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Abstract

This paper develops a regional dynamic general equilibrium model calibrated using t*wo regional SAMs for the Italian region Valle D'Aosta for the years 1963 and 2002*. A historical calibration procedure is performed over the 40 years period and a validation exercise ensures that the modelled tendencies closely approximate the actual observed growth patterns of the main regional macroeconomic variables. The dynamic general equilibrium model provides an original and powerful tool for historical counterfactual analysis not available using standard dynamic general equilibrium models. The model is used to compare the growth path followed by the region during the period of interest with different scenarios intended to rank the social desirability of alternative behaviours of the regional administration.

JEL Code: C68, R13.

Keywords: historical calibration, historical validation, regional dynamic general equilibrium model, historical counterfactual analysis.

1. Introduction

Economic history can draw lessons for current topics in policy analysis and economic research. Understanding the historical paths of institutional and economic development is of central importance in understanding the current differences in economic performances across regions and countries (Engerman and Sokoloff 2000; Acemoglu et al. 2005). The choice of a particular development and institutional path, in a certain point in time, in fact, can trigger alternative growth trajectories and lead to different levels of efficiency. Moreover, the use of economic theory and statistical technique to analyse economic history is becoming a popular exercise. A new field in the economic discipline, defined as "cliometrics" (Costa et al. 2007), is aimed to reintroduce the necessary historical dimension often neglected in many economic studies. This historical approach, which has been mainly carried out using econometric techniques, is here extended to the applied general equilibrium modelling.

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In this paper we reproduce the economic development path undertaken by the Italian region Valle D'Aosta during the last 4 decades using a regional dynamic general equilibrium model built on two regional Social Accounting Matrices (SAMs) constructed for the years 1963 and 2002. The availability of two regional SAMs, equal in the structure and referred to two different periods in time, offers an extraordinary opportunity to perform a dynamic calibration procedure based on the knowledge of the initial conditions and of the current economic circumstances. In addition, the procedure adopted in this paper, which also involves the use of additional calculated and observed historical trends, ensures that the modelled tendencies closely approximate the actual observed growth patterns of the main regional macroeconomic variables. The calibrated dynamic model provides an original and powerful tool for counterfactual analysis in which the path followed so far by the regional economy can be compared to alternative policy scenarios in order to draw lessons for future policy recommendations.

Computable general equilibrium (CGE) models are widespread tools for policy analysis, nevertheless, criticisms have been addressed to the lack of validation and empirical foundations. Validation, which consists in verifying the matching between modelled and historical tendencies over a chosen period of time, is a major concern for all simulation and operations research models (Gass, 1983, Kleijnen, 1999). Conducting a validation exercise can help to asses the model limitation and predictive capacity.

In the economic literature, few studies have attempted to carry out an historical calibration/validation procedure for dynamic general equilibrium models and little attention has been paid to the ex post evaluation of model performances. A validation approach called "backcasting" or backwards forecasting has been suggested by Gehlhar, (1997). The method implies the use of exogenous shocks operated on a model calibrated at a base year and regarding changes in factor endowments and total factor productivity calculated in order to reach the levels of particular endowments in a previous period. Some other papers adopt a validation practise which consists in running a dynamic general equilibrium model forward and compare the outcomes with historical records. The initial results provide the basis for readjusting the calibration of the model to match historical data. In Kehoe et al. (1995), for instance, the authors compare the results generated by the model with actual data for the Spanish economy[1]. Historical data includes consumer prices, producer prices, activity levels and macroeconomic aggregates. An alternative approach is presented in Dixon and Rimmer (1999). Their model employs a historical closure in which some of the variables normally not explained by CGE models, for example tax rates, technology and preferences, are considered endogenous in order to reproduce the observed movements in the main endogenous variables. More recently Arndt et al. (2002) suggested a maximum entropy approach to estimate the behavioural parameters of a static CGE model. This method, besides making use of historical records provides also statistical tests for the estimates. The historical targets considered include GDP, sales, imports, exports, investment, consumption by commodities and household type.

