1.5.	Development Stage	REM is operational since appr. 1974
1.6.	Time Period	Data is based on 1955-1967. REM is meant for the medium term
1.7.	Country	The Netherlands

2. MODEL PURPOSE

2.1.	General Purpose	1. Forecasting studies, Planning studies (ex-ante), 3. Planning studies (ex-post)
2.2.	Specific Purpose	To generate simultaneous medium term forecasts of production, employment, labour supply and unemployment for the Dutch provinces.

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 11
		sectors	: 7
		exogenous variables	: 115
		endogenous variables	: 765
		equations	: 765
3.2.	Exogenous Variables	National : growth rates of employment and production per sector, labour supply, capital stock (industry)	
		Regional : Natural growth of labour supply	
3.3.	Endogenous Variables	National : -	
		Regional : production and employment per sector, labour supply (including migration), unemployment, investments	

4. MODEL STRUCTURE

4.1.	Production Technology	Cobb-Douglas production functions have been used for several sectors. The production factors are labour and capital

4.2.	Interregional and International Trade	Not included
4.3.	Other Interregional Linkages	Not included
4.4.	National-Regional Links	REM is a pure top-down model.
4.5.	Supply and Demand Considerations	Regional production in the industrial sector is mainly determined by the supply side (capital formation). In the other sectors, regional production is mainly determined by demand.
4.6.	Equilibrium Assumptions	Disequilibria occur on the labour market
4.7.	Treatment of Prices	Prices and wages are included. They play a role in substitution processes between capital and labour.
4.8.	Dynamics	REM is dynamic
4.9.	Functional Forms	REM is linear
4.10.	Solution Equations	Standard method to solve a system of linear equations
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	OLS, based on pooled cross-sections
5.2.	Validation	Simulation runs have been carried out with REM. According to the model builders the validity is sufficient for an analysis of the sixties and the beginning of the seventies.
6.	MODEL USE	
6.1.	Model Users	Central Planning Bureau
6.2.	Main Applications	Generation of medium term forecasts (1975-1980) and analysis of impacts of investment subsidies
6.3.	Documentation	- Documentation about structure and limitations : available to a certain extent - User manual, testing data : not available - Documentation enabling one to replicate the model : available to a certain extent
7.	DISTINGUISHING FEATURES	Treatment of interrelations between demand and supply of labour.

1. GENERAL INFORMATION

1.1. Model Name	REGAM(Regional Labour Market Model)
1.2. Model Builders	W. Suyker and A. van Delft
1.3. Responsible Organizations	Central Planning Bureau, The Hague, Netherlands
1.4. Publication	A. van Delft and W. Suyker, Regional Investment Subsidies: an Estimation of the Labour Market Effects for the Dutch Regions, paper presented at the XXI European Congress of the Regional Science Association in Barcelona, August 1981.
1.5. Development Stage	REGAM is operational since 1981. It is an improved version of a former regional labourmarket model.
1.6. Time Period	Data is based on 1951 - 1980. REGAM is meant for the medium term.
1.7. Country	The Netherlands

2. MODEL PURPOSE

2.1. General Purpose	1. Forecasting studies, 2. Planning studies (ex-post), 3. Planning studies (ex-ante)
2.2. Specific Purpose	REGAM has been built to generate forecasts of employment, labour supply and unemployment for the Dutch provinces for the period 1980 - 1985.

3. MODEL ELEMENTS

3.1. Model Size	regions	: 11
	sectors	: 6
	exogenous variables	: 465
	endogenous variables	: 1410
	equations	: 1410
3.2. Exogenous Variables	National : growth rate of employment per sector; growth rate of labour supply Regional : natural growth of population and labour supply, attractiveness of natural scenery	
3.3. Endogenous Variables	National : none Regional : growth of employment per sector, growth rate of labour supply, net migration, rate of unemployment	

4. MODEL STRUCTURE

4.1. Production Technology	No explicit use is made of a productionfunction.

4.2.	Interregional & International Trade	No explicit attention is paid to interregional or international trade.
4.3.	Other Interregional Linkages	In REGAM the main explanatory variables of net interregional migration are the situation on the housing market and the environmental quality. Labout market variables do not contribute significantly to an explanation of interregional migration.
4.4.	National-Regional Links	REGAM is a top-down model
4.5.	Supply and Demand Considerations	On the regional labour market, labour supply and demand are interdependent. Regional unemployment is an important variable in this interdependence: it influences regional labour supply and regional industrial labour demand.
4.6.	Equilibrium Assumptions	Unemployment is a key variable in the model
4.7.	Treatment of Prices	Prices and wages are in general not included. The only exception is the variable: price-reduction of investment as result of investment subsidies.
4.8.	Dynamics	REGAM is dynamic
4.9.	Functional Forms	REGAM is linear
4.10.	Solution Techniques	A standard approach to solve a system of linear equations can be used.

5. ESTIMATION AND VALIDATION

5.1.	Estimation	A weighted least squares estimation on pooled cross-section data has been carried out.
5.2.	Validation	The validity of the model has been tested (not published). According to the model-builders the validity is satisfactory.

6. MODEL USE

6.1.	Model Users	The Central Planning Bureau
6.2.	Main Applications	Forecasts of the development of regional labour markets for the period 1980 - 1985. An analysis of the impacts of investment subsidies.
6.3.	Documentation	- Documentation about structure and limitations : available to a certain extent - User Manual, testing data : not available - Documentation enabling one to replicate the model : available to a certain extent

7. DISTINGUISHING FEATURE — Treatment of interrelations between demand and supply on the labour market.

1.	GENERAL INFORMATION	
1.1.	Model Name	Interregional Policy Model for Energy-Economic-Environmental Interactions
1.2.	Model Builders	F. Muller and P.J.J. Lesuis
1.3.	Responsible Organizations	Erasmus University, Rotterdam, The Netherlands
1.4.	Publication	P. Lesuis, F. Muller and P. Nijkamp, An Interregional Policy Model for Energy-Economic-Environmental Interactions, Regional Science and Urban Economics, vol. 10, 1980 pp. 343-370
1.5.	Development Stage	The model is operational since appr. 1972. It is in a continuous process of updating and revision
1.6.	Time Period	The model is based on data from 1970. It is meant for use on the short, medium and long term
1.7.	Country	The Netherlands
2.	MODEL PURPOSE	
2.1.	General Purpose	1. Planning studies (ex-ante), 2/3. Analytical studies, Forecasting studies
2.2.	Specific Purpose	Study of interactions between energy, environment and the economy.
3.	MODEL ELEMENTS	
3.1.	Model Size	regions : 2 (the central provinces of the Netherlands versus the rest of the country) sectors : 11 exogenous variables : appr. 60 endogenous variables : appr. 40 equations (inequalities) : appr. 50
3.2.	Exogenous Variables	National : - Regional : exports abroad, constraints on production, employment, energy consumption, pollution
3.3.	Endogenous Variables	National : - Regional : production, employment, energy consumption, pollution, final demand
4.	MODEL STRUCTURE	
4.1.	Production Technology	Input-output. A productionfunction with fixed technical coefficients has been assumed for the production factors labour and energy
4.2.	Interregional and International Trade	Competing imports originated from the other region are allocated to the regional sector, importing a fixed ratio of total demand for its products (this implies the absence of cross-hauling)
4.3.	Other Interregional Linkages	None

4.4.	National-Regional Links	The model has a bottom-up structure
4.5.	Supply and Demand Considerations	Model outcomes depend on demand variables (exports abroad) as well as on supply variables (restrictions on the availability of materials, labour and energy)
4.6.	Equilibrium Assumptions	For all products, demand and supply are equal. On the labour market, excess supply may exist
4.7.	Treatment of Prices	In the model a submodel is included to deal with substitution effects on the production technology due to (exogenous) price changes. The approach in the submodel is based on regional translog price possibility frontiers. Due to weaknesses in the data-base, the outcomes of the submodel only have a preliminary character.
4.8.	Dynamics	The model is static
4.9.	Functional Forms	In the main model, the functional forms are linear. In the submodel they are log-linear.
4.10.	Solution Equations	The model is formulated as a multiobjective programming model with objectives related to employment, energy use and pollution.
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Coefficients in the main model have been obtained by one-point estimates.
5.2.	Validation	A validation has not been carried out.
6.	MODEL USE	
6.1.	Model Users	The model has been used by a national and a regional governmental agency, as well as at the university
6.2.	Main Applications	Analysis of the interrelationships between economic development, air pollution and energy consumption.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available to a certain extent
7.	DISTINGUISHING FEATURES	Inclusion of energy and pollution. Study of substitution processes in input-output context.

BELGIUM

1. GENERAL INFORMATION

1.1.	Model Name	RENA (Regional National Model)
1.2.	Model Builders	F. Thijs-Clement, P. van Rompuy, L. de Corel
1.3.	Responsible Organizations	Belgian Planning Office, Brussels, Belgium
1.4.	Publication	F. Thijs, P. van Rompuy, RENA, Regional Model for Belgium, in: R. Courbis (ed), Modèles Régionaux et Modèles Régionaux-Nationaux, CUJAS, Paris, 1979, pp. 103-122
1.5.	Development Stage	RENA is operational since 1973
1.6.	Time Period	The main data is based on the period from 1963 - 1970. RENA is meant for the medium term.
1.7.	Country	Belgium

2. MODEL PURPOSE

2.1.	General Purpose	1. Educational purposes, 2. Analytical studies, 3. Forecasting studies
2.2.	Specific Purpose	Instrument in the framework of the 5 year national regional economic plans, especially for the period 1976 - 1980.

3. MODEL ELEMENTS

3.1.	Model Size	regions : 3 sectors : 2 exogenous variables : 96 endogenous variables : 160 equations : 160
3.2.	Exogenous Variables	National : money supply, government consumption, import prices, world export prices, discount rate, social security contributions and transfers Regional : population, subsidies, government investment, structural unemployment
3.3.	Endogenous Variables	National : imports, exports, consumption, investments, GNP, tax receipts, profits, output and factor prices Regional : activity rates, user cost of capital, wages, investment, structural unemployment

4. MODEL STRUCTURE

4.1.	Production Technology	Production depends on employment and the capital stock
4.2.	Interregional and International Trade	International trade is specified in RENA. Much attention is paid to the role of prices in determining the volume of exports and imports
4.3.	Other Interregional Linkages	Commuting is taken into account

4.4.	National-Regional Links	The model contains interactions between the national and regional level. A top-down approach is applied to regional production. For employment, unemployment, investment and wages a bottom-up approach has been adopted.
4.5.	Supply and Demand Considerations	Regional production is mainly determined by variables from the demand side.
4.6.	Equilibrium Assumptions	On the money market, demand and supply are equal by assumption. On the goods market, equilibrium is attained by price adjustments. On the labour market disequilibrium may occur.
4.7.	Treatment of Prices	Wages and prices play an important role in the regional investment function.
4.8.	Dynamics	RENA is dynamic
4.9.	Functional Forms	Linear and log-linear forms occur
4.10.	Solution Techniques	RENA can be solved by the Gauss-Seidel procedure, after presenting the model in a pseudo-recursive form.

5. ESTIMATION AND VALIDATION

5.1.	Estimation	RENA has been estimated by means of OLS, two stage least squares and restricted least squares.
5.2.	Validation	Static and dynamic simulations have been carried out with RENA. The validity of RENA seems satisfactory.

6. MODEL USE

6.1.	Model Users	The model has been used by the Belgian Planning Office and by the model builders
6.2.	Main Applications	Evaluation of policy measures (subsidies, government investment) for the Belgian Plan 1976-80.
6.3.	Documentation	- Documentation about structure and limitaitons : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : not available

7. DISTINGUISHING FEATURES

RENA was one of the first operational national-regional models.

1.	GENERAL INFORMATION	
1.1.	Model Name	SERENA (sectoral-regional model)
1.2.	Model Builders	G. d'Alcantara, J. Floridor, E. Pollefliet
1.3.	Responsible Organizations	Belgian Planning Bureau, Brussels, Belgium
1.4.	Publication	G. d'Alcantara, J. Floridor, E. Pollefliet, Major Features of the SERENA-Model for the Belgian Plan, Planning Bureau, Brussels, 1980
1.5.	Development Stage	SERENA is operational since 1980
1.6.	Time Period	SERENA is based on data from 1960 to 1978. It is meant for the medium term.
1.7.	Country	Belgium
2.	MODEL PURPOSE	
2.1.	General Purpose	1. Planning studies (ex-ante), 2. Forecasting studies, 3. Analytical studies
2.2.	Specific Purpose	Prepare the options of the Belgian plan (1981-85)
3.	MODEL ELEMENTS	
3.1.	Model Size	regions : 3 sectors : 7 exogenous variables : 1700 endogenous variables : 800 equations : 800
3.2.	Exogenous Variables	National : employment in public administration, tax rate Regional : population, commuting
3.3.	Endogenous Variables	National : the complete national accounts, prices, employment, labour supply, unemployment Regional : employment, investments, value added (per sector), labour supply, unemployment
4.	MODEL STRUCTURE	
4.1.	Production Technology	input-output; putty-clay
4.2.	Interregional and International Trade	In SERENA attention is paid to international trade. Import volumes are among others a function of relative prices. In certain sectors export volumes are determined by foreign demand, in other sectors by profitability conditions given the prices on the world market.
4.3.	Other Interregional Linkages	Some attention is paid to commuting.

4.4.	National-Regional Links	A bottom-up approach is adopted for the variables specified at the regional level.
4.5.	Supply and Demand Considerations	In most markets the production volumes are determined by variables from the demand side.
4.6.	Equilibrium Assumptions	Prices play an important role in determining equilibrium on the markets.
4.7.	Treatment of Prices	For all components of demand the corresponding price has been included. Prices play a role, among others, in the decision to replace production vintages.
4.8.	Dynamics	SERENA is dynamic
4.9.	Functional Forms	
4.10.	Solution Techniques	
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	
5.2.	Validation	
6.	MODEL USE	
6.1.	Model Users	SERENA is used by the Belgian Planning Bureau
6.2.	Main Applications	Preparation of the Belgian Plan
6.3.	Documentation	- Documentation about structure and limitations : available - User Manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available to a certain extent
7.	DISTINGUISHING FEATURES	The use of production vintages

1. GENERAL INFORMATION

1.1 Model Name	MACEDOINE II
1.2 Model Builders	M. Despontin, H. Glejser
1.3 Responsible Organizations	Free University, Brussels, Belgium
1.4 Publication	G. Glejser, G. van Daele and M. Lambrecht, The First Experiments with an Econometric Regional Model of the Belgian Economy, Regional Science and Urban Economics, vol.3, 1973, pp.301-314
1.5 Development Stage	An earlier version of the model was operational in 1973. After then the model has been revised and updated.
1.6 Time Period	The coefficients of the model are based on data from 1959 to 1976. The model is meant for the short and medium term
1.7 Country	Belgium

2. MODEL PURPOSE

2.1 General Purpose	1. Planning studies (ex-ante) 2. Forecasting studies, 3. Planning studies(ex-post)
2.2 Specific Purpose	Explanation of regional variables by mechanisms on the regional level and not as a disaggregation of national data

3. MODEL ELEMENTS

3.1 Model Size

regions	: 9
industries	: 1
exogenous variables	: 30
endogenous variables	: 63
equations	: 63 (behavioural equations)

3.2 Exogenous Variables	National : import prices, labour immigration Regional : gross investments, producer prices, non-wage employment
3.3 Endogenous Variables	National : - Regional : gross regional product, employment, labour immigration, unemployment, wages, consumer prices, capital stock.

4. MODEL STRUCTURE

4.1 Production Technology:	A Regional production function of the Cobb-Douglas type is used with labour and capital as production factors. In the production function cyclical movements of the national economy and technical development are taken into account.

4.2	Interregional and International Trade	No attention is paid to interregional trade
4.3	Other Interregional Linkages	The regional level of unemployment is among others explained by the levels of employment, unemployment and non-wage employment in contiguous regions
4.4	National-Regional Links	The only exogenous variables at the national level are import prices and labour immigration Hence MACEDOINE is very much characterized by a bottom-up approach
4.5	Supply and Demand Considerations	In the model, the volumes of production and employment are determined simultaneously. Hence, the model is characterized by supply-demand interactions
4.6	Equilibrium Assumptions	Demand and supply of goods are equal by assumption. On the labourmarket unemployment may exist
4.7	Treatment of Prices	Regional wages and consumer prices are endogenous
4.8	Dynamics	MACEDOINE-II is a dynamic model
4.9	Functional Forms	The model consists of non linear relationships of various forms
4.10	Solution Techniques	The model is solved by means of the Gauss-Seidel algorithm. In a linearized form it has been used for a series of multi-objective programming experiments.