None of the above mentioned studies exploits the comprehensive range of information that can be obtained from the use of two SAMs constructed for two different points in time. Thurlow (2004) presents a dynamic general equilibrium model for South Africa

[1] Another example of this procedure is presented in Sanchez (2004) and Rattsø and Stokke (2008).

which involves the use of two SAMs for the years 1993 and 2000, although the model takes account of a between period component, no explicit attention is given to whether the model replicates 2000 actual figures. In this paper we attempt to develop a regional dynamic general equilibrium model calibrated on historical data and, starting from the year 1963, able to reproduce the regional economic structure as depicted by the 2002 regional SAM. The model represents a unique experimental setting for a historical counterfactual analysis of alternative policy scenarios which is not available using standard dynamic cge models. This exercise is backward looking and compares the model generated outcomes with alternative scenarios obtained by introducing shocks throughout the observed period.

The paper proceeds as follows. Section 2 describes the data and the regional economic background, the economic structure of the region in the two periods is compared using information obtained from the two regional SAMs. Section 3 describes the main features of the regional dynamic general equilibrium model while paragraph 3.3 presents in more details the historical calibration and the validation procedures. In section 4 the results of the historical counterfactual analysis are discussed. Section 5 concludes.

2. Data and regional background

The regional dynamic model presented in this paper is calibrated using two regional social accounting matrices for the region Valle D'Aosta constructed for the years 1963 and 2002. The original matrix accounts have been aggregated in order to obtain a reduced SAM as required by the simplicity of the applied dynamic model. The original matrices are reported in Lovo et al., (2008) together with the description of their content and of the procedures and sources adopted in the construction.

The aggregated SAMs are reported in Table A1 and A2 of the Appendix. The matrices include 14 sectors, 2 factors of production (labour and capital), one private institution account incorporating households and enterprises, the regional government and the rest of the world. The rest of the world sector is a simplified account that includes three main trading partners: the rest of Italy, the European Union and the others non-European countries. The 1963 SAM has been converted to constant prices 2002 using the price index reported by the national institute of statistics, Istat (2005). The series of annual population growth rates used in the historical calibration procedure, the series of value added by sector and capital stock used in the validation exercise have been provided by the Centre for North South Economic Research, CRENoS[2]. Value added data covers the period 1960-1997. For the years 1997-2002 the dataset has been updated using information provided by Istat (2004a).

The two regional SAMs adopt the same structure and are therefore fully comparable. The rest of this section is devoted to the analysis of the information recovered from the 1963 and 2002 SAMs[3] to highlight the main features of the regional economy in the two periods.

[2] For a detailed description of CRENOS database see Marrocu, et al. (2000)
[3] For the description of the two SAMs we follow Thurlow (2004).

Valle D'Aosta is one of the Italian regions enjoying a high level of governing, financial and legislative autonomy which have been fully implemented since 1981. The mountainous region is situated on the North-West edge of Italy and shares the border with France and Switzerland.

Table 1 reports the distribution of regional value added at factor costs across sectors and reflects the level of sector disaggregation used later in the model. In general, we observe a large reduction in the contribution of the secondary sector, including the manufacturing industries and construction, to the formation of Gross Domestic Product (GDP). While in 1963 the manufacturing, the construction and the service sectors were equally contributing to the regional GDP, in 2002 there is an evident overtaking by the private and public services showing a shift out of the manufacturing and into the services of the regional economy. The construction sector appeared to be very vital during the first decade of the analysis mainly due to the large demand for infrastructures and public works. In the 70s and 80s the vigour of the sector was ensured by the demand for tourism construction. This positive tendency is, however, interrupted by a downfall in the second half of the 90 caused mainly by the introduction of new European regulation on public contracting and the more severe limits imposed on national government public expenditure.

The regional administration has notably increased the contribution to the formation of regional domestic product. In 2002, the public services account for the 23% of GDP in comparison to the 8% of the manufacturing sector. The comparison with national figures and with the nearby Italian regions reveals the abnormal presence of the public administration. The comparison with another mountainous and autonomous region in the North of Italy, Trentino Alto Adige[4], where the contribution to value added of the public sector is around 15% (Istat, 2004b), confirms the relevant role played by the public sector in Valle D'Aosta. The public services generate the 35% of total labor income and employs about 30% of the labor forces. The growth has been sustained during the last 40 years accompanying the positive performance of the other sectors during periods of expansion and acting as a social damper during the slow down of the regional economy to alleviate unemployment.

The composition of the regional Gross Domestic Product reported in Table 2 shows a change in the overall structure of GDP during the considered 4 decades. The largest components of GDP in 1963 are imports and exports. This is an aspect that typically characterises small regions such as Valle D'Aosta which is the smallest region in Italy with a population of 125,000. In 2002 the economy is less oriented toward exports and there is a notably increase in the role of private domestic consumption. This may reflect a loss of competitiveness with respect to the nearby territories. On the other side, the share of imports as a percentage of GDP has fallen by only 9 percentage points. The share of fixed investment and the tax burden have slightly increased.

3. A dynamic regional general equilibrium model

This section describes the main characteristics of the regional dynamic model developed in this paper, the complete version of the model is reported in the Appendix. The static

[4] In Trentino Alto Adige the composition of value added is the following: manufacturing 13.8%, construction 10.3%, private services 55.9% and public services 14.6%.

version of the model embraces the core specifications of the IFPRI standard general equilibrium model (Löfgren et al. 2001). The model is recursive dynamic which means that agents' behaviour depends on current and past states of the economy and do not form expectations about future events.

3.1 The static specification

In the model, producers maximize profits under perfect competition given the technological constraint. Following a standard procedure, production is related to value added and total intermediate input through a nested constant elasticity of substitution (CES) function. Value added itself is a CES function of the two factors of production, capital and labour, and intermediate inputs are aggregated according to a Leontief function.

Interregional trade is modelled in a simple, aggregated way, namely, considering a single trade partner that includes the three main trading regions: the rest of Italy, the rest of Europe and non-European countries. The aggregate output is sold domestically and outside the region subject to imperfect substitutability between exports and domestic sales represented by a constant elasticity of transformation (CET) function. Domestic demand matches the supply of a composite commodity obtained by an Armington aggregation of imports and domestic output which reproduces the imperfect substitutability between the two.

The peculiar characteristics of the region help to add few simplifications to the modelling of the government account. Under the current constitution, Valle D'Aosta is one of the five Italian regions enjoying a high level of governing and financial autonomy. This confers to the region, for analytical purposes, the condition of a "small country" within the country. Given the financial independence, government revenues and expenditures can be seen as occurring within the regional borders. The regional government obtains revenues from production, factor and income taxes which are imposed on the regional sectors and institutions. The government budget includes also the net transfers from the national government. Finally, government total expenditure is assumed to be a fixed percentage of the regional GDP and is allocated according to a CES function.

Households, enterprises and the regional government earn factor incomes in proportion to the owned share of factor stocks. Government and non-government institutions receive transfers from the rest of the economy and from the other institutions. Households use their income, net of direct taxes, to consume and save. Household consumption is allocated according to a simple Cobb-Douglas utility function.

The system constraints and the macroeconomic closures follow the standard specification of the IFPRI model. In particular, capital and labour are fully employed and mobile. Factor prices adjust to ensure that demand for factors of production equals total supply. Due to the lack of data on sector-specific labour forces and capital endowments, homogenous wages are assumed across sectors.