5. ESTIMATION AND VALIDATION

5.1	Estimation	The coefficients have been estimated by means of OLS and variance component analysis for pooling cross-sections and time-series
5.2	Validation	MACEDOINE has been used to forecast variables in the years 1980/81. The results are encouraging, according to the authors

6. MODEL USE

6.1	Model Users	The model has been used by the model-builders
6.2	Main Applications	Quantitave economic policy simulations in a multi-objective framework
6.3	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available - Documentation enabling one to replicate the model : available

7. DISTINGUISHING FEATURES — Application of an econometric model in a mathematical programming context. Modelling of links between contiguous regions.

1. GENERAL INFORMATION

1.1. Model Name	BREIN: Belgian Regional and Interregional Analytical Model
1.2. Model Builders	W.K. Brauers, J.Van Waterschoot, P. Van Elewijck.
1.3. Responsible Organizations	Centrum voor Economische Studiën, University of Louvain, Belgium.
1.4. Publications	W.K. Brauers, The Belgian Experience in Interregional Input-Output Tables,1980 Centrum voor Economische Studiën, University of Louvain.
1.5. Development Stage	Operational since 1973.
1.6. Time Period	An interregionel input-output table is available from 1976. The model is meant for the short term.
1.7. Country	Belgium

2. MODEL PURPOSE

2.1. General Purpose	1. Analytical studies, 2. Planning studies (ex-post), 3. Planning studies (ex-ante).
2.2. Specific Purpose	To obtain insight in the regional economic structure (regions fixed by law) of Belgium to improve policy formulations.

3.MODEL ELEMENTS

3.1. Model size	regions : 3 industries : between 46 and 62 exogenous variables : endogenous variables : between 138 and 186 equations : between 138 and 186
3.2. Exogenous Variables	National : final demand Regional : final demand
3.3. Endogenous Variables	National : sectoral production Regional : sectoral production

4. MODEL STRUCTURE

4.1. Production Technology	input-output
4.2. Interregional/ International Trade	In BREIN, interregional and international trade has been modelled explicitly by means of trade coefficients.

4.3 Other Interregional Linkages	no
4.4 National Reginal Links	The model has a top-down structure. Regional value added, production and imports are determined by means of a disaggregation of the corresponding national variables.
4.5 Supply and Demand Considerations	The model is demand driven.
4.6 Equilibrium Assumptions	Demand and supply of goods are not necessarily equal: they may differ because of inventory formation.
4.7 Treatment of Prices	Prices do not play an explicit role.
4.8 Dynamics	BREIN is static.
4.9 Functional Form	The model is linear.
4.10Solution Techniques	Standard.

5. ESTIMATION AND VALIDATION

5.1 Estimation	Input-output and trade coefficients are partly directly based on statistical data and partly on various data manipulation methods.
5.2 Validation	According to the model-builders, BREIN provides insight in the structure of sector and regious.

6. MODEL USE

6.1 Model Users	BREIN was designed for the National Fund for Scientific Research and the Ministry of Economic Affairs. It has been used by a national governmental agency, a private organization and a university.
6.2 Main Applications	The effects of taxes and gouvernment expenditures on the regions.
6.3 Documentation	- Documentation about structure and limitations : available - User manual, testing data, etc. : available to a certain extent - Documentation enabling one to replicate the model: available

1. GENERAL INFORMATION

1.1 Model Name	K.I.M.: Short Term Interregional Model for Belgium.
1.2 Model Builders	W.K. Brauers, J. van Waterschoot, P. van Elewijck, P. Mwebesa
1.3 Responsible Organizations	Centrum voor Economische Studiën, University of Louvain, Belgium; RUCA, Faculty of Applied Economics, University of Antwerp, Belgium
1.4 Publication	---
1.5 Development Stage	The model is operational but up to now publications are not yet available for the general public.
1.6 Time Period	The main national data are from 1952-1977. The main regional data are from 1966-1977 The model is meant for the short term.
1.7 Country	Belgium

2. MODEL PURPOSE

2.1 General Purpose	1. Forecasting Studies, 2. Planning Studies (ex-ante), 3. Planning Studies (ex-post)
2.2 Specific Purpose	To give assistance to regional economic policy makers

3. MODEL ELEMENTS

3.1 Model Size	regions : 3 industries : 20 exogenous variables : 67 endogenous variables : 124 equations : 124
3.2 Exogenous Variables	National: Final demand, capital formation, employment, imports Regional: employment and investment in certain sectors
3.3 Endogenous Variables	National: production, value added Regional: production, value added

4. MODEL STRUCTURE

4.1 Production Technology:	input-output
4.2 Interregional/ International Trade	In KIM, interregional and international trade has been modelled explicitly by means of trade coefficients.

4.3 Other Interregional Linkages	no
4.4 National-Regional Links	KIM has a top-down structure. Regional value added, production and imports are determined by means of a disaggregation of national variables.
4.5 Supply and Demand Considerations	KIM is demand driven
4.6 Equilibrium Assumptions	The supply of goods is equal to demand by assumption
4.7 Treatment of Prices	Prices do not play an explicit role
4.8 Dynamics	KIM is dynamic
4.9 Functional Forms	The relationships are linear and log-linear
4.10Solution Techniques	Standard

5. ESTIMATION AND VALIDATION

5.1 Estimation	Coefficients have been estimated among others by means of OLS
5.2 Validation	

6. MODEL USE

6.1 Model Users	National Government: Ministry of Economic Affairs
6.2 Main Applications	
6.3 Documentation	- Documentation about structure and limitations : not available - User manual, testing data : not available - Documentation enabling one to replicate the model : not available

FRANCE

1. GENERAL INFORMATION

1.1. Model Name	REGINA (Regional-National Model)
1.2. Model Builders	Raymond Courbis, Jean Bourdon, Gérard Cornilleau, Cuong le Van with contributions of Christian Pommier and Françoise Bourdon.
1.3. Responsible Organizations	Groupe d' Analyse Macroéconomique Appliquée, University of Paris X, Nanterre, France.
1.4. Publication	R. Courbis, The REGINA Model, a Regional-National Model for French Planning, Regional Science and Urban Economics, vol. 9, 1979, pp. 117-139.
1.5. Development Stage	REGINA is operational since appr. 1974.
1.6. Time Period	REGINA is based on national data from 1959 - 1975, regional data from appr. 1962 to 1972 or 1976, and on an input-output table from 1969/1970. REGINA is meant for the medium term.
1.7. Country	France.
1.8 Related Models	A simplified version of REGINA has been designed : REGIS (Regionalized Simulation Model). This model is at present in an experimental stage of development.

2. MODEL PURPOSE

2.1. General Purpose	1. Analytical studies, 2. Planning studies (ex-ante).
2.2. Specific Purpose	Analysis of the interdependence between national and regional development. In particular analysis of regional impacts of national development and policies, and of national inpacts of regional policies and disequilibria.

3. MODEL ELEMENTS

3.1. Model Size	regions	: 5 (with a break-down of each region in 3 areas in terms of urbanization).
	sectors	: 10
	exogenous variables	:
	endogenous variables	: appr. 8000
	equations	: appr. 8000
3.2. Exogenous Variables	National	: demographic variables, variables from foreign countries, national policy instruments.
	Regional	: production and prices of agriculture, natural rate of population growth.
3.3. Endogenous Variables	National	: production, demand, consumption, investment, employment, unemployment, wages, prices, income distribution, foreign trade.
	Regional	: employment, unemployment, migration, wages, income distribution, production, investments, capital stock, consumption, interregional trade.

4. MODEL STRUCTURE

4.1. Production Technology	Input-output. Production functions are used with labour and capital as production factors.

4.2. Interregional and International Trade	Interregional trade is modelled by means of interregional input-output analysis.
4.3. Other Interregional Linkages	Interregional migration (depends among others on wage differential and jobs creation) Interregional wage linkages (wage increases in peripheral regions depend among others on wage increases in the core regionl
4.4. National-Regional Links	For almost all variables a bottom-up approach has been adopted. A top-down approach is applied to foreign trade, distribution of profits and investments of state government and of free-located industries. The national volume of investments in free-located industries (the manufacturing sector) is distributed among regions according to the regional investment opportunities.
4.5. Supply and Demand Considerations	Certain industries (free-located industries) are supply driven. In these industries regional production is determined by the regional stock of capital. Other industries are demand-driven: regional production levels are determined by regional demand.
4.6. Equilibrium Assumptions	In certain sectors, regional demand and supply are equal by assumption. In other sectors regional demand and supply are equal by price adjustment. In again other sectors equilibrium is attained at the national level by foreign trade. On the labour market, demand and supply are not necessarily equal.
4.7. Treatment of Prices	Wages and prices play an important role in REGINA. Especially the dynamics of regional wages are crucial.
4.8. Dynamics	REGINA is static.
4.9. Functional Forms	Several forms occur in REGINA.
4.10 Solution Techniques	Numerical methods for solving a system of non-lineau equations.

5. ESTIMATION AND VALIDATION

5.1. Estimation	Coefficients have mainly been estimated by means of OLS. In some cases non-linear estimation procedures or two stage least squares have been adopted.
5.2. Validation	To a certain extent comparisons between forecasts and results have been made. The validity is - according to the builders - sufficient for projections of main figures and quite interesting for impact studies.

6. MODEL USE

6.1. Model Users	The model has been used by the French Planning Office, a regional governmental agency and the model builders.
6.2. Main Applications	-Regional impacts of national scenarios of the French Plan -National impacts of regional policies concerning public and private investments and social security rates -National and regional impacts of large regional projects such as investments in the steel industry, coal mining, tourism.
6.3. Documentation	-Documentation about structure and limitations : available -User manual, testing data : available to a certain extent -Documentation enabling one to replicate the model : available to a certain extent

7. DISTINGUISHING FEATURES :
- The distinction between demand and supply driven industries.
- The interregional dynamics of wages.
- Different levels of spatial analysis (national-regional-zonal).

ITALY

1.	GENERAL INFORMATION	
1.1.	Model Name	A Regional-National Econometric Model of Italy
1.2.	Model Builders	S. Arora, M. Brown, M. di Palma, B. Ferrara, T. Furagori, M.J. Hartley, S. Kim
1.3.	Responsible Organization	State University of New York at Buffalo U.S.A. and Centre di Studi e Piani Economici, Rome, Italy
1.4.	Publication	M. Brown, M. di Palma, B. Ferrara, Regional-National Econometric Modeling, Pion, London, 1978
1.5.	Development Stage	The model consists of series of operational sub-models (for migration, prices, labour markets, etc) The model as a whole is not operational. The sub-models have been developed around the years 1972/1973.
1.6.	Time Period	The main data is based on the period of 1951 to 1968. The model is meant for the medium term
1.7.	Country	Italy
2.	MODEL PURPOSE	
2.1.	General Purpose	1. Planning studies (ex-ante), 3. Planning Studies (ex-post), 3. Forecasting studies
2.2.	Specific Purpose	The explanation of the formation, use and distribution of the components of value added
3.	MODEL ELEMENTS	
3.1.	Model Size	regions : 19 sectors : 6 exogenous variables : appr. 130 endogenous variables : 737 equations : 737
3.2.	Exogenous Variables	National : interest rate, prices, net imports, government consumption, investments (in one version of the model) Regional : government consumption, investments (in one version of the model)
3.3.	Endogenous Variables	National : production, consumption, employment, unemployment, taxes, population, wages Regional : production, consumption, employment, unemployment, taxes, population, net imports, prices, wages
4.	MODEL STRUCTURE	
4.1.	Production Technology	Factor demand functions are based on Cobb-Douglas and C.E.S. production functions with labour and capital as production factors.
4.2.	Interregional and International Trade	Interregional and international trade are dealt with implicitly by means of net imports per region which are explained, among others by the regional price level relative to the national price level.

4.3.	Other Interregional Linkages	Interregional migration is explained among others by income and urbanization variables.
4.4.	National-Regional Links	A bottom-up approach is used for the majority of endogenous variables.
4.5.	Supply and Demand Considerations	The model is characterized by supply-demand interactions on the labour and commodity market
4.6.	Equilibrium Assumptions	Equilibrium exists on the commodity market by price adjustments. On the labour market the existence of unemployment is taken into account.
4.7.	Treatment of Prices	Regional prices and wages are endogenous. They give rise to adjustment processes on commodity and labour markets.
4.8.	Dynamics	The model is dynamic
4.9.	Functional Forms	Linear, log-linear, C.E.S., S-branch
4.10.	Solution Techniques	Most of the sub-models have a recursive structure so that the endogenous variables can be found directly.

5. ESTIMATION AND VALIDATION

5.1.	Estimation	The following procedures have been applied : OLS, maximum likelihood, Cochran-Orcutt adjustment, Almon distributed lags, generalized F analysis.
5.2.	Validation	The model as a whole has not been validated.

6. MODEL USE

6.1.	Model Users	The model has been used by the model builders
6.2.	Main Applications	Analysis of the effects of rising energy prices on regional income per worker
6.3.	Documentation	- Documentation about the structure and limitation : available - Use manual, testing data : not available - Documentation enabling one to replicate the model : available

7. DISTINGUISHING FEATURES — This is one of the earliest models with extensive use of bottom-up approaches.

1. GENERAL INFORMATION

1.1. Model Name	Nord-Sud
1.2. Model Builders	Dino Martellato
1.3. Responsible Organization	University of Venice
1.4. Publication	D. Martellato, Structural Analysis with an Updated Interregional Input-Output Model for Italy, 1977, paper presented at the 20th European meeting of the Regional Science Association, Munchen, August 1980.
1.5. Development Stage	The model is still in a development phase.
1.6. Time Period	The model is based on data from 1969 and 1977. It is meant for the medium term.
1.7. Country	Italy.

2. MODEL PURPOSE

2.1. General Purpose	1. Analytical studies, 2. Forecasting studies.
2.2. Specific Purpose	The study of dualistic growth phenomena in Italy.

3. MODEL ELEMENTS

3.1. Model Size	regions : 2 (The Northern and Southern part of Italy) industries : 35 exogenous variables : 70 endogenous variables: 70 equations : 70
3.2. Exogenous Variables	National : none Regional : final demand
3.3. Endogenous Variables	National : none Regional : production, interregional trade.

4. MODEL STRUCTURE

4.1. Production Technology	Input-output.
4.2. Interregional and International Trade	For all industries the possiblity of interregional trade is taken into account. All sectors of destination within a region are assumed to have the same pattern of imports.
4.3. Other Interregional Linkages	None.
4.4. National Regional Links	None. National variables have not been formulated explicitly in the model.

4.5. Supply and Demand Considerations	Regional production is exclusively determined by final demand.
4.6. Equilibrium Assumptions	The supply and demand of goods are assumed to be equal.
4.7. Treatment of Prices	Prices do not play a role in the model.
4.8. Dynamics	The model is static.
4.9. Functional Forms	The model is linear.
4.10 Solution Techniques	Usual methods of solving a system of linear equations.

5. ESTIMATION AND VALIDATION

5.1. Estimation	The input-output and trade coefficients have been constructed by means of usual survey and updating approaches.
5.2. Validation	The validity of the model has not been tested.

6. MODEL USE

6.1. Model Users	The model is used by the model builder.
6.2. Main Applications	Analysis of economic integration between Northern and Southern Italy.
6.3. Documentation	-Documentation about structure and limitations : available to a certain extent -User Manual, Testing Data : available to a certain extent -Documentation enabling one to replicate the model : available to a certain extent

7. REMARKS — A version with endogenous consumption and investments is planned.

1. GENERAL INFORMATION

1.1. Model Name	VERDI
1.2. Model Builders	Paolo Costa, Dino Martellato, Lucio Malfi.
1.3. Responsible Organizations	University of Venice.
1.4. Publication	Interregional Input-Output Analysis, Some experiments with the VERDI model, Paper presented at the Italian Regional Science Conference, Rome, 1980 (Italian).
1.5. Development Stage	VERDI is still in a development phase.
1.6. Time Period	The model is based on data from 1972 and 1977. It is meant for the medium term.
1.7. Country	Italy.

2. MODEL PURPOSE

2.1. General Purpose	1. Analytical studies, 2. Forecasting studies.
2.2. Specific Purpose	The construction of an interregional input-output model for Italy by successive aggregation of single region input-output systems.