3.2 The dynamic specification

The model is solved forward in a dynamically recursive fashion, in which the solution depends only on current and past variables. Total capital accumulation is endogenous and is represented in equation 1. The capital stock (QFS_K) at a particular point in time is given by the previous year depreciated capital stock and the current total investments (TOTinv), the depreciation rate is indicate by depk. Capital is considered perfectly mobile across sectors and the allocation of new capital is influenced by the technology adopted by each sector.

$$QFS_{K,t+1} = QFS_{K,t} \cdot (1 - \text{depk}) + \text{TOTinv}_t \,. \tag{1}$$

The dynamic model is exogenously updated to reflect demographic, technological and behavioural changes. In particular we include those exogenous variables not normally explained by CGE models which are both observable, such as the tax rates, and unobservables (technology and preferences). These variables are updated on the basis of observed and calculated projected trends. The process helps to implement the changes in the regional economic structure not explained by the economic mechanism of the dynamic model.

The updated exogenous trends include the movements in population, total factor productivity and the transfers from and to the rest of the economy. Population growth[5] follows the standard specification reported in equation 2 where QFS_L represents the stock of population and the rate of growth, n_t, varies annually according to the observed historical records provided by CRENoS.

$$QFS_{L,t+1} = QFS_{L,t} \cdot (1 + n_t) \,. \tag{2}$$

Total factor productivity (TFP) growth is heterogeneous across sectors and is exogenously updated accordingly to the following equation (3):

$$TFP_{i,t+1} = TFP_{i,t} \cdot (1 + g_i) \,. \tag{3}$$

The rate of growth of total factor productivity by sector, g, is determined through the historical calibration process that will be explained in the next section.

The agents' economic behaviour, mainly represented by technology and preferences, is also updated to reflect the changes observed between the initial and the final states of the considered period, depicted by the two regional SAMs. This procedure involves the distribution of consumption expenditure, the formation of total investments and the technical changes in the production process (input-saving and factor saving technical changes). The updating procedure includes also the adjustments in the policy variables such as tax rates, government transfers and expenditure. Table 3 reports the list of behavioral and policy variables which have been exogenously updated according to calculated projected trends.

The projected trends are computed using the information contained in the two SAMs. The calibration of the static general equilibrium model on the basis of the regional SAM

[5] In our model we do not distinguish between population and labour forces growth this is due to the lack of availability of data.

for the year 2002 provides a set of target parameters which, although based on the assumption of unchanged relative prices[6], can still provide a reasonable picture of how the behavioural, technological and policy parameters have evolved. The overall changes in the above mentioned parameters observed between 1963 and 2002, are homogenously distributed throughout the 39 years period according to constant changes over time.

$$\theta_t = \theta_0 + c^t . \quad (4)$$

Equation 4 describes the updating mechanism applied to the behavioural and policy variables generically indicated by θ_t at a constant change over time, c.

3.3 Historical calibration and validation

This section describes the procedure followed in the historical calibration of the regional dynamic general equilibrium model and shows the results of the historical validation exercise conducted to assess how closely the model approximate the actual development path of the main macroeconomic indicators.

The peculiar experimental design of this study allows us to use a calibration procedure which differs from the standard dynamic calibration method because exogenous growth rates are not imposed on key variables such as total factor productivity by borrowing them from external data sources. We clarify this feature in the following definition.

Definition 1: Historical calibration. It refers to a dynamic calibration procedure where exogenous growth rates are internally determined from the information available for the time period under observation.

This calibration approach based on the historical information of input/output matrices permits to closely match model generated outcomes, such as sector value added, with actual data in a specific point in time. The historical dimension of the analysis extends to the validation procedure.

Definition 2: Historical validation. The historical validation procedure compares model generated results and actual data throughout the time span of the analysis in order to assess the correspondence of the model and its outputs to observed reality.

This method is in line with the concept of replicative validity first introduced by Gass (1983). The static model is calibrated following a standard procedure commonly used in applied general equilibrium models. Share and shifts parameters are computed assuming that the economy is in equilibrium and the units for goods are chosen in order to have a price of unity in the base year. In the calibration process some external information is in any case required such as the value of the elasticities adopted in the production and

[6] This assumption adopted for the historical calibration is relaxed in the dynamic specification of the model since relative prices are allowed to change in order to satisfy market clearing conditions. To assess the relevance of this potential contradiction we have solved the dynamic model after deflating the 1963 SAM using the relative prices 2002 obtained as a solution of the model. The model converges and the results do not change significantly. This suggests that the above potential contradiction does not affect the performance of the model.

trade functional specification and the stock of endowments. When times series or cross section data are not available, elasticities cannot be estimated and are commonly taken from external sources. For instance, from similar contexts or as a sort of average tendency of estimates in the general equilibrium literature. In this paper, we adopted the elasticities used in Finizia et al. (2005) where a general equilibrium model employing similar functional forms for production, investment and foreign trade is applied to the whole Italian economy. The initial endowment of capital is calibrated according to the data on capital stocks provided by CRENoS. Because data are not available at sector level we assume a homogenous rate of capital remuneration across sectors.

In the historical calibration, while elasticities are kept constant, most of the other structural parameters are updated assuming a constant change over time to match 2002 structural relations and policy changes as explained above.

Total factor productivity growth rate by sector is calibrated such that the value added by sector matches the actual figures as reported by the 2002 regional SAM. The estimated annual productivity growth rates, reported in table 4, vary between 0 and 3% and reveal a wide heterogeneity in the performances across sectors. The average calibrated growth rate is reasonably close to the one estimated in Leonida et al. (2004) for the whole economy of the region. The authors estimated the total factor productivity growth rates for the 20 Italian regions over the period 1970-1995 and report an annual growth rate of 1.5% for the region Valle D'Aosta. The best performances in terms of TFP growth are observed in the Machinery, Chemical sectors while the food, textiles and the hotels sector are remaining behind.

The historical calibration, by construction, ensures that the modelled value added by sector reasonably matches the actual values reported in the 2002 SAM as shown in Figure 1. At the same time, the updating procedure of the main endowments, behavioural and policy variables guarantees that the majority of the elements of the SAM obtained as a solution of the model fairly approximate the actual values reported in the 2002 SAM. The actual and the model generated SAMs are reported in tables A3 and A4.

The solution of the dynamic regional CGE model produces a base-line that captures the combined effect of all economic policy reforms and structural changes occurred during the period 1963-2002. In the remaining of the section we will attempt to show how the simulated base-line approximates the actual trend of the value added by sector. A critical evaluation of the model framework, in fact, does not always ensure the good performance of the model. It is recognized that a highly complex and detailed modelling, if supported by low quality data, is likely to produce poor results (Gehlhar, 1997). A historical validation process, therefore, allows the evaluation of the model as a whole.

Because of the theoretical assumptions necessary for the calibration and the solution of the model, the simulated trends are not expected to perfectly replicate actual figures, nevertheless the modelled tendency of aggregated and disaggregated regional GDP and capital accumulation fairly matches the observed trends. The comparison between the actual value added series and the model outcomes are reported in Figure 2 and 3[7]. Due

[7] Value added series are available only for those sector reported in Figure 2 and 3.

to model assumptions and the constant variation pattern imposed on parameters and total factor productivity growth, the model generated paths are smooth throughout the period.

The model correctly reproduces the negative performances of the metal and construction sectors. As anticipated in the previous section, the construction sector has suffered from the European legislation in terms of public contracting and expenditure. The metal sector, one of the first to be established in the region, experienced some fluctuations during the 80s and a subsequent downfall concluded with the closure of some of the most important companies. Agriculture shows an almost steady behaviour with the exception of few positive picks in the first half of the 90s (Noto and Meneghelli, 2008). This has been ensured by the constant financial support received from the regional administration. The model also approximately replicates the initial decrease and the following recovery of the energy sector. The modest and sometime negative performances of these industries are accompanied by the positive trends observed in the private and public service sectors. The positive performance of the public services, however, can be mainly attributed to the enormous injections of resources in the sector rather then to positive productivity enhancements as mentioned above.