3. MODEL ELEMENTS

3.1. Model Size	regions : 2 (The Venice-region and the rest of Italy). industries : 44 exogenous variables : endogenous variables: 88 equations : 88
3.2. Exogenous Variables	National : none Regional : final demand (interregional trade excluded)
3.3. Endogenous Variables	National : none Regional : production, interregional trade.

4. MODEL STRUCTURE

4.1. Production Technoloby	Input-Output
4.2. Interregional and International Trade	For all industries the possiblity of interregional trade is taken into account. All sectors of destination within a region are assumed to have the same pattern of imports.
4.3. Other Interregional Linkages	None

4.4. National-Regional Links	None. National variables have not been formulated explicitly in the model.
4.5. Supply and Demand Considerations	Regional production is exclusively determined by regional demand.
4.6. Equilibrium Assumptions	The supply and demand of goods are assumed to be equal.
4.7. Treatment of Prices	Prices do not play a role in the model.
4.8. Dynamics	VERDI is static.
4.9. Functional Forms	VERDI is linear.
4.10 Solution Techniques	Usual methods of solving a system of linear equations.

5. ESTIMATION AND VALIDATION

5.1. Estimation	Input-output and trade coefficients have been constructed by menas of usual survey and updating approaches.
5.2. Validation	The validity of VERDI has not been tested.

6. MODEL USE

6.1. Model Users	VERDI is used by the model builders.
6.2. Main Applications	--
6.3. Documentation	-Documentation about structure and limitations : available -User manual, testing data : available to a certain extent -Documentation enabling one to replicate the model: available to a certain extent

UNITED KINGDOM

1. GENERAL INFORMATION

1.1. Model Name	Interregional Input-Output Model for the United Kingdom.
1.2. Model Builders	Ian Gordon
1.3. Responsible Organizations	Urban and Regional Studies Unit, University of Kent, Canterbury, England.
1.4. Publication	I.R. Gordon, Regional Interdependence in the U.K. Economy, in W. Leontief (ed.), Structure, System and Economic Policy, Cambridge University Press, 1977.
1.5. Development Stage	The model is operational since apprx. 1977.
1.6. Time Period	The base year of the interregional input-output relationships is 1963. The model is meant for the medium te
1.7. Country	United Kingdom.

2. MODEL PURPOSE

2.1. General Purpose	1. Analytical studies, 2. Forecasting studies, 3. Planning studies (ex-ante).
2.2. Specific Purpose	To understand and predict some of the broader trends in regional growth performance.

3. MODEL ELEMENTS

3.1. Model Size

regions	: 11
sectors	: 40 (households are one of the sectors)
exogenous variables	:
endogenous variables	: 440
equations	: 440

3.2. Exogenous Variables	National : exports and investment by sector Regional : exports and investment by sector
3.3. Endogenous Variables	National : gross output and employment income by sector Regional : gross output and employment income by sector

4. MODEL STRUCTURE

4.1. Production Technology	Input-output.
4.2. Interregional and International trade	Regional trade coefficients are independent of the identity of the purchasing sector. The trade coefficients have been estimated by means of a gravity model.

4.3. Other Interregional Linkages	Commuting is taken into account because of the fact that households form one of the sectors.
4.4. National-Regional Links	All endogenous national variables are obtained as the sum of the corresponding regional variables.
4.5. Supply & Demand Considerations	The model is demand-driven.
4.6. Equilibrium Assumptions	On the commodity markets sypply and demand are equal by assumption.
4.7. Treatment of Prices	Regional price differences play a role in the construction of the input-output coefficients of some sectors.
4.8. Dynamics	The model is static.
4.9. Functional Forms	The model is linear.
4.10 Solution Techniques	Usual methods of solving a system of linear equations.

5. ESTIMATION AND VALIDATION

5.1. Estimation	Input-output coefficients are in most cases straightforward proportions of base-year data. Trade coefficients have been estimated via a gravity model.
5.2. Validation	A validation has not been carried out.

6. MODEL USE

6.1. Model Users	The model has been used by the model builder.
6.2. Main Applications	
6.3. Documentation	-Documentation about structure and limitations : available to a certain extent -User manual, testing data : not available -Documentation enabling one to replicate the model: available to a certain extent

1. GENERAL INFORMATION

1.1.	Model Name	WREM (Warwick Regional Employment Model)
1.2.	Model Builders	Peter Elias and others
1.3.	Responsible Organizations	University of Warwick, Coventry, United Kingdom
1.4.	Publication	G.T. Keogh and D.P.B. Elias, A Model for Projecting Regional Employment in the U.K., Regional Studies, vol. 13, pp. 465-482
1.5.	Development Stage	WREM is operational since appr. 1978
1.6.	Time Period	Data is based on 1965-1980. The model is meant for the medium term
1.7.	Country	United Kingdom

2. MODEL PURPOSE

2.1.	General Purpose	1. Forecasting studies, 2. Analytical studies, 2. Planning studies (ex ante)
2.2.	Specific Purpose	To provide medium-term forecasts of employment by industry group and region

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 11
		sectors	: 26
		exogenous variables	: 26
		endogenous variables	: 286
		equations	: 286
3.2.	Exogenous Variables	National : employment Regional : -	
3.3.	Endogenous Variables	National : - Regional : employment	

4. MODEL STRUCTURE

4.1.	Production Technology	This model does not contain production functions
4.2.	Interregional and International Trade	Not included
4.3.	Other Interregional Linkages	Not included

4.4.	National-Regional	WREM is a pure top-down model. It consists exclusively of equations of the type $E_{irt} = f(E_{it}, t)$ and where E,i,r,t refer to employment, sector, region and time period, respectively
4.5.	Supply and Demand Considerations	WREM exclusively deals with labour demand. In certain applications it has been confronted with regional labour supply projections, but no attempts have been made to include supply variables into WREM.
4.6.	Equilibrium Assumptions	Not applicable
4.7.	Treatment of Prices	Prices are not included
4.8.	Dynamics	WREM is dynamic
4.9.	Functional Forms	The model consists of linear relationships.
4.10.	Solution Techniques	Each endogenous variable only depends on exogenous variables so that the solution is straightforward
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	The coefficients have been estimated by means of OLS and two stage least squares (in some cases with Cochrane-Orcutt adjustments)
5.2.	Validation	The model has been used for dynamic simulations. Simulated values have been confronted with actual data
6.	MODEL USE	
6.1.	Model Users	WREM is used by the Manpower Services Commission (at the national and regional level), regional authorities and several corporations
6.2.	Main Applications	Generation of regional employment forecasts on the medium term.
6.3.	Documentation	- Documentation about structure and limiations : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available
7.	DISTINGUISHING FEATURES	Interaction with model users : Provisional projections of employment by industry and region are provided to regional offices of the Manpower Services Commission, local authorities, public and private corporations for comment. Their feed-back is incorporated into the final set of projections

EUROPEAN ECONOMIC COMMUNITY

1. GENERAL INFORMATION

1.1.	Model Name	FLEUR (Factors of Location in Europe)
1.2.	Model Builders	Willem Molle, Jean Paelinck, Jean Pierre Ancot, Henk Roelofs
1.3.	Responsible Organizations	FLEUR is developed by the Netherlands Economic Institute, Rotterdam, the Netherlands for the European Economic Community
1.4.	Publication	W. Molle and B. van Aalst, Factors of Location in Europe, Foundations of Empirical Economic Research, 1976/15, Netherlands Economic Institute, Rotterdam
1.5.	Development Stage	The project started in 1973. The final report is in preparation.
1.6.	Time Period	The main data is based on 1950, 1960, 1970. FLEUR is meant for the medium and long term.
1.7.	Country	European Community
1.8.	Related Models	A similar model for Dutch regions is in an intermediate stage of development at the Netherlands Economic Institute. It is a model dealing with 80 regions and 27 sectors. The location factors included are: market, availability of labour, cost of labour, industrial sites, accessibility, regional policy, office space

2. MODEL PURPOSE

2.1.	General Purpose	ex equo : Analytical studies, Forecasting studies, Planning studies
2.2.	Specific Purpose	To explain and forecast regional employment by sector in the EC.

3. MODEL ELEMENTS

3.1.	Model Size	regions : 76 sectors : 53 exogenous variables : endogenous variables : appr. 4000 equations : appr. 4000
3.2.	Exogenous Variables	National : growth rates of employment by sector Regional : indicators of presence of markets for inputs or outputs, transport, labour market, urbanization, regional policy
3.3.	Endogenous Variables	National : employment by sector Regional : employment by sector (population, gross domestic product)

4. MODEL STRUCTURE

4.1.	Production Technology	The indicator for the presence of markets for inputs or outputs is based on input-output relationships
4.2.	Interregional and International Trade	Interregional and international trade are taken into account indirectly via the transport variable (defined as an accessibility measure)

4.3.	Other Interregional Linkages	Employment in region r at time t is explained a.o. by employment in other regions at time t-1
4.4.	National-Regional Links	FLEUR has a bottom-up structure
4.5.	Supply and Demand Considerations	Regional employment is explained simultaneously by variables from the supply side and the demand side
4.6.	Equilibrium Assumptions	Equilibrium is assumed on the level of the EC.
4.7.	Treatment of Prices	Wages play a role via the labour market variable
4.8.	Dynamics	FLEUR is dynamic
4.9.	Functional Forms	Various forms are used
4.10.	Solution Techniques	
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Relationships are estimated a.o. by OLS and discriminant analysis
5.2.	Validation	The validation has not (yet) been carried out.
6.	MODEL USE	
6.1.	Model Users	European Community
6.2.	Main Applications	FLEUR has not yet been applied
6.3.	Documentation	- Documentation about structure and limitation : not available - User manual, testing data : not available - Documentation enabling one to replicate the model : available to a certain extent
7.	DISTINGUISHING FEATURES	FLEUR aims at a multiregional analysis in an international setting

SWEDEN

1. GENERAL INFORMATION

1.1.	Model Name	LP Forecasting Model (LP refers to long range regional development planning)
1.2.	Model Builders	Per-Ove Engelbrecht, Olof Mårtensson
1.3.	Responsible Organizations	Ministry of Industry, Stockholm, Sweden
1.4.	Publication	P-O Engelbrecht, L. Johansson, T Österberg, Information for Regional Planning Systems in Sweden, Report to the Council of Europe Seminar on Information Systems for Regional Planning in Madrid, 1979 (pp. 17-21)
1.5.	Development Stage	The model is operational since 1976
1.6.	Time Period	The main data is based on 1970 - 1980. The model is meant for the medium and long term
1.7.	Country	Sweden

2. MODEL PURPOSE

2.1.	General Purpose	1. Forecasting studies, 2. Planning studies (ex-ante), 3. Analytical Studies
2.2.	Specific Purpose	To forecast employment on 35 (and 7) sectors, and population

3. MODEL ELEMENTS

3.1.	Model Size	region	: medium term : 24	long term : 24 (and 300 subregions)
		sectors	: medium term : 35	long term : 7
		exogenous variables	:	
		endogenous variables	:	
		equations	:	
3.2.	Exogenous Variables	National : employment forecasts in certain sectors Regional : survival and fertility rates		
3.3.	Endogenous Variables	National : - Regional : employment, participation rate, commuting		

4. MODEL STRUCTURE

4.1.	Production Technology	No explicit use of production functions
4.2.	Interregional and International Trade	Not included
4.3.	Other Interregional Linkages	Commuting and migration. Migration is explained by different employment opportunities of the regions
4.4.	National-Regional Links	In certain sectors, a top-down approach is used for employment. For other variables a bottom-up approach is employed.

4.5.	Supply and Demand Considerations	The model is mainly demand driven: regional demand is determined independent from labour supply, while labour supply adapts to labour demand.
4.6.	Equilibrium Assumptions	On the labour market, commuting, migration and flexible participation rates guarantee equality of demand and supply.
4.7.	Treatment of Prices	Prices are not included
4.8.	Dynamics	The model is dynamic
4.9.	Functional Forms	The model is linear
4.10.	Solution Equations	Standard procedures to solve systems of linear equations
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	The majority of the parameters is based on common sense.
5.2.	Validation	The validity has not been explicitly tested.
6.	MODEL USE	
6.1.	Model Users	The model has been used by the Ministry of Industry, Regional Administrative Boards, private enterprise and academic researchers.
6.2.	Main Applications	Continuous generation of regional labour market forecasts since 1976.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : not available - Documentation enabling one to replicate the model : available
7.	DISTINGUISHING FEATURES	Regional and sectoral employment forecasts are partly obtained by models, and partly by annual surveys and estimates of municipalities, counties and companies. Thus a decentralized forecasting system is arrived at in which the 24 County Administrative Boards are interconnected in the same time-sharing computer system. The model serves to a certain extent as a means of communication between national and regional planning authorities concerning population and labour market forecasts.

1. GENERAL INFORMATION

1.1.	Model Name	Model for Break-fown of Official Swedish Long-Term Forecasts
1.2.	Model Builders	Folke Snickars, Börge Tallroth, Margit Strandberg, Birgitta Voetblad
1.3.	Responsible Organizations	Ministry of Economy and the Central Bureau of Statistics, Stockholm, Sweden
1.4.	Publication	F. Snickars, Regional Development Consequences of Different Energy Scenarios. The case of a Swedish Close-down of Nuclear Power, IIASA Workingpaper, 1981
1.5.	Development State	The model is operational since 1978
1.6.	Time Period	The model is based on time series (25 years for the national variables, 10-15 years for the regional variables) The model is meant for the short and medium term
1.7.	Country	Sweden

2. MODEL PURPOSE

2.1.	General Purpose	1. Forecasting studies, 2. Consistency checks, 3. Planning studies (ex-ante)
2.2.	Specific Purpose	1. Find out whether the Swedish economic development will lead to unacceptable imbalance problems in the regional development of employment opportunities 2. Provide material for planning/forecasting work at the regional, county and municipal levels in conjunction with the results of the Swedish county planning.

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 8 county groups (or 24 counties)
		sectors	: 20
		exogenous variables	: 28
		endogenous variables	: 168
		equations	:
3.2.	Exogenous Variables	National : production and employment by sector, population Regional : unemployment rates participation rates (partially), population	
3.3.	Endogenous Variables	National : none Regional : employment, labour supply, participation rates (partially)	

4. MODEL STRUCTURE

4.1.	Production Technology	A simplified input-output structure is assumed (basic versus non-basic sectors)
4.2.	Interregional and International Trade	Not included

4.3.	Other Interregional Linkages	Gross commuting flows between regions are modelled by Lowry type relationships
4.4.	National-Regional Links	The model has a top-down structure
4.5.	Supply and Demand Considerations	The development of non-basic sectors is determined by the demand exerted by the basic sectors. The development of basic sectors is determined by trend extrapolation.
4.6.	Equilibrium Assumptions	On the regional labour market, supply and demand are not necessarily equal.
4.7.	Treatment of Prices	Prices are not included
4.8.	Dynamics	The model is static
4.9.	Functional Forms	Linear relationships are used for basic sectors. Non-linear (ratio-type) relationships are used for non-basic sectors
4.10.	Solution Techniques	
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Parameters have been estimated by means of linear and non-linear regression
5.2.	Validation	Estimated parameters have been used to forecast actual outcomes.
6.	MODEL USE	
6.1.	Model Users	Ministry of Economy, County Planning Agencies
6.2.	Main Applications	The model has been employed to generate long term regional economic forecasts, which have been used a.o. by County Planning Agencies. Further, the model has been used to assess the regional economic impacts of a close-down of Swedish nuclear power.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : not available - Documentation enabling one to replicate the model : available (in Swedish)
7.	DISTINGUISHING FEATURES	Detailed treatment of public sector and labour demand. The model is strongly application oriented.

1. GENERAL INFORMATION

1.1.	Model Name	MORSE (Model for the Analysis of Regional Development, Scarce Resources and Employment)
1.2.	Model Builders	Lars Lundqvist
1.3.	Responsible Organizations	Research Group for Urban and Regional Planning, Department of Mathematics, Royal Institute of Technology, Stockholm, Sweden
1.4.	Publication	L. Lundqvist, A Dynamic Multiregional Input-Output Model for Analyzing Regional Development, Employment and Energy Use, TRITAT-MAT-1980-20, Dept. of Mathematics, Royal Institute of Technology, Stockholm.
1.5.	Development Stage	MORSE is operational since 1980
1.6.	Time Period	Input-output coefficients are based on 1975. MORSE is meant for the medium term and to a certain extend for the long term. In its present form, MORSE covers the three 5-year periods from 1975 to 1990.
1.7.	Country	Sweden

2. MODEL PURPOSE

2.1.	General Purpose	1. Planning studies (ex-ante), 2. Analytical studies, 3. Forecasting studies
2.2.	Specific Purpose	To provide a tool for an integrated analysis of economic, employment and resource developments in a regional perspective. MORSE should be applicable to feasibility, impact and policy studies.