In Figure 4 the evolution of the modelled regional stock of capital is compared to the available data on capital stock estimated in Paci and Pusceddu (2000) and provided by CRENoS. The available estimates of regional capital stocks do not take into account the physical depreciation of capital, therefore the modelled trend reported in Figure 4 has been constructed ignoring capital depreciation. The simulated trend matches the actual one fairly reasonably in particular for the period 1972-84[8]. Finally, we report the comparison between the actual and modelled trend of regional total investments (Figure 5).

The validation and updating procedures have been focused on domestic variables and less attention has been given to the modelling of interregional trade[9]. The inclusion of additional exogenous restriction in this simple dynamic model would have been too constraining. Inter-temporal systems of equations, in fact, are governed by their internal logic of theoretical consistency and it is not always possible to make use of ad hoc external values for the parameters. Nevertheless, the modelled net trade balance by sector fairly matches the actual figures as it is possible to notice from tables A3 and A4 in the Appendix.

The solution of the regional dynamic general equilibrium model produces a modelled historical counterfactual growth path that can be compared to alternative scenarios as described in the next section.

4. Simulations and counterfactual results

[8] It is worth noting that the series of capital stock we are using as baseline for the comparison, which is provided by CRENoS, are not actual figures but the results of an estimation process described in Paci and Pusceddu (2000).

[9] To reproduce the actual paths of imports and exports is it possible to calibrate import and export taxes Rattsø and Stokke (2008); given the simplicity of the model used these were not included and therefore cannot be used in the calibration exercise.

In this section we discuss the results of two simple simulations which are intended to compare the effects of alterative behaviours of the regional public administration. At the moment, the simplicity of the dynamic general equilibrium model restricts the available range of policy simulations. Policy changes can be simulated by changing the relevant exogenous variables or imposing constrains on determined variables. Given the model presented above, simulations can be conducted mainly in two ways. In a first case, the model can be used to forecast the effects of a particular scenario by solving the model forward in time. The second approach, instead, is backward looking and compares the modelled trend for the period 1963 to 2002 with alternative tendencies obtained by shocking the model throughout the period. The latter approach, which is adopted in this section, allows for a historical counterfactual exercise which is not available using standard dynamic general equilibrium models.

The calibrated total factor productivity growth rates reported in the previous section show a poorer performance of the public sector in comparison with the other branches of the service sector. The first scenario is intended to reproduce the economic growth path of the region Valle D’Aosta under a more efficient behaviour of the public sector in terms of productivity performances. Therefore, we apply a total factor productivity growth rate of 1.5% to the public services in line with the average growth rate of the private service sector.

The second scenario involves the allocation of investments. As reported in table 5, a huge percentage of the total investments of the region is directed to the public service sector. The percentage of investments in public services has grown from 27% in 1995 (ISTAT, 2004b) to about 38% in 2002 in comparison with the 12% and 14% of the nearby northern regions and Italy respectively. This suggests a potential alternative scenario in which public investments are limited and the exceeding capital is redistributed to other sectors according to the adopted technology. In particular, we simulate an extreme situation in with the capital employed by the public sector remain stable throughout the years meaning that public investments only replace the depreciated public capital. Investments reallocated from the public sector to more productive private sectors are expected to positively contribute to the economic growth of the region. The results are summarized in Figure 6.

A more efficient performance in terms of total factor productivity of the public sector leads to a better outcome in terms of economic growth. The annual growth rates are higher throughout the all period and the averaged growth rate is increased by 3 percent. A reallocation of investments from the public to the private sectors also contributes positively to economic growth, although with less intensity. The averaged growth rate rises by about 1 percent. The effects could have been larger if the investments subtracted from the public sector were allocated to the best performing private sectors such as the machinery and the chemical sectors. The machinery sector, in particular, has recently received attention in the view of the implementation of a regional plan for research and technological development supported by the European Fund for Regional Development (EFRD). This plan aims at stimulating the local high-tech sector exploiting its innovative capacity.

5. Conclusions

In this paper we developed a regional dynamic general equilibrium model for the Italian region Valle D'Aosta. The dynamic model covers a 40 years period capturing the historical development path followed by regional sectors and institutions which is of central importance in understanding the nature of the current economic conditions (Engerman and Sokoloff 2000; Acemoglu et al., 2005).

The model incorporates the changes in the economic behaviour of local agents and institutions exploiting the information contained in two regional SAMs for the year 1963 and 2002. The historical calibration is performed over the 40 years period to obtain the total factor productivity growth rates by sector which ensure that the model generated value added reasonably match the actual figures by sector in 2002. The validation of the model, which implies the comparison between the actual and modelled trends for the main regional macroeconomic variables, guaranties that the model closely approximate the actual development path. The model allows for a historical counterfactual exercise which is not available using standard dynamic general equilibrium models. The analysis compared the modelled growth path for the considered period to different scenarios to assess the effects of alternative behaviours of the regional administration.

The public sector plays a central role and appears to be one of the main drivers of the development of the regional economy. Nevertheless, the calibrated productivity growth rates show that the public sector is underperforming with respect to the other private services sectors. The first simulation tries to reproduce the alternative growth path the region would have followed with a better performance, in terms of total factor productivity, of the public sector. A further scenario explores the effects of a reallocation of investments from the public to the private sectors. Both scenarios have positive effects on the economic growth path suggesting the need for a more efficient behaviour of the public administration and the desirability of a transfer of resources from the public to the more efficient private sectors.

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TABLES and FIGURES

Table 1 – Value added by sector in 1963 and 2002

	Value added by sector		Percentage of valued added			
			Valle D'Aosta		Italy	North-West
	1963	2002	1963	2002	2002	2002
Agriculture	36	38	2.8%	1.3%		
Mining	39	12	3.1%	0.4%		
Metals	275	77	21.3%	2.6%		
Machinery	10	19	0.8%	0.6%		
Chemicals	10	6	0.8%	0.2%		
Food, beverages, tobacco and textiles	20	69	1.6%	2.3%		
Others	19	96	1.5%	3.2%		
Construction	270	136	20.9%	4.5%		
Energy	125	157	9.7%	5.2%		
Trade	77	256	5.9%	8.5%		
Hotels and restaurant	58	256	4.5%	8.5%		
Transport and Communications	37	291	2.8%	9.6%		
Financial intermed / other services	152	906	11.8%	30.0%		
Public services	161	701	12.5%	23.2%		
Total	1289	3018	100.0%	100.0%		
Manufacturing	335	267	26.0%	8.8%	21.4%	26.3%
Construction	270	136	20.9%	4.5%	5.3%	4.6%
Private services	323	1707	25.1%	56.6%	54.2%	53.2%
Public services	161	701	12.5%	23.2%	14.1%	10.3%

Source: SAMs 1963 - 2002 for the Region Valle D'Aosta and Istat(2004b)
Note: Values are in millions of Euros at 2002 constant prices

Table 2 – Composition of regional GDP in 1963 and 2002

	Value (Million of Euros at constant prices 2002)		Percentage of GDP at market prices	
	1963	2002	1963	2002
Private consumption	462	2316	33%	68%
Fixed investment	284	856	20%	25%
Government consumption	254	895	18%	26%
Exports	1172	1568	84%	46%
Imports	779	2215	56%	65%
GDP at market prices	1393	3419	100%	100%
Net inderct taxes	103	401	7%	12%
GDP at factor costs	1289	3018	93%	88%