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 8
		sectors	: 9
		exogenous variables	: 66
		endogenous variables	: 417
		equations (inequalities)	: 498
3.2.	Exogenous Variables	National : balance of payments requirement, upper bounds on resource utilization, lower bound on capital formation rate	
		Regional : minimum consumption rate, upper and lower bounds on labour supply	
3.3.	Endogenous Variables	National : production, consumption, investments, foreign imports and exports	
		Regional : idem, plus interregional imports and exports	

4. MODEL STRUCTURE

4.1.	Production Technology	Input-output. The productionfunction has fixed technical coefficients. The production factors are : capital, labour and energy.
4.2.	Interregional and International Trade	All sectors of destination within a region are supposed to have the same pattern of imports.

4.3.	Other Interregional Linkages	None
4.4.	National-Regional Links	A bottom-up approach is applied to production for the majority of the sectors and consumption. A top-down approach is used for energy consumption, capital formation, international trade and production in some sectors.
4.5.	Supply and Demand Considerations	In MORSE, the values of regional production are determined, given the fixed supply of the production factors labour and energy, and given the constraints on minimum consumption. Hence, MORSE has a mixed supply-demand orientation.
4.6.	Equilibrium Assumptions	Disequilibrium may occur on the markets of goods and production factors.
4.7.	Treatment of Prices	Prices do not play an explicit role in MORSE
4.8.	Dynamics	MORSE is dynamic
4.9.	Functional Forms	The equations and inequalities are linear
4.10.	Solution Techniques	MORSE is solved by linear programming
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	The interregional transaction table has been estimated by means of an information theoretic approach.
5.2.	Validation	Projections for the 1975-80 period have been confronted with actual outcomes. According to the model builder it is too early to draw definite conclusions about its validity.
6.	MODEL USE	
6.1.	Model Users	MORSE has been used by the model builder.
6.2.	Main Applications	1. Assessment of impacts of energy supply systems and oil price increases, 2. Projection of economic development, regional employment and energy use, 3. Analysis of trade-offs between consumption, employment and energy use.
6.3.	Documentation	- Documentation about structure and limitations : available to a certain extent - User manual, testing data : not available - Documentation enabling one to replicate the model : available to a certain extent
7.	DISTINGUISHING FEATURES	Treatment of energy resources

1. GENERAL INFORMATION

1.1.	Model Name	REGAL (Interregional Allocation Model)
1.2.	Model Builders	Arne Granholm, Folke Snickars, Olle Ohlsson
1.3.	Responsible Organizations	Royal Institute of Technology, Stockholm and the University of Gothenburg, Gothenburg, Sweden
1.4.	Publication	A. Granholm, Interregional Planning Models for the Allocation of Private and Public Investments, Department of Economics, University of Gothenburg, Gothenburg, 1981
1.5.	Development Stage	REGAL is operational since appr. 1979
1.6.	Time Period	REGAL is mainly based on data from 1975-1977. It is meant for the medium term
1.7.	Country	Sweden

2. MODEL PURPOSE

2.1.	General Purpose	1. Planning studies (ex ante), 2, Analytical Studies
2.2.	Specific Purpose	To investigate the connections between private and public investment allocation in a multiregional context.

3. MODEL ELEMENTS

3.1.	Model Size	regions : 8 sectors : 21 exogenous variables : 444 endogenous variables : 824 equations (inequalities) : 832
3.2.	Exogenous Variables	National : production, employment and capital stock (in certain sectors); population Regional : lower and upper limits of sectoral employment levels and of population
3.3.	Endogenous Variables	National : - Regional : value added, employment, gross investment and capital stock (per sector), population

4. MODEL STRUCTURE

4.1.	Production Technology	A production function with fixed technical coefficients is used. The production factors are labour and capital
4.2.	Interregional and International Trade	Not included
4.3.	Other Interregional Linkages	Not included

4.4.	National-Regional Links	For the majority of the sectors the national volume of either production, employment, or capital is determined exogenously. Thus, REGAL is basically a top-down model. A bottom-up approach is applied to private and public investments.
4.5.	Supply and Demand Considerations	Regional production volumes are determined by variables from the supply side (availability of production factors) and the demand side (demand of firms and households for services of the public sector)
4.6.	Equilibrium Assumptions	On the labour market supply and demand are assumed to be equal. Excess supply may exist on the market of goods and services.
4.7.	Treatment of Prices	Prices are not included
4.8.	Dynamics	REGAL is static
4.9.	Functional Forms	REGAL is linear
4.10.	Solution Techniques	When the objective function is the minimization of national private and/or public investments, REGAL can be solved by means of linear programming. When REGAL is used for forecasting purposes, use may be made of an extended entropy measure in order to deal with the problem of inertia of the economic system. In this case, REGAL has to be solved by means of non-linear programming.
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Coefficients are one-point estimates
5.2.	Validation	The validity of REGAL has not been tested
6.	MODEL USE	
6.1.	Model Users	An earlier version of the model has been used by the city of Stockholm
6.2.	Main Applications	Analysis of the optimal regional allocation of population, employment and private and public investments in Sweden.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available
7.	DISTINGUISHING FEATURES	Detailed account of the public sector : subdivided into 8 sectors. Possibility to use a programming model for forecasting purposes by means of entropy formulation.

1.	GENERAL INFORMATION	
1.1	Model Name	GISSIR (Growth-Inducing Sustainable Structure)
1.2	Model Builders	A.E. Andersson, F. Snickars
1.3	Responsible Organization	Ministry of Labour and Housing, Sweden
1.4.	Publication	A.E. Andersson, A Closed nonlinear Growth Model for International and Interregional Trade and Location, Regional Science and Urban Economics, 1975, pp. 427 - 444
1.5.	Development Stage	Various versions of the model have been developed since 1974.
1.6.	Time Period	The data is based on 1968. The model is meant for the medium and long term
1.7.	Country	Sweden
2.	MODEL PURPOSE	
2.1.	General Purpose	1. Analytical studies, 2. Educational purposes, 3. Planning studies (ex-ante)
2.2.	Specific Purpose	To generate integrated location, trade and transportation scenarios for variations in networks, consumption structures, labour productivity and capital production assumptions
3.	MODEL ELEMENTS	
3.1.	Model Size	regions : 8 sectors : 20 - 30 exogenous variables : endogenous variables : 240 equations : 240
3.2.	Exogenous Variables	National : consumption pattern, public expenditure pattern Regional : public expenditure pattern
3.3.	Endogenous Variables	National : growth rates and production structure of sectors Regional : production of sectors
4.	MODEL STRUCTURE	
4.1.	Production Technology	Non-linear input-output
4.2.	Interregional and International Trade	The sectors of destination within a region are supposed to have the same pattern of imports. Trade coefficients have been estimated by means of a gravity model approach.
4.3.	Other Interregional	Interregional investment flows (modelled in a way analogous to interregional trade)
4.4.	National-Regional Links	The model has a bottom-up structure
4.5.	Supply and Demand Considerations	Regional production levels are determined simultaneously by supply and demand variables

4.6.	Equilibrium Assumptions	Demand and supply of goods are equal by assumption
4.7.	Treatment of Prices	Prices are not included
4.8.	Dynamics	GISSIR is dynamic
4.9.	Functional Forms	Linear and quadratic
4.10.	Solution Equations	The model consists of a system of non-linear differential equations. After linearization the system is solved by an eigenvalue method.
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Coefficients have been estimated by means of information theoretic approaches.
5.2.	Validation	The model is hard to validate on Swedish historical data
6.	MODEL USE	
6.1.	Model Users	GISSIR has been used by the Ministry of Labour and Housing and by the model builders
6.2.	Main Applicationa	Evaluation of transportation policies
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available
7.	DISTINGUISHING FEATURES	Endogenous and simultaneous determination of trade and location

NORWAY

1. GENERAL INFORMATION

1.1.	Model Name	REGION
1.2.	Model Builders	Olav Bjerkholt, Tor Skoglund
1.3.	Responsible Organizations	Central Bureau of Statistics, Oslo, Norway
1.4.	Publication	Tor Skoglund, Region, A Model for Regional Input-Output Analysis, articles from the Central Bureau of Statistics, No.122, Oslo, 1980 (In Norwegian).
1.5.	Development Stage	The model is operational since appr. 1980.
1.6.	Time Period	The main data is based on 1973. The model is meant for the medium and long term.
1.7.	Country	Norway
1.8.	Related Models	REGION is part of a larger economic demographic model which is at present developed at the Central Bureau of Statistics. (model builders : Per Sevaldson, Stein Erland Brun and Knut Ø Sørensen). In this model (called DRØM), attention is paid to a.o. labour supply and migration.

2. MODEL PURPOSE

2.1.	General Purpooe	1. Planning studies (ex-ante), 2. Forecasting studies, 3. Analytical studies
2.2.	Specific Purpose	REGION is meant as a regional supplement of an existing national economic model. The main purpose is to improve the co-ordination between national economic planning and regional planning.

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 19
		industries	: 38
		exogenous variables	: appr. 1000
		endogenous variables	: appr. 3000
		equations	: appr. 3000
3.2.	Exogenous Variables	National : private consumption, investment, exports, labour productivity Regional : consumption and investment capital in central and local government	
3.3.	Endogenous Variables	National : production and employment by industry Regional : production and employment by industry, private consumption, investment	

4. MODEL STRUCTURE

4.1.	Production Technology	Input-output based on a commodity-by-industry approach. Labour is a production factor in a production-function with fixed technical coefficients.
4.2.	Interregional and International Trade	Interregional flows of commodities are specified in the model. Constant input-output coefficients have been assumed for interregional flows; the coefficients vary between commodities, industries and regions. The production of interregional commodities is determined by the assumption of constant regional shares for each commodity.
4.3.	Other Interregional Linkages	None

4.4.	National-Regional Links	For private consumption and investment a top-down approach has been adopted. For production and employment a bottom-up approach is used.
4.5.	Supply and Demand Considerations	REGION is a demand-driven model.
4.6.	Equilibrium Assumptions	On the commodity market, supply is assumed to be equal to demand.
4.7.	Treatment of Prices	Prices do not play a role.
4.8.	Dynamics	REGION is static
4.9.	Functional Forms	The relationships are linear
4.10.	Solution Techniques	Usual methods of solving systems of linear equations
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Most of the coefficients are straightforward proportions estimated from the base year data.
5.2.	Validation	A confrontation is being carried out of model outcomes with observed data from 1976. A definite conclusion has not yet been drawn.
6.	MODEL USE	
6.1.	Model Users	The model has been used by the Ministry of Environment (which is responsible for regional policies)
6.2.	Main Applications	An analysis of the regional consequences of different national economic forecasts. Model outcomes have been used as inputs to regional employment studies and regional studies of electricity demand.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available to a certain extent

AUSTRIA

1. GENERAL INFORMATION

1.1. Model Name	A regional labour market model for Austria (REMO)
1.2. Model Builders	Uwe Schubert, J. Baumann, E. Brunner, P. Hampapa, G. Maier, H. Stoffl.
1.3. Responsible Organizations	Interdisciplinary Institute for Urban and Regional Studies - University of Economics, Vienna, Austria.
1.4. Publication	J. Baumann and U. Schubert, Factors of Regional Labor Force Participation Rates, An Econometric Study for Austria, Paper presented at the regional Science Association Conference, Munich, August, 1980.
1.5. Development Stage	Pilot study in development phase.
1.6. Time Period	Data available : 1970 - 1975. The model is meant for the medium term.
1.7. Country	Austria.

2. MODEL PURPOSE

2.1. General Purpose	1. Analytical studies, 2. Educational purposes, 3. Forecasting studies.
2.2. Specific Purpose	Experimental study to explore the possibilities to construct a regional econometric model.

3. MODEL ELEMENTS

3.1. Model Size	regions	:	4 types of regions (urban core, urban ring, rural and peripheral areas)
	industries	:	3
	exogenous variables	:	
	endogenous variables	:	appr. 320
	equations	:	appr. 320
3.2. Exogenous Variables	National	:	none
	Regional	:	school capacity variables, transportation infrastructure variables, social infrastructure variables, regional policy variables: subsidies etc.
3.3. Endogenous Variables	National	:	none
	Regional	:	employment, unemployment, vacancies, investment wages, population.

4. MODEL STRUCTURE

4.1. Production Technology	Experiments have been carried out to include a production function in REMO. The production factors are: capital and various types of labour (by qualification).
4.2. Interregional and International trade	No explicit treatment (at present).

4.3. Other interregional links	Migration, commuting, capital movements.
4.4. National-Regional links	In REMO no explicit attention is paid to the national level of variables.
4.5. Supply & Demand Considerations	In its present form, the model is demand driven: first the levels of regional production and labour demand are determined after which the effects on regional labour supply are analyzed. In a more definite form supply-demand interactions will be taken into account.
4.6. Equilibrium Assumptions	On the regional labour market several responses to disequilibria are studied: education (in order to improve one's qualifications), migration, commuting, changes in wages and participation rates. Demand and supply are not necessarily equal.
4.7. Treatment of Prices	Wages are intended to play a role in the model.
4.8. Dynamics	The model is dynamic
4.9. Functional Forms	Various types, among which logit specifications.
4.10 Solution Techniques	Some numerical method to solve a system of non-linear equations.

5. ESTIMATION AND VALIDATION

5.1. Estimation	Relationships have been estimated by means of OLS.
5.2. Validation	No validation has been carried out. Consistency of sub-models is not guaranteed as partly non-compatible data had to be used.

6. MODEL USE

6.1. Model Users	Model is used by model builers.
6.2. Main Applications	None
6.3. Documentation	-Documentation about structure and limitations : available to a certain extent -User Manual, testing data : not available -Documentation enabling one to replicate the model : available to a certain extent

7. DISTINGUISHING FEATURES : The labour market is segmented according to educational qualifications. Transition probabilities between various qualifications are variables.

YUGOSLAVIA

1. GENERAL INFORMATION

1.1.	Model Name	Economic Demographic Model BACHUE-Yugoslavia
1.2.	Model Builders	Miroslav Macura, Bojan Popović
1.3.	Responsible Organizations	Economic Institute, Belgrade, Yugoslavia
1.4.	Publications	M. Macura, B. Popović and M. Rašević, BACHUE-Yugoslavia : Regionalized Policy Simulation Economic-Demographic Model of Yugoslavia - Conceptual Basis, Population and Employment Working Paper, No.55, International Labour Office, Geneva, 1977.
1.5.	Development Stage	The model is not yet fully operational
1.6.	Time Period	Data is based on 1962 - 1974. The model is meant for the medium and long term.
1.7.	Country	Yugoslavia

2. MODEL PURPOSE

2.1.	General Purpose	1. Planning studies (ex-ante), 2. Analytical studies, 3. Forecasting studies
2.2.	Specific Purpose	Analysis of the ways in which economic and demographic policies can contribute to a better development of less developed regions and to a more equitable distribution of development benefits between more and less developed regions

3. MODEL ELEMENTS

3.1.	Model Size	regions : 8 (socialist republics and autonomous provinces of Yugoslavia) sectors : 21 exogenous variables : appr. 240 endogenous variables : appr. 570 equations : appr. 570
3.2.	Exogenous Variables	National : world trade Regional : federal government consumption per person (ex-ante), mortality, migration abroad
3.3.	Endogenous Variables	National : foreign deficit on current account, national fund for regional development, federal government budget Regional : output, social product, investment, income, personal consumption, imports, exports, social consumption, employment, labour supply, wages, fertility, population, interregional migration, students

4. MODEL STRUCTURE

4.1.	Production Technology	Input-output
4.2.	Interregional and International Trade	Interregional trade is dealt with in the model

4.3.	Other Interregional Linkages	Population and labour flows
4.4.	National-Regional Links	A bottom-up approach is used for all variables listed under 3.3. as regional endogenous variables.
4.5.	Supply and Demand Considerations	Demand and supply variables simultaneously influence regional production levels.
4.6.	Equilibrium Assumptions	A supply-demand disequilibrium approach is applied to goods and services, investment funds and the labour market.
4.7.	Treatment of Prices	Wages are endogenous
4.8.	Dynamics	The model is dynamic
4.9.	Functional Forms	The model includes linear, log-linear, double-log and inverted log relationships.
4.10.	Solution Techniques	
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	The coefficients have been estimated by means of OLS
5.2.	Validation	Not yet carried out
6.	MODEL USE	
6.1.	Model Users	
6.2.	Main Applications	
6.3.	Documentation	- Documentation about structure and limitations : available to a certain extent - User manual, testing data : not available - Documentation enabling one to replicate the model : not available
7.	DISTINGUISHING FEATURES	Detailed treatment of government sector; inclusion of education

CZECHOSLOVAKIA

1. GENERAL INFORMATION

1.1.	Model Name	Multiregional Forecasting Model for the Development of the National Economy
1.2.	Model Builders	Stefan Mizera
1.3.	Responsible Organizations	Research Institute of Regional Economic Planning, (VÚOP), Bratislava
1.4.	Publication	Research report 121, VÚOP, 1980 (slovak)
1.5.	Development Stafe	The model is operational since 1980
1.6.	Time Period	The main data is based on 1970 - 1978. The model is meant for the long term.
1.7.	Country	Slovak Socialist Republic

2. MODEL PURPOSE

2.1.	General Purpose	1. Forecasting studies, 2. Planning studies (ex-ante), 3. Planning studies (ex-post)
2.2.	Specific Purpose	Consistent forecasting of socio-economic development of Slovakian regions

3. MODEL ELEMENTS

3.1.	Model Size	regions : 4 sectors : 9 exogenous variables : appr. 140 endogenous variables : 411 equations : 411 (161 of which are regression equations)
3.2.	Exogenous Variables	National : population; employment, investment, capital, production, wage index (in certain sectors) Regional : migration and commuting balance, agricultural land, medical services, housing stock, development investments in industry.
3.3.	Endogenous Variables	National : none Regional : population, labour supply, production, investments, average wages, income, expenditures

4. MODEL STRUCTURE

4.1.	Production Technology	Production levels depend on labour and capital
4.2.	Interregional and International Trade	Not included
4.3.	Other Interregional Linkages	Not included

4.4.	National-Regional Links	The model has a top-down structure
4.5.	Supply and Demand Considerations	
4.6.	Equilibrium Assumptions	Demand and supply of labour and investments are equal by assumption
4.7.	Treatment of Prices	Wages play a role in the model
4.8.	Dynamics	The model is dynamic
4.9.	Functional Forms	The equations are linear or log-linear
4.10.	Solution Techniques	The model is recursive, hence it is easy to solve
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	The model has been estimated by means of OLS and modifications
5.2.	Validation	Computed endogenous variables have been compared with actual data
6.	MODEL USE	
6.1.	Model Users	The model has been used by the Slovak Planning Commission, and by the model builder
6.2.	Main Applications	Forecasts of socio-economic development (27 indicators) of regions
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available - Documentation enabling one to replicate the model : available

POLAND

1. GENERAL INFORMATION

1.1. Model Name	IRUD (Interactive Rural-Urban Development Model)
1.2. Model Builders	R. Kulikovski, L. Krus
1.3. Responsible Organizations	Systems Research Institute of the Polish Academy of Sciences
1.4. Publication	R. Kulikovski and L. Krus, A Regional Computerized Interactive Planning System, in : Proceedings of Joint Task Force Meeting on Development Planning for the Notec (Poland) and Silistra (Bulgaria) Regions, IIASA, CP-80-9, 1980, pp.102-150.
1.5. Development Stage	IRUD is operational since 1980.
1.6. Time Period	The data are based on appr. 1973. The model is meant for the medium term.
1.7. Country	Poland (Notec region)

2. MODEL PURPOSE

2.1. General Purpose	Planning studies (ex-ante), 2. Planning studies (ex-post), 3. Forecasting studies
2.2. Specific Purpose	Evaluation of various regional development policies with special attention to effects on migration. Simulation of the decision process concerning the allocation of subsidies by means of gaming.

3. MODEL ELEMENTS

3.1. Model Size	regions : 2 (urban and rural) sectors : 1 exogenous variables : 20 endogenous variables : 30 equations : 30
3.2. Exogenous Variables	National : population subsidies, capital and labour costs Regional : natural development of population, subsidies on capital expenditures, subsidies on aggregate consumption
3.3. Endogenous Variables	National : - Regional : production, personal consumption, aggregate consumption, standard of living, employment, migration, migration costs

4. MODEL STRUCTURE

4.1. Production Technology	A Cobb-Douglas production function is used with labour and capital as production factors
4.2. Interregional and International Trade	-

4.3. Other Interregional Linkages	Interregional migration is driven by differences on the standard of living.
4.4. National - Regional Links	A top-down approach is used for the subsidies (to be allocated among the regions) and population. For other variables a bottom-up approach is employed.
4.5. Supply and Demand Considerations	Regional production levels are driven by supply variables.
4.6. Equilibrium Assumptions	Demand and supply of goods and production factors are equal by assumption.
4.7. Treatment of Prices	Prices and wages are exogenous. They influence the substitution between production factors.
4.8. Dynamics	The model is static
4.9. Functional Forms	In IRUD various forms are used : Cobb-Douglas, polynomial and linear relationships
4.10. Solution Techniques	IRUD can be solved in two different ways. It can be solved as an optimization model. In this case the objective is the maximization of production minus migration costs and the decision variables are the subsidies allocated to the regions for investments or consumption. It can also be solved as a gaming model with three players, the first player allocating the subsidies between the regions and the other players allocating the regional subsidies to investments or consumption. An interactive computerprogram has been developed so that the game can be played several times in a short period. In both views on the model, use is made of the Newton method to solve non-linear equations.

5. ESTIMATION AND VALIDATION

5.1. Estimation	Coefficients have been estimated by means of non-linear regression
5.2. Validation	Not yet carried out

6. MODEL USE

6.1. Model Users	The model is used by the pertaining regional governmental agency and at the university
6.2. Main Application	Effects of urban and rural development policies on migration
6.3. Documentation	- Documentation about the structure and limitations : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available to a certain extent

7. DISTINGUISHING FEATURES

Interactive program for game simulations.

U.S.S.R.

1. GENERAL INFORMATION

1.1.	Model Name	System of Models for Optimal Prospective PLanning of the National Economy
1.2.	Model Builders	E.F. Baranov, I.S. Matlin
1.3.	Responsible Organizations	Central Economics and Mathematical Institute of the Academy of Sciences of the U.S.S.R., Moscow, U.S.S.R.
1.4.	Publication	E.F. Baranov, I.S. Matlin and A.V. Koltsov, Multiregional and Regional Modeling in the U.S.S.R., in F.G. Adams and N.J. Glickman (eds.), Modeling the Multiregional Economic System, Lexington Books, Lexington, 1980, pp. 215-220.
1.5.	Development State	The system of models is operational since appr. 1975.
1.6.	Time Period	The system of models is based on data from 1959 to 1972. It is meant for the medium term (ten years)
1.7.	Country	U.S.S.R.

2. MODEL PURPOSE

2.1.	General Purpose	1. Planning studies (ex-ante), 2. Analytical studies, 3. Forecasting studies
2.2.	Specific Purpose	Coherent optimization of sectoral and regional planning under constraints on labour and natural resources allowing national goals to be reconciled with the social interest of each region.

3. MODEL ELEMENTS

3.0.	System Components	The system of models includes : 1 national model, 16 sectoral models, 24 regional models, 12 transportation models and 1 migration model.
3.1.	Model Size	regions : 24 sectors : 98 exogenous variables : endogenous variables : appr. 140,000 per year considered (the system covers a time period of ten years) equations (and/or inequalities) :
3.2.	Exogenous Variables	National : limit to capital investments, supply of specific products Regional : labour supply, rate of growth of social capital
3.3.	Endogenous Variables	National : investments and production levels per sector Regional : investments and production levels per sector, consumption and other final demand components, income, migration, transportation flows

4. MODEL STRUCTURE

4.1.	Production Technology	Input-output. Production factors : labour and capital

4.2.	Interregional and International Trade	For 12 types of goods a transportation model has been included: these are optimization models with the minimization of transport costs as the objective function.
4.3.	Other Interregional Linkages	Interregional migration, explained a.o. by income and consumption per capita and social capital
4.4.	National-Regional Links	A top-down approach is applied to capital investments and the supply of specific goods. For the other variables a bottom-up approach is used.
4.5.	Supply and Demand Considerations	Production/volumes are determined by variables from both the supply and the demand side
4.6.	Equilibrium Assumptions	Demand and supply of goods are not necessarily equal
4.7.	Treatment of Prices	Prices play a role in the objective functions used in the various programming models of the system.
4.8.	Dynamics	The system of models is dynamic.
4.9.	Functional Forms	The main relationships are linear. In some cases quadratic objective functions are used in the programming models.
4.10.	Solution Techniques	The models included in the system are solved by mathematical programming. Since the models are interdependent, an iterative multilevel programming procedure has to be carried out in order to ensure consistency between the outcomes of the various models.
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Parameters are based on input-output tables, and on OLS regressions applied to time-series
5.2.	Validation	Model results have been confronted with actual developments
6.	MODEL USE	
6.1.	Model Users	The system of models has been used by the model builders and by GOSPLAN : the national governmental planning agency
6.2.	Main Applications	The system has been used for checking the consistency of regional and national production programs developed for the five-year plans.
6.3.	Documentation	- Documentation about structure and limitations : available to a certain extent - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : not available
7.	DISTINGUISHING FEATURES	The big size of the system of models. The use of iterative procedures for overall optimization of optimal solutions of particular models.

1. GENERAL INFORMATION

1.1.	Model Name	Optimization Interregional Input-Output Model (SIREN-OPT)
1.2.	Model Builders	Alexandre Granberg
1.3.	Responsible Organizations	Institute of Economics and Industrial Organization, Siberian Branch of the USSR Academy of Sciences, Novosibirsk
1.4.	Publication	A. Granberg, Optimization of Proportions of Territorial Economies, Moscow, Ekonomika Publishers, 1973
1.5.	Development Stage	The model is operational since 1967.
1.6.	Time Period	Input-output coefficients are based on 1966, 1972, 1980; other statistical data are based on 1961-1980; planned data are available for the period up to 1990; calculations are carried out for the period of 10-15-20 years.
1.7.	Country	U.S.S.R.

2. MODEL PURPOSE

2.1.	General Purpose	1. Studying trends and prospects of development of the national economy, interregional interactions, particular regions. 2. Including the model into the national economy planning technology.
2.2.	Specific Purpose	Studying the Siberian development problems in the U.S.S.R. national economy system.

3. MODEL ELEMENTS

3.1.	Model Size	regions : 11 sectors : 16, 48 exogenous variables : 333 per period, assuming that R = 16 endogenous variables : ≥ 492 equations (and inequalities) : ≥ 383
3.2.	Exogenous Variables	National : exports, imports, investments Regional : inventory formation, depreciation of capital stock, transport investments, maximum volumes of primary resources production, shares of consumption, labor resources for the material production, transport expenditures for crosshauling
3.3.	Endogenous Variables	National : - Regional : production, consumption, investments, interregional deliveries

4. MODEL STRUCTURE

4.1.	Production Technology	Input-output coefficients vary by region and are forecasted for every period.

4.2.	Interregional and International Trade	Interregional deliveries are, mainly, exogenous variables, crosshauling may be fixed (assortment exchange within the product group).
4.3.	Other Interregional Linkages	Interregional migration variables are endogenous ones (their changes are carried out on the basis of analyzing migration costs and shadow prices of labor).
4.4.	National-Regional Links	A top-down approach is applied to investments. A bottom-up approach is used for the other endogenous variables.
4.5.	Supply and Demand Considerations	Regional production levels are determined by variables from the supply-side (labor resources) and from the demand side.
4.6.	Equilibrium Assumptions	Demand and supply of goods are not necessarily equal.
4.7.	Treatment of Prices	Prices are exogenous. They play a role among others in the transportation and migration equations.
4.8.	Dynamics	SIREN-OPT is dynamic. It yields balances of production, labor resources and transport services for the last year of the periods of 10, 15, and 20 years.
4.9.	Functional Forms	SIREN-OPT is linear.
4.10.	Solution Techniques	The model can be solved by linear and separable programming. Also, use is made a multi-objective optimization.

5. ESTIMIZATION AND VALIDATION

5.1.	Estimation	Parameters are obtained by various methods : one point estimates, forecasts of input-output coefficients, expert information.
5.2.	Validation	Ex-ante forecasts have been carried out and confronted with actual outcomes. According to the model builder, the structural changes forecasted by the model are confirmed by actual developments.

6. MODEL USE

6.1.	Model Users	Institute of Economic Studies, the U.S.S.R. GOSPLAN
6.2.	Main Applications	Generation of alternatives for the development of the national and regional economies (pre-planning studies).
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available to a certain extent

7. DISTINGUISHING FEATURES — Possibility to include detailed industrial and regional sub-models.

CANADA

1. GENERAL INFORMATION

1.1 Model Name	FRET (Forecasting Regional Economies and Transportation), consisting of two interdependent sub-models: the multiregional economic model TOMM (Transport Oriented Multiregional Model) and the transport model FRETNET (NETwork model of FRET).
1.2. Model Builders	Marc Los, Sang Nguyen.
1.3. Responsible Organizations	Centre de Recherche sur les Transports, Université de Montréal, Montréal, Canada.
1.4. Publication	M. Los, A Transportation-Oriented Multiregional Economic Model for Canada, Centre de Recherche sur les Transports, Université de Montréal, Publication 178,1980
1.5. Development Stage	FRET is close to being operational.
1.6. Time Period	The main data are input-output data for 1974. FRET is meant for the medium term (5 to 10 years).
1.7. Country	Canada.

2. MODEL PURPOSE

2.1. General Purpose	1. Planning studies(ex-ante), 2. Forecasting Studies, 3. Analytical Studies.
2.2. Specific Purpose	FRET aims at an integrated analysis of the economy and the freight transportation system. It enables one to study 1. the effects of regional economic development on the utilization of the freight transportation system, and 2. the effects of changes in the freight transportation system on the regional economies.

3. MODEL ELEMENTS

3.1. Model Size

regions	: TOMM : R =	; FRETNET: 82,	including 9 for the USA and 9 for the rest of the world.
industries	: TOMM : I =	; FRETNET: 78	
exogenous variables	: TOMM :	;	
endogenous variables	: TOMM : IR^2	;	
equations (and inequalities)	: TOMM :	;	

3.2. Exogenous Variables	National : total volume of tradeable commodities, price indices for tradeable commodities. Regional : price indices for non-tradeable commodities, wage index, final demands per commodity, labour supply, capacity constraints per commodity, international imports, exports and transit traffic (per commodity), network information (costs etc.).
3.3. Endogenous Variables	National : - Regional : interregional trade-flows, production, employment, network utilization (including modal choice) aggregate interregional transport costs.

4. MODEL STRUCTURE

4.1. Production Technology.	input-output; labour and capital are related to production levels bij means of fixed technical coefficient

4.2. Interregional and International trade	In TOMM the volumes of international,interregional and intraregional trade of various commodities are modelled bij a programming model determining an optimum spatial allocation of economic activities. In FRETNET route and mode choice(approximately 7 transport modes have been distinguised) are determined at a less aggregated spatial and commodity level.
4.3. Other Interregional Linkages	None
4.4. National-Regional Links	In TOMM the total volume of tradeable commodities is determined exogenously at the national level. This indicates that TOMM has a top-down structure.
4.5. Supply and Demand Considerations.	In TOMM regional production levels are determined given exogenously specified final demand variables and labour and capacity constraints.
4.6. Equilibrium Assumptions	On the goods market, supply and demand are equal bij definition. On the labour market excess-supply may arise.
4.7. Treatment of Prices	Prices are exogenous in the model (except for aggregate interregional transport costs). They play an important role in determining the spatial allocation of activities and mode choice.
4.8. Dynamics	The model is static.
4.9. Functional Forms	TOMM is a programming model with linear constraints and an objective function which includes an information term, so that it is non-linear. FRET consists of linear relationships.
4.10.Solution Techniques	The models have to be solved by convex and linear programming techniques.

5. ESTIMATION AND VALIDATION

5.1. Estimation	Model coefficients are determined by elementary operations(e.g., division) applied to observations from one year.
5.2. Validation	The model has not been validated.

6. MODEL USE

6.1. Model Users

6.2. Main Applications

6.3. Documentation

7. Distinguishing Features.Detailed modelling of the freight transportation sectors of the economy.

1. GENERAL INFORMATION

1.1.	Model Name	Statistics Canada Interprovincial Input-output Model
1.2.	Model Builders	R. Hoffman, C. Gaston and others
1.3.	Responsible Organizations	Structural Analysis Division, Statistics Canada, Ottawa, Canada
1.4.	Publication	R. Hoffman and J. Kent, Design for Commodity by Industry Interregional Input-Output Models, in K.R. Polenske and J.V. Skolka (eds.), Advances in Input-Output Analysis, Ballinger, Cambridge, (Mass.), 1976, pp. 251-262
1.5.	Development Stage	The model is operational since appr. 1976.
1.6.	Time Period	The data base was compiled for 1966 and 1974. It will be recompiled for 1979
1.7.	Country	Canada
1.8.	Related Models	A two-region input-output model is being completed by the same model builders. The "regions" are : Canada and the U.S.A. The number of industries is : 480 (U.S.A.) and 200 (Canada). The number of commodities is : 480 (U.S.A.) and 650 (Canada)

2. MODEL PURPOSE

2.1.	General Purpose	Ex equo : Analytical studies, Planning studies
2.2.	Specific Purpose	The model is multi-purpose tool for interregional studies

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 11
		sectors	: 200 (650 commodities)
		exogenous variables	:
		endogenous variables	: 2200
		equations	: 2200
3.2.	Exogenous Variables	National : -	
		Regional : sectoral outputs, interregional trade flows	
3.3.	Endogenous Variables	National : -	
		Regional : sectoral outputs, interregional trade flows	

4. MODEL STRUCTURE

4.1.	Production Technology	Input-Output (commodity-by-industry methodology)
4.2.	Interregional and International Trade	Included in the model

4.3.	Other Interregional Linkages	-
4.4.	National-Regional Links	In most cases a top-down approach is appropriate for final demand. A bottom-up approach is applied to sectoral outputs
4.5.	Supply and Demand Considerations	The model is demand driven
4.6.	Equilibrium Assumptions	Supply and demand are equal by assumption
4.7.	Treatment of Prices	Prices are not included
4.8.	Dynamics	The model is static
4.9.	Functional Forms	The model is linear
4.10.	Solution Techniques	Standard methods for systems of linear equations
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Coefficients one point estimates
5.2.	Validation	
6.	MODEL USE	
6.1.	Model Users	The model has been used by national and regional governmental agencies, private organizations and universities
6.2.	Main Applications	
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : - Documentation enabling one to replicate the model : not available (data is in part confidential under the Statistics Act)
7.	DISTINGUISHING FEATURES	Commodity-by-industry method

U. S. A.

1. GENERAL INFORMATION

1.1.	Model Name	MRIO (Multiregional Input-Output Model)
1.2.	Model Builders	Karen R. Polenske
1.3.	Responsible Organizations	MRIO has been developed at the Harvard Economic Research Project. It is now installed at the Massachusetts Institute of Technology, Cambridge, Mass., U.S.A.
1.4.	Publication	K.R. Polenske, The U.S. Multiregional Input-Output Accounts and Model
1.5.	Development Stage	MRIO is operational since appr. 1970.
1.6.	Time Period	MRIO is based on an input-output table from 1963. The model is meant for the short and medium term.
1.7.	Country	U.S.A.

2. MODEL PURPOSE

2.1.	General Purpose	1. Analytical studies, 2. Planning studies (ex-post), 3. Forecasting studies
2.2.	Specific Purpose	MRIO is a comprehensive multipurpose tool for accounting, policy analysis and forecasting.

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 51
		sectors	: 79
		exogenous variables	:
		endogenous variables	: 4029
		equations	: 4029
3.2.	Exogenous Variables	National : -	
		Regional : final demand variables per sector(government expenditures, personal consumption, gross investments, foreign exports)	
3.3.	Endogenous Variables	National : -	
		Regional : industrial outputs and interregional trade (by sector)	

4. MODEL STRUCTURE

4.1.	Production Technology	Input-Output
4.2.	Interregional and International Trade	In MRIO, a uniform import pattern for all industries in a certain region for a given commodity is assumed
4.3.	Other Interregional Linkages	-
4.4.	National-Regional Links	The determination of regional final demand variables falls outside the scope of MRIO. In most applications a top-down approach to these variables will be used. MRIO implies a bottom-up approach to sectoral outputs.

4.5.	Supply and Demand Considerations	MRIO is driven by demand variables
4.6.	Equilibrium Assumptions	On the markets for goods, supply and demand are equal by assumption
4.7.	Treatment of Prices	Prices are not included in the standard version. In the dual version MRIO can be used to study the formation of regional prices
4.8.	Dynamics	MRIO is static
4.9.	Functional Forms	MRIO is linear
4.10.	Solution Techniques	MRIO is solved by standard methods for systems of linear equations
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Different methods have been applied for each sector.
5.2.	Validation	MRIO has been simulated for the base year data (1963). Backcasts of the model to 1947 and 1958 state outputs
6.	MODEL USE	
6.1.	Model Users	MRIO has been used by national and regional governmental agencies, universities, private organizations and students
6.2.	Main Applications	Regional employment and income analyses, disparities in regional allocations, regional energy analyses, interregional transportation analyses and forecasts, analyses of the railroad industry.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available - Documentation enabling one to replicate the model : available
7.	DISTINGUISHING FEATURES	Consistency of data base. Extensive use by different analysts for alternative purposes

1.	GENERAL INFORMATION	
1.1.	Model Name	MULTIREGION
1.2.	Model Builders	David J.Bjornstad, Richard J. Olsen, David P. Vogt
1.3.	Responsible Organizations	Oak Ridge National Laboratory, Oak Ridge (Tennessee), U.S.A. Applied Business Research, Inc., Wellesley (Mass.) U.S.A. Charles River Associates, Inc., Boston (Mass.) U.S.A.
1.4.	Publication	R.J. Olsen et al, MULTIREGION : A Simulation-Forecasting Model of BEA Area Population and Employment, ORNL/RUS-25, Oak Ridge National Laboratory, 1977 D.J. Bjornstad, Recent Modification to the Oak Ridge National Laboratory MULTIREGIONAL Model, paper represented at the conference on an Assessment of the State-of-the-Art in Regional Modeling, MIT Harvard Joint Center for Urban Studies, April, 1980
1.5.	Development Stage	MULTIREGION is operational since appr. 1977 and has been developed at O.R.N.L. At present two versions of the model exist. One version is used at O.R.N.L., the other at C.R.A.
1.6.	Time Period	Data is based on 1950 - 1970, some on 1975. The model is meant for the medium and long term.
1.7.	Country	U.S.A.
2.	MODEL PURPOSE	
2.1.	General Purpose	1. Forecasting studies, 2. Analytical studies, 3. Planning studies (ex-ante)
2.2.	Specific Purpose	To produce forecasts of regional population and employment
3.	MODEL ELEMENTS	
3.1.	Model Size	regions : 73 sectors : 36 exogenous variables : endogenous variables : appr. 15,000 equations : appr. 15,000
3.2.	Exogenous Variables	National : employment by sector, population by age/sex cohort Regional : employment for certain sectors
3.3.	Endogenous Variables	National : - Regional : employment by sector, population by age-sex cohort
4.	MODEL STRUCTURE	
4.1.	Production Technology	Production is not dealt with in an explicit way. MULTIREGION consists of two components, dealing with population and employment, respectively.

4.2.	Interregional and International Trade	For certain sectors interregional backward or forward linkages are included by market accessibility measures of the gravity-type based on truck transport times.
4.3.	Other Interregional Linkages	Gross migration is explained by a.o.: employment pressure, climatic conditions and population potential
4.4.	National-Regional Linkages	The model has a top-down structure
4.5.	Supply and Demand Considerations	Regional employment levels are determined by both supply and demand variables
4.6.	Equilibrium Assumptions	Various adjustment processes give rise to an approximation of regional labour market equilibrium
4.7.	Treatment of Prices	Prices are not included
4.8.	Dynamics	MULTIREGION is dynamic
4.9.	Functional Forms	MULTIREGION is linear
4.10.	Solution Techniques	MULTIREGION is solved by a multi-stage iterative computation process where last period values of some explanatory variables are used to produce first-stage estimates of endogenous variables.
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Relationships have been estimated by means of OLS and weighted least squares applied to pooled cross-section time series.
5.2.	Validation	MULTIREGION has been used in dynamic simulations. Given the results the adjustment processes to disequilibrium on the regional labour markets have been revised.
6.	MODEL USE	
6.1.	Model Users	The model has been used by national and regional governmental agencies, private organizations and at a university.
6.2.	Main Applications	- Long term projections of regional population and employment - To drive regional energy projections - Demand for land for industrial purposes
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available (to a certain extent) - Documentation enabling one to replicate the model : available (to a certain extent)
7.	DISTINGUISHING FEATURES	Large number of regions. Supply-demand interactions on the labour market

1.	GENERAL INFORMATION	
1.1.	Model Name	Multiregional Econom etric Model of the U.S.A. (MAG model)
1.2.	Model Builders	Norman J. Glickman, F. Gerard Adams, William J. Milne
1.3.	Responsible Organizations	University of Pennsylvania, Philadelphia, U.S.A.
1.4.	Publication	W.J. Milne, N.J. Glickman and F.G. Adams, A Framework for Analyzing Regional Growth and Decline : A Multiregional Econometric Model of the United States, Journal of Regional Science, vol. 20, 1980, pp.173-189.
1.5.	Development Stage	The model is operational since appr. 1979
1.6.	Time Period	Data is based on 1954 - 1976. The model is meant for the short term.
1.7.	Country	U.S.A.
2.	MODEL PURPOSE	
2.1.	General Purpose	1. Forecasting studies, 2. Planning studies (ex-ante), 3. Planning studies (ex-post)
2.2.	Specific Purpose	To study the effects of national economic growth on differential regional economic development and to forecast regional energy demand.
3.	MODEL ELEMENTS	
3.1.	Model Size	regions : 9 (census region) sectors : 6 exogenous variables : appr. 800 endogenous variables : appr. 1600 equations : appr. 1600
3.2.	Exogenous Variables	National : outputs in certain industries, wages, population size Regional : energy prices
3.3.	Endogenous Variables	National : - Regional : sectoral output, sectoral employment, sectoral wages, non-wage income, energy consumption, population size, interregional migration
4.	MODEL STRUCTURE	
4.1.	Production Technology	Labour demand is based on a CES production function
4.2.	Interregional and International Trade	-

4.3.	Other Interregional Linkages	Regional wage rates repend among others on the wage rates in surrounding regions. Interregional migration depends among others on wage differentials between regions and relative unemployment rates.
4.4.	National- Regional Links	The model is driven by national variables, forecasted by the Wharton Annual Model
4.5.	Supply and Demand Considerations	In the manufacturing industries the regional shares depend on variables from the supply side : labour and energy costs. Regional output in the other industries depends on regional demand
4.6.	Equilibrium Assumptions	The market of manufacturing industries is in equilibrium at the national level. The markets of the other industries are in equilibrium at the regional level. On the labour market the possibility of excess supply is taken into account
4.7.	Treatment of Prices	Interregional differentials in wages and energy prices are determinants of the interregional allocation of production. The volume and consumption of regional energy demands are influenced by regional energy prices.
4.8.	Dynamics	The model is dynamic
4.9.	Functional Forms	The model is linear
4.10.	Solution Techniques	Usual methods to solve systems of linear equations

5. ESTIMATION AND VALIDATION

5.1.	Estimation	The model has been estimated by means of OLS
5.2.	Validation	Ex-post simulations outside the sample period have been carried out

6. MODEL USE

6.1.	Model Users	The model has been used by a national governmental agency and a private organization
6.2.	Main Applications	Energy demand forecasting
6.3.	Documentation	- Documentation about structure and limitations : available to a certain extent - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available to a certain extent

1. GENERAL INFORMATION

1.1.	Model Name	IDIOM (Income Determination Input-Output Model)
1.2.	Model Builders	Stephen P. Dresch, Robert D. Goldberg and Daniel A. Updegrove
1.3.	Responsible Organizations	Institute for Demographic and Economic Studies, New Haven (Conn.) U.S.A.
1.4.	Publication	S.P. Dresch and D.A. Updegrove, IDIOM : A Disaggregated Policy-Impact Model of the U.S. Economy, in : R. Haveman and K. Hollenbeck (eds.), Microeconomic Simulation Models for Public Policy Analysis, vol. 2, Academic Press, New York, 1980, pp. 213-249
1.5.	Development Stage	IDIOM is operational since 1972
1.6.	Time Period	The main data is based on appr. 1973
1.7.	Country	U.S.A.

2. MODEL PURPOSE

2.1.	General Purpose	1.Planning studies (ex ante), 2. Analytical Studies, 2. Educational Purposes
2.2.	Specific Purpose	To assess the economic effects of changes in fiscal structure (taxes, transfers, expenditures) and other exogenous economic developments at a relatively high degree of disaggregation (by region, industry and occupation)

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 51
		sectors	: 86 (60 national and 26 regional sectors)
		exogenous variables	:
		endogenous variables	: appr. 3000
		equations	: appr. 3000
3.2.	Exogenous Variables	National : components of final demand by sector (other than personal consumption) Regional : components of final demand (other than personal consumption) in regional sectors	
3.3.	Endogenous Variables	National : labour and nonlabour income, personal consumption, output by sector, tax revenues, primary materials requirements, capital requirements by sector, employment by sector Regional : output by sector, employment	

4. MODEL STRUCTURE

4.1.	Production Technology	Input-output. Fixed technical coefficients are applied to labour and capital
4.2.	Interregional and International Trade	IDIOM assumes the existence of interregional trade, but it does not contain an explicit representation of such a trade pattern.
4.3.	Other Interregional Linkages	-

4.4.	National-Regional Links	IDIOM is a top-down model. First, outputs of national sectors are determined on the national level. Then these outputs are distributed across regions according to the distribution of activity in a base period.
4.5.	Supply and Demand Considerations	IDIOM is demand driven
4.6.	Equilibrium Assumptions	For national sectors, demand and supply are equal at the national level (transportation costs are assumed to be zero). For regional sectors, demand and supply are equal at the regional level (transport costs are assumed to be infinite). On the labour market unemployment may exist.
4.7.	Treatment of Prices	Prices are not included
4.8.	Dynamics	IDIOM is static
4.9.	Functional Forms	IDIOM is linear
4.10.	Solution Techniques	Standard methods of solving systems of linear equations
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Coefficients have been obtained as one-point estimates
5.2.	Validation	Validation studies have not (yet) been carried out
6.	MODEL USE	
6.1.	Model Users	IDIOM has been used by national and regional governmental agencies, private organizations (including consultants) and universities
6.2.	Main Applications	Impact analysis of : military expenditures, cutback in arms exports, local public works and a major earthquake
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available - Documentation enabling one to replicate the model : available (to a certain extent)
7.	DISTINGUISHING FEATURES	The use of the distinction between national and regional sectors to avoid the problem that interregional trade patterns have to be dealt with explicitly.

1. GENERAL INFORMATION

1.1.	Model Name	NRIES (National-Regional Impact Evaluation System)
1.2.	Model Builders	Kenneth Ballard, John Kort, Robert Wendling, Richard Gustely
1.3.	Responsible Organizations	Bureau of Economic Analysis, U.S. Department of Commerce, Washington, D.C., U.S.A.
1.4.	Publication	K.P. Ballard, R.D. Gustely and R.M. Wendling, NRIES, Structure, Performance and Applications of a Bottom-up Interregional Econometric Model, Bureau of Economic Analysis, U.S. Department of Commerce, Washington, D.C., 1980
1.5.	Development Stage	NRIES is operational since appr. 1979
1.6.	Time Period	NRIES is based on data from 1955 to 1976. It is meant for use in the short and medium term
1.7.	Country	U.S.A.

2. MODEL PURPOSE

2.1.	General Purpose	ex equo : forecasting studies, planning studies (ex ante), planning studies (ex-post)
2.2.	Specific Purpose	Analysis of spatial distribution of impacts resulting from policy alternatives. Generation of medium term forecasts of regional economic activity.

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 51
		sectors	: 12
		exogenous variables	:
		endogenous variables	: 14000
		equations	: 14000 (of which 3500 are behavioural equations)
3.2.	Exogenous Variables	National : production indices in agriculture and mining, social security information, federal expenditures, balance of payments, minimum wage rate	
		Regional : -	
3.3.	Endogenous Variables	National : output, population, employment unemployment, wage rates, consumer prices, interest rate, etc	
		Regional : output, population, employment, unemployment, wage rates, income, taxes	

4. MODEL STRUCTURE

4.1.	Production Technology	A linear labour demand relationship is assumed. This relationship takes into account technological change.
4.2.	Interregional and International Trade	In several sectors, regional production depends on distance deflated production or income in the other regions
4.3.	Other Interregional Linkages	-

4.4.	National-Regional Links	A bottom up approach is applied to all main endogenous variables
4.5.	Supply and Demand Considerations	In NRIES regional production is mainly determined by variables from the demand side
4.6.	Equilibrium Assumptions	On the markets of goods and services, supply and demand are assumed to be equal. On the labour market, unemployment is taken into account.
4.7.	Treatment of Prices	Wages play a role a.o. in the determination of income and the interregional allocation of production.
4.8.	Dynamics	NRIES is dynamic
4.9.	Functional Forms	NRIES is linear
4.10.	Solution Techniques	NRIES is solved by a Gauss-Seidel iterative solution technique.
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	The model has been estimated by means of OLS (in some cases with Cochrane-Orcutt adjustments)
5.2.	Validation	Dynamic simulations have been carried out with NRIES (within the sample period). For several regions M.A.P.E. statistics based on NRIES have been compared with MAPE statistics resulting from single regional models. In general, the statistics are of the same order of magnitude.
6.	MODEL USE	
6.1.	Model Users	NRIES has been used by national and regional governmental agencies
6.2.	Main Applications	Impact analysis of energy scenarios (solar energy, coal, oil and gas). Impact analysis of the Federal government Grants-in-Aid Program. Impact analysis of local public works programs.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available - Documentation enabling one to replicate the model : available
7.	DISTINGUISHING FEATURES	NRIES is a large scale bottom-up model with an interesting treatment of interregional linkage features

1. GENERAL INFORMATION

1.1.	Model Name	MREEED (Multiregional Model of the Economy, Environment and Energy Demand)
1.2.	Model Builders	T.R. Lakshmanan
1.3.	Responsible Organizations	Department of Geography, Boston University, Boston U.S.A.
1.4.	Publications	T.R. Lakshmanan, A Multiregional Policy Model of the Economy, Environment and Energy, Boston University, National Science Foundation Project Working Paper, NSF 79-1, 1979
1.5.	Development Stage	MREEED will be operational in 1981
1.6.	Time Period	The main data is based on appr. 1966 - 1976. The model is meant for short, medium and long term purposes.
1.7.	Country	U.S.A.

2. MODEL PURPOSE

2.1.	General Purpose	1. Analytical studies, 2. Planning studies (ex-ante), 3. Planning studies (ex-post)
2.2.	Specific Purpose	MREEED is a policy analysis model capable of determining the key economic-environmental-energy consequences associated with alternative national and regional public policies.

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 50
		sectors	: 53
		exogenous variables	:
		endogenous variables	: appr. 270 per region
		equations	: appr. 270 per region
3.2.	Exogenous Variables	National : taxes, depreciation, investment tax credit, interest rate, replacement capital rate Regional : wage rates, unemployment rate, labour force, fuel prices, taxes, interregional transport costs by sector, regional consumption, public dept., heating degree days.	
3.3.	Endogenous Variables	National : some types of investment, employment Regional : output by sector, capital, labour and energy demands, income, public expenditures, taxes, transportation energy demand, residential energy demand, aggregate energy price, environmental emissions, investment supply	

4. MODEL STRUCTURE

4.1.	Production Technology	Factor demand functions are based on a productionfunction with production factors capital, labour, energy and materials

4.2.	Interregional and International Trade	Interregional forward linkages are taken into account by means of a demand potential variable. This variable is defined as the weighted sum of demand in other regions, deflated by the costs of interregional communication. Further, regional investment supply depends on accessibility of input and output markets.
4.3.	Other Interregional Linkages	-
4.4.	National - Regional Links	A top-down approach is applied to most variables, among which investment supply in manufacturing industries. A bottom-up approach is used for investments in sectors whose output is determined in regional markets and some other variables.
4.5.	Supply and Demand Considerations	Regional output is determined by variables from the demand side (demand potential) and variables from the supply side (prices of production factors)
4.6.	Equilibrium Assumptions	Disequilibria are taken into account at the regional labour market
4.7.	Treatment of Prices	Prices are an important driving force of substitution processes in production and interregional location.
4.8.	Dynamics	MREEED is a dynamic model.
4.9.	Functions Forms	A large variety of forms is used: e.g. translog production functions, log-linear energy demand, logit models, linear forms
4.10.	Solution Techniques	
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Various econometric methods are used : OLS, 2SLS, Instrumental Variables, Iterative Zellner, Maximum Likelihood, Multinomial Logit.
5.2.	Validation	A validation plan has been written for MREEED, but it has not yet been carried out.
6.	MODEL USE	
6.1.	Model users	
6.2.	Main Applications	
6.3.	Documentation	
7.	DISTINGUISHING FEATURES	Detailed treatment of energy sector. Use of flexible production and consumption functions. Use of the median voter model in public expenditure equations.

1. GENERAL INFORMATION

1.1.	Model Name	Multiregional, Multi-Industry Forecasting Model (MRMI)
1.2.	Model Builders	Curtis C. Harris Jr. and Mehrzad Madji
1.3.	Responsible Organizations	Bureau of Business and Economic Research, University of Maryland
1.4.	Publications	C.C. Harris Jr., New Developments and Extensions of the Multiregional, Multi-Industry Forecasting Model, Journal of Regional Science, vol. 20, 1980
1.5.	Development Stage	Operational since 1973
1.6.	Time Period	National data : 1958 to 1980. Regional data : 1970 - 1976. The model is meant for the medium and long term.
1.7.	Country	U.S.A.

2. MODEL PURPOSE

2.1.	General Purpose	1. Planning studies (ex-ante). 2. Forecasting studies. 3. Planning studies (ex-post)
2.2.	Specific Purpose	Making base line forecasts and doing long-run regional economic impact analyses.

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 3,103 counties, or, 435 SMSAs and rest of economic areas, or 183 economic areas, or, 51 states
		sectors	: 108
		exogenous variables	:
		endogenous variables	: 1129 per region
		equations	: 1129 per region plus auxiliary equations
3.2.	Exogenous Variables	National	: all national variables from the Interindustry Forecasting Model (INFORUM) developed by C1. Almon et al. at the University of Maryland
		Regional	: none
3.3.	Endogenous Variables	National	: none
		Regional	: per sector : output, employment, total demand, investments, government expenditures, personal consumer expenditures, foreign imports and exports, transport costs; population, births, deaths, labour force, unemployment, personal income, value of land

4. MODEL STRUCTURE

4.1.	Production Technology	Input-output analysis is used to estimate intermediate demand

4.2.	Interregional and International Trade	Interregional and international trade is dealt with by means of a linear programming transportation model. The shadow-prices of this model indicate the marginal transportation costs of shipping goods out of each region and of obtaining inputs at each region. These shadow-prices play an important role in the location of output among regions.
4.3.	Other Interregional Linkages	-
4.4.	National Regional Links	MRMI is a pure top-down model.
4.5.	Supply and Demand Considerations	Regional outputs are determined by supply variables (production costs) and demand variables
4.6.	Equilibrium Assumptions	At the national level supply and demand for goods are equal. At the regional level supply and and demand for labour and goods are not necessarily equal.
4.7.	Prices	Costs of transportation, labour and land are important explanatory variables determining the interregional location of output.
4.8.	Dynamics	MRMI is dynamic
4.9.	Functional Forms	MRMI is linear
4.10.	Solution Techniques	MRMI contains a linear programming transportation problem. The solution of the remaining part of the model is straightforward since it is recursive.
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Relationships are estimated by OLS.
5.2.	Validation	Forecasts for historical years have been compared with actual dates.
6.	MODEL USE	
6.1.	Model Users	The model has been used extensively by several institutions: national and regional agencies, private organizations and universities
6.2.	Main Applications	Regional economic effects of national highway systems, regional effects of locating the communications sector, onshore impacts of off-shore oil wells, impacts of opening new coal mines, etc.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : not available - Documentation enabling one to replicate the model : available to a certain extent
7.	DISTINGUISHING FEATURES	The model is greatly disaggregated. The use of a programming transportation model to deal with transportation costs. No predetermined regional values are needed.

1. GENERAL INFORMATION

1.1. Model Name	MEPA-III. Massachusetts Economic Policy Analysis Model (III refers to substate regional version)
1.2. Model Builders	George I. Treyz et al.
1.3. Responsible Organisations	MEPA project, Economics Department, University of Massachusetts, Amherst, (Mass,), U.S.A.
1.4. Publication	G.I. Treyz, A.F. Friedlaender and B.H. Stevens, The Employment Sector of a Regional Policy Simulation Model, Review of Economics and Statistics, vol.62, 1980, pp.63-73.
1.5. Development State	MEPA is operational since 1977 as a single regional model. It has been proposed as a point of departure for a multiregional model for the U.S.A. Further, it has been planned to extend MEPA as a multiregional model for several sub-regions of Massachusetts. The following description is mainly based on the single regional version, but in some cases properties of the proposed multiregional version are reported.
1.6. Time Period	MEPA is a quarterly model, based on data from appr. 1954-1975. It is meant for the short, medium and long term.
1.7. Country	U.S.A. (state of Massachusetts)

2. MODEL PURPOSE

2.1. General Purpose	1. Planning studies (ex-ante), 2. Forecasting studies, 3. Planning studies (ex-post)
2.2. Specific Purpose	To determine the effects of state policy initiatives and external events on the Massachusetts economy and to make economic and tax revenue forecasts.

3. MODEL ELEMENTS

3.1. Model Size	regions : 5 (subregions of Massachusetts) sectors : 50 exogenous variables : 355 endogenous variables : 565 equations : 565
3.2. Exogenous Variables	National : employment and investments in various sectors, components of disposable income, wages, prices Regional : direct consumer taxes, personal tax parameters, business taxes, government spending, fuel costs
3.3. Endogenous Variables	National : - Regional : employment and investments in various sectors, unemployment, wages, prices, disposable income

4. MODEL STRUCTURE

4.1. Production Technology	A Cobb-Douglas production function is assumed; the production factors are: labour, capital and material inputs from each sector separately. This means that - unlike the traditional input-output analysis - the model permits factor substitution in response to changes in relative input prices.

4.2. Interregional and International Trade	Regional exports depend on the average cost of regional production relative to the average national production costs. In the proposed structure for the multiregional version, interregional trade is determined by interregional differences in production costs, taking into account interregional transportation costs.
4.3. Other Interregional Linkages	-
4.3. National-Regional Links	The single regional version of MEPA is obviously a top-down model. In the multiregional version a top-down approach is applied to a.o. employment, while a bottom-up approach is used for a.o. labour supply.
4.5. Supply and Demand Considerations	On the labour market, employment is determined by both demand and supply (wage) variables. Regional wages are a.o. determined by the discrepancy between supply and demand of labour.
4.6. Equilibrium Assumptions	The model is based on a general equilibrium approach taking into account various adjustment processes to changes in exogenous variables.
4.7. Treatment of Prices	Regional wages and prices are endogenous. They play a role in income formation, factor substitution and interregional investment decisions.
4.8. Dynamics	MEPA is dynamic.
4.9. Functional Forms	MEPA consists of linear and log-linear forms.
4.10. Solution Techniques	
5. ESTIMATION AND VALIDATION	
5.1. Estimation	Equations have been estimated by means of OLS and certain numerical methods.
5.2. Validation	An ex-ante forecasting record for MEPA has been published for the years 1977-1979. Final revised actual data for these years is not yet available, however.
6. MODEL USE	
6.1. Model Users	MEPA has been used by the Massachusetts State Government
6.2. Main Applications	Forecasts of main regional economic indicators. Regional effects of government tax and expenditures measures. Effects of expanding port facilities.
6.3. Documentation	- Documentation about structure and limitations : available to a certain extent - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available to a certain extent
7. DISTINGUISHING FEATURES	Treatment of input-output relationships by means of Cobb-Douglas production functions. Inclusion of a submodel dealing with inequalities in the income distribution.

JAPAN

1. GENERAL INFORMATION

1.1.	Model Name	Regional Dispersion Model (Version II)
1.2.	Model Builders	Noburu Suzuki, Fumikatsu Kimura, Yasuyuki Yoshida
1.3.	Responsible Organizations	Mitsubishi Research Institute, Inc., Tokyo
1.4.	Publication	Mitsubishi Research Institute, Inc., Regional Dispersion Policies and their Effects on Industries-Calculation based on Interregional Input-Output Model (Version II), 1978
1.5.	Development Stage	Operational since appr. 1973
1.6.	Time Period	Input-output coefficients are based on 1970, coefficients of final demand equations are based on 1960-72; the coefficients are in the process of updating now; the model is meant for the medium and long term.
1.7.	Country	Japan

2. MODEL PURPOSE

2.1.	General Purpose	1. Planning studies (ex-ante), 2. Forecasting studies, 2. Analytical studies
2.2.	Specific Purpose	Forecasting the effects of various policy measures on the regional distribution of economic activities (transportation network improvements, private and public investments, environmental standards, taxes)

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 9
		industries	: 11
		exogenous variables	: appr. 750 (except environmental submodel)
		endogenous variables	: appr. 1250 (except environmental submodel)
		equations	: appr. 500
3.2.	Exogenous Variable	National : government consumptive expenditures and investments, exports, inventory formation Regional : exports, inventory formation	
3.3.	Endogenous Variables	National : production, value added Regional : production, value added, investment, labour demand	

4. MODEL STRUCTURE

4.1.	Production	Input-output. A Cobb-Douglas productionfunction is assumed with capital and labour as production factors.
4.2.	Interregional and International Trade	All sectors of destination within a region are supposed to have the same pattern of imports. Trade coefficients are explained by time distances between regions and the share of the capital stock in the region of origin relative to the national capital stock.

4.3.	Other Interregional Linkages	-
4.4.	National-Regional Links	A bottom-up approach is used for variables such as production and value added. A top-down approach is employed for government expenditures, exports and inventory formation
4.5.	Supply and Demand Considerations	Regional production is mainly determined by final demand. Supply restraints only play a role in the specification of interregional trade coefficients (via the capital variable)
4.6.	Equilibrium Assumptions	Commodity and labour markets are assumed to be in equilibrium
4.7.	Treatment of Prices	Prices and the interest rate are exogenous. They play a role as explanatory variables for regional investments.
4.8.	Dynamics	The model is mainly static; some parts are dynamic (capital formation)
4.9.	Functional Forms	The model is mainly linear. Trade coefficient equations are log-linear
4.10.	Solution Techniques	The model is solved by standard methods for systems of equations
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Behavioural equations have been estimated by means of OLS. In some equations parameters have been modified given the results of calibrations
5.2.	Validation	Model simulations have been carried out and compared with actual data. The gaps between the two are reasonably small, according to the model builders.
6.	MODEL USE	
6.1.	Model Users	The model was designed for (and has been used by) the Economic Planning Agency of the national government. It has also been used by regional planning agencies.
6.2.	Main Applications	Impact analysis of : trunkline transportation network improvement, large sized regional development investments, environmental controls, dispersion tax systems, regional distribution of government investments.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available to a certain extent
7.	DISTINGUISHING FEATURES	The model includes an environmental submodel dealing with the emission of water and air pollutants, and investments for waste disposal.

1. GENERAL INFORMATION

1.1.	Model Name	BALAMO (Multiregional Balanced Input-Output Model)
1.2.	Model Builders	T. Kawashima and associates
1.3.	Responsible Organizations	BALAMO has been developed by the Fujimic Research Institute at the request of the Ministry of Construction of the Japanese Government.
1.4.	Publication	T. Kawashima, Regional Impact Simulation Model BALAMO, in A. Straszak and B. Wagle (eds.): Models for Regional Planning and Policy Making, Proceedings of the Joint IBM/IIASA Conference , Vienna 1978.
1.5.	Development Stage	BALAMO is operational since 1976.
1.6.	Time Period	BALAMO is based on data from 1960 to 1970. It is meant for the short and medium term.
1.7.	Country	Japan

2. MODEL PURPOSE

2.1.	General Purpose	1. Forecasting studies, 2. Planning studies (ex-ante), 3. Analytical studies
2.2.	Specific Purpose	To measure impacts of public investments at the national level on regional economic activity. The model is meant as a tool for government decision-makers dealing with public investments.

3. MODEL ELEMENTS

3.1.	Model Size	regions	: 8 (covering the northern part of Japan)
		sectors	: 8
		exogenous variables	: appr. 60
		endogenous variables	: 192
		equations	: 192 (apart from the input-output related equations)
3.2.	Exogenous Variables	National : public investment, final demand in certain sectors Regional : final demand in certain sectors	
3.3.	Endogenous Variables	National : production pressure, output, employment (by sector) Regional : idem	

4. MODEL STRUCTURE

4.1.	Production Technology	Input-output. Production factors are labour and public capital (road stock). The production functions are linear or log-linear.
4.2.	Interregional and International Trade	For certain sectors, interregional trade is taken into consideration. Trade coefficients are constant.
4.3.	Other Interregional Linkages	None
4.4.	National-Regional Links	BALAMO is a top-down model

4.5.	Supply and Demand Considerations	BALAMO is characterized by supply-demand interactions; production levels are determined by both final demand and the availability of production factors
4.6.	Equilibrium Assumptions	On the market for goods excess-demand (or excess-supply) situations may arise
4.7.	Treatment of Prices	Prices are not included in BALAMO
4.8.	Dynamics	BALAMO is dynamic
4.9.	Functional Forms	Linear and log-linear
4.10.	Solution Techniques	BALAMO is a recursive model so that the solution is straightforward.

5. ESTIMATION AND VALIDATION

5.1.	Estimation	Coefficients have been estimated by means of OLS and two-stage-least-squares
5.2.	Validation	In a strict sense, no validation has been carried out.

6. MODEL USE

6.1.	Model Users	BALAMO has been used by the organizations mentioned in 1.3.
6.2.	Main Applications	To measure the impact of public investment for highway construction on regional economic activities and environmental degradation.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available to a certain extent

1. GENERAL INFORMATION

1.1 Model Name	Nine Region Politico-economic Model
1.2 Model Builders	Takao Fukuchi and others
1.3 Responsible Organizations	University of Tsukuba, Japan
1.4 Publication	T. Fukuchi, analyse economico-politique d'un développement regional harmonisé, Les Collections de l'INSÉÉ, C.61, 1978, pp. 227-253.
1.5 Development Stage	A first version of the model is operational since appr. 1976
1.6 Time Period	The data are mainly based on the years 1966-71. The model is meant for the medium term
1.7 Country	Japan
1.8. Related Models	This model is related to multiregional models built by dr. Fukuchi at the end of the sixties. These models have been used (and partly still are used) for metropolitan and regional development planning. Special attention is paid in these models to public investments.

2. MODEL PURPOSE

2.1 General Purpose	1. Planning studies (ex-ante), 2. Forecasting studies, 3. Analytical studies
2.2 Specific Purpose	To identify the interrelation between political voting behaviour and economic resource distribution

3. MODEL ELEMENTS

3.1 Model -Size	regions : 9 sectors : 3 exogenous variables : 38 endogenous variables :243 equations :243
3.2 Exogenous Variables	National : interest rate Regional : cultivated land, sectoral exports
3.3 Endogenous Variables	National : standard of living, voting shares of political parties Regional : income, consumption, production, consumer's price, wage rate, employment, capital stock, population, social overhead capital (various-categories)

4. MODEL STRUCTURE

4.1 Production Technology	Cobb-Douglas production functions have been used for the various sectors. Production factors are: labour, private capital and social overhead capital
4.2 Interregional and International Trade	No explicit attention is paid to interregional trade.

4.3	Other Interregional Linkages	Interregional migration is dealt with in an implicit way.
4.4	National-Regional Links	The model has a bottom-up structure
4.5	Supply and Demand Considerations	The volumes of production and the productionfactors are interdependent (with a time lag) Hence the model is characterized by supply-demand interactions.
4.6	Equilibrium Assumptions	Demand and supply are equal on the various markets. Equilibrium is attained by price adjustments, price adjustments, migration and resource reallocation.
4.7	Treatment of Prices	Consumer prices and wages are endogenous.
4.8	Dynamics	The model is dynamic
4.9	Functional Forms	Most of the relationships are log-linear
4.10	Solution Techniques	The model is recursive; consequently, it can be solved in a straightforward way.

5. ESTIMATION AND VALIDATION

5.1	Estimation	Coefficients have been estimated by means of direct and iterative least squares.
5.2	Validation	The model has been simulated for the year 1980. According to the model-builder the validity is reasonable.

6. MODEL USE

6.1	Model Users	The model has been used by the model builders
6.2	Main Applications	The model has among others been used to study the sensitivity of the socio-economic structure and the voting behaviour of the people for the interest rate.
6.3	Documentation	- Documentation about structure and limitations : available to a certain extent - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model: available to a certain extent
7.	Distinguishing Features:	Integration of socio-economic and political system

AUSTRALIA

1. GENERAL INFORMATION

1.1.	Model Name	INTEREG
1.2.	Model Builders	David F. Batten
1.3.	Responsible Organizations	Commonwealth Scientific and Industrial Research Organization, Highett, Vic., Australia
1.4.	Publication	D.F. Batten, The Interregional Linkages between National and Regional Input-Output Models, International Regional Science Review, in press
1.5.	Development Stage	The model is operational since 1980.
1.6.	Time Period	The model is meant for the short and medium term
1.7.	Country	Australia (state of Victoria), Sweden (several regions)

2. MODEL PURPOSE

2.1.	General Purpose	1. Analytical studies, 2. Education purposes, 3. Planning studies (ex-ante)
2.2.	Specific Purpose	To estimate the complete pattern of interregional commodity flows and input-output tables for a nominated set of interacting regions

3. MODEL ELEMENTS

3.1.	Model Size	regions : variable sectors : variable exogenous variables : variable endogenous variables : variable equations (inequalities) : variable
3.2.	Exogenous Variables	National : outputs, intermediate and final demand by sector; input-output coefficients Regional : outputs by sector; some information on final demand
3.3.	Endogenous Variables	National : - Regional : interregional and intersectoral flows, interregional and intraregional input-output coefficients

4. MODEL STRUCTURE

4.1.	Production Technology	Input-output
4.2.	Interregional and International Trade	Interregional trade flows are estimated on the basis of some accounting constraints, capacity constraints in the transport network, and the principle of entropy maximization

4.3.	Other Interregional Linkages	-
4.4.	National-Regional Links	INTEREG is a top-down model
4.5.	Supply and Demand Considerations	INTEREG is mainly demand driven. Supply constraints are present in the form of capacity constraints in the transportation network.
4.6.	Equilibrium Assumptions	At the national level, supply and demand are in equilibrium. At the regional level disequilibrium may occur.
4.7.	Treatment of Price	Prices are not included
4.8.	Dynamics	INTEREG is static
4.9.	Functional Forms	The maximand in INTEREG is an entropy function. The constraints are linear
4.10.	Solution Techniques	INTEREG is formulated as a mathematical programming problem. This problem is transformed into a system of non-linear equations which is solved by means of Newton's method.
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	In its present form, the coefficients in INTEREG are assumed as given.
5.2.	Validation	Survey-based interregional tables do not exist in Australia and Sweden. Hence, it is not possible to confront model outcomes with actual developments.
6.	MODEL USE	
6.1.	Model Users	INTEREG has been used by the CSIRO and at the university.
6.2.	Main Applications	Estimation of interregional input-output tables. Examination of regional multiplier effects.
6.3.	Documentation	- Documentation about structure and limitations : available to a certain extent - User manual, testing data : available to a certain extent - Documentation enabling one to replicate the model : available
7.	DISTINGUISHING FEATURES	INTEREG is formulated in such a general way, that it is suitable for applications involving any set of regions or nations.

1. GENERAL INFORMATION

1.1.	Model Name	Dynamic Regional Economic Allocation Model (DREAM)
1.2.	Model Builders	Ron Sharpe, Anders Karlqvist, David Batten, John F. Brotchie
1.3.	Responsible Organizations	CSIRO, Division of Building Research, Highett, Australia
1.4.	Publications	A. Karlqvist, R. Sharpe, D.F. Batten and J.F. Brotchie, A Regional Planning Model and its Applications to South Eastern Australia, Regional Science and Urban Economics, vol.8,1978,pp.57-86
1.5.	Development Stage	The model is still in a development and educational phase.
1.6.	Time Period	The model is predominantly based on data of 5-10 years vintage. The model is meant for use on the short, medium and longterm.
1.7.		Australia

2. MODEL PURPOSE

2.1.	General Purpose	1. Planning studies (ex-ante), 2. Analytical studies, 3. Forecasting studies
2.2.	Specific Purpose	The model is formulated to analyse the feasibility consistency and trade-offs between different national and regional objectives in terms of populations, economic activities and the transportation system.

3. MODEL ELEMENTS

3.1.	Model Size	regions	$R \leq 10$
		industries	$I \leq 30$
		exogenous variables	
		endogenous variables	
		equations (and inequalities)	
3.2.	Exogenous Variables	National : target production levels of national sectors, population Regional : population	
3.3.	Exogenous Variables	National : production, employment and investment, imports, exports Regional : production, employment, investment, interregional commodity flows	

4. MODEL STRUCTURE

4.1.	Production Technology	The model contains input-output relationships. Regional production levels are constrained by the regional labour force and capital stock.
4.2.	Interregional and International Trade	For certain sectors, interregional and international trade is taken into account. The trade flows are modelled by means of an entropy maximizing method.
4.3.	Other interregional Linkages	At present the model does not contain other interregional links. An extension into the direction of interregional population flows has been planned.

4.4.	National-Regional Links	A top-down approach is applied to production levels in national sectors. A bottom-up approach is used for other variables.
4.5.	Supply and Demand Considerations	The values of regional production are determined, given constraints on the supply of labour and minimum consumption. Consequently, DREAM has a mixed supply-demand orientation.
4.6.	Equilibrium Assumptions	In DREAM disequilibrium may occur in the markets for labour and capital.
4.7.	Treatment of Prices	Transport costs play a role in determining the pattern of interregional trade-flows.
4.8.	Dynamics	DREAM is a dynamic model.
4.9.	Functional Forms	DREAM contains linear constraints and an objective which may be in either a linear or entropy form.
4.10.	Solution Techniques	DREAM is solved by iterative linear programming techniques.
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	The coefficients of the model have been derived directly from the available data, e.g. an input-output table, supplemented with expert judgements.
5.2.	Validation	The overall performance of the model has not been confronted with actual developments, the reason being that the main purpose of the model is prescription rather than prediction.
6.	MODEL USE	
6.1.	Model Users	The model has been designed for the National Department of Urban and Regional Development and for internal research purposes.
6.2.	Main Applications	- Evaluation of a growth centre between two metropolises. - Evaluation of large mineral developments - Equity versus efficiency evaluations of regional development - Evaluation of a metropolis and its State
6.3.	Documentation	- Documentation about structure and limitations : available to a certain extent - User manual, testing data, etc. : available to a certain extent - Documentation enabling one to replicate the model : available to a certain extent

KENYA

1.	GENERAL INFORMATION	
1.1.	Model Name	Interregional Input-Output Simulation Model for Kenya (IIOSMK)
1.2.	Model Builders	Arne Bigsten
1.3.	Responsible Organizations	Gothenburg University, Sweden
1.4.	Publication	A. Bigsten, Regional Inequality and Development, A Case Study of Kenya, Gower, Farmborough, 1980
1.5.	Development Stage	The model is operational since approximately 1979
1.6.	Time Period	The model is based on data from 1967 to 1976. It is meant for the medium term.
1.7.	Country	Kenya
2.	MODEL PURPOSE	
2.1.	General Purpose	1. Analytical Studies, 2. Planning Studies (ex-ante)
2.2.	Specific Purpose	To simulate the development of regional inequality in Kenya and to test the effects of various policy changes.
3.	MODEL ELEMENTS	
3.1.	Model Size	regions : 8 sectors : 9 exogenous variables : endogenous variables : equations :
3.2.	Exogenous Variables	National : final demand variables in base year Regional : idem
3.3.	Endogenous Variables	National : final demand variables after base year Regional : final demand variables after base year, income, employment
4.	MODEL STRUCTURE	
4.1	Production Technology	Input-Output. A production function with fixed technical coefficients has been assumed for labor.

4.2.	Interregional and International Trade	All sectors of destination within a region are supposed to have the same pattern of imports.
4.3.	Other Interregional Linkages	Interregional income transfers are taken into account.
4.4.	National-Regional Links	A top-down approach is applied to some of the final demand components. A bottom-up approach is used for income and employment.
4.5.	Supply and Demand Considerations	IIOSMK is a demand driven model both on the commodity and the labor markets.
4.6.	Equilibrium Assumptions	On the commodity markets, supply and demand are equal by assumption. On the labor market, no attention is paid to unemployment due to conceptual and statistical reasons.
4.7.	Treatment of Prices	Prices do not play an explicit role.
4.8.	Dynamics	The model is dynamic.
4.9.	Functional Forms	The model is linear.
4.10.	Solution Techniques	Standard.

5. ESTIMATION AND VALIDATION

5.1.	Estimation	Interregional trade coefficients have been estimated by means of entropy-maximizing methods. For other coefficients, use has been made of OLS.
5.2.	Validation	Ex-post simulations have been carried out.

6. MODEL USE

6.1.	Model Users	The model has been used by the model builder.
6.2.	Main Applications	The effects on interregional income inequalities have been analyzed of policies concerning among others the regional distribution of private investments and infrastructure.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data, etc. : available to a certain extent - Documentation enabling one to replicate the model : available

KOREA

1. GENERAL INFORMATION

1.1.	Model Name	Optimum Transportation Sector Investment Study (OTSIS)
1.2.	Model Builders	Tschangho John Kim
1.3.	Responsible Organizations	Korea Institute of Science and Technology, Seoul, Korea
1.4.	Publication	Coal/Cement Distribution and Optimum Transportation Sector Investment Study, Technical Report
1.5.	Development Stage	The model is operational since approximately 1980.
1.6.	Time Period	The main data base for OTSIS consists of a freight origin-destination survey carried out one time, and two input-output tables related to two years (with a time difference of 10 years). OTSIS is meant for short term purposes.
1.7.	Country	Korea

2. MODEL PURPOSE

2.1.	General Purpose	1. Planning studies (ex-ante), 2. Forecasting studies, 3. Planning studies (ex-post)
2.2.	Specific Purpose	To generate transportation sector improvement programs that are needed to be implemented during the 5th Five-Year Development period of 1981-1986 in Korea.

3. MODEL ELEMENTS

3.1.	Model Size	regions : 31 sectors : 5 exogenous variables : 1411 endogenous variables : 7322 equations (and inequalities) : 1364
3.2.	Exogenous Variables	National : imports and exports per sector Regional : interregional passenger travel demand by mode
3.3.	Endogenous Variables	National : total welfare Regional : production per sector, recommended number of lanes to be constructed for interregional transport for each transport system

4.	MODEL STRUCTURE	
4.1.	Production Technology	Input-Output
4.2.	Interregional and International Trade	Interregional transport is studied by system and by mode.
4.3.	Other Interregional Linkages	-
4.4.	National-Regional Links	A top-down approach is used for imports and exports per sector. A bottom approach is used for transportation investments.
4.5.	Supply and Demand Considerations	The model is demand driven. If it appears that the existing capacity of transportation systems is insufficient to come to meet the demands, the model generates the required expansions of ports and lanes.
4.6.	Equilibrium Assumptions	Demand and supply are equal by assumption.
4.7.	Treatment of Prices	Prices do not play an explicit role in the model, apart from transport costs.
4.8.	Dynamics	The model is static.
4.9.	Functional Forms	The model is linear.
4.10.	Solution Techniques	OTSIS is solved by linear programming.
5.	ESTIMATION AND VALIDATION	
5.1.	Estimation	Coefficients have been obtained as one-point estimates.
5.2.	Validation	The validity of the model will be tested by means of the ex-ante forecasts for the period 1981-86.
6.	MODEL USE	
6.1.	Model Users	The model has been used by the Ministry of Transportation of Korea.
6.2.	Main Applications	Generation of recommendations for the transportation development programs for the 5th Five-Year Development Program in Korea.
6.3.	Documentation	- Documentation about structure and limitations : available - User manual, testing data : available - Documentation enabling one to replicate the model : available
7.	DISTINGUISHING FEATURES	Detailed treatment of transportation sector and infrastructure.