Source: SAMs 1963 - 2002 for the Region Valle D'Aosta

Table 3 - List of behavioural and policy variables updated in the dynamic model

Behavioural variables	Symbol
Private Consumption and savings	α_i^d, MPS
Sectoral investment parameters	α_i^{INV}
Production parameters	δ_i^{Xs}, $ica_{i,ii}$
Policy variables	
Direct tax rates	ty
Production tax rates	tq_i
Government pension transfers	$tr_{gov,h}$
Government expenditure	Gcons, α_i^{GOV}

Table 4 – Calibrated total factor productivity growth rate

Agriculture	1.70%
Mining	0.80%
Metals	1.30%
Machinery	2.80%
Chemicals	2.80%
Food, beverages, tobacco and textiles	0.00%
Others	2.60%
Construction	0.70%
Energy	0.70%
Trade	1.50%
Hotels and restaurant	0.00%
Transport and Communications	1.80%
Financial intermediation and other services	1.40%
Public services	0.70%
Average annual growth rate	1.34%

Table 5 – Investments by sector of destination

	Valle D'Aosta	Nord-West	Italy
	2002	2002	2002
Agriculture	1.59%	3.63%	4.20%
Manufacturing	12.42%	26.02%	21.10%
Private Services	28.99%	49.95%	52.04%
Public Services	37.99%	11.77%	13.86%
Other	19.00%	8.77%	8.80%
Total	100.00%	100.00%	100.00%

Source: ISTAT, 2004b.

Figure 1 – Actual and modelled value added and production by sector

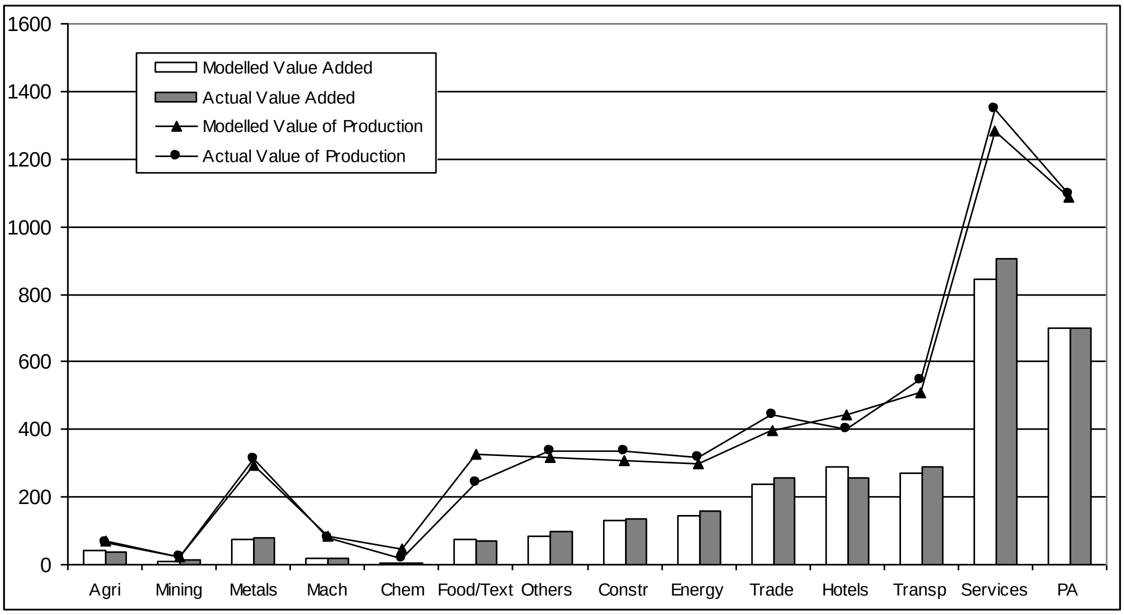


Figure 2 - Modelled and actual trends of value added by sector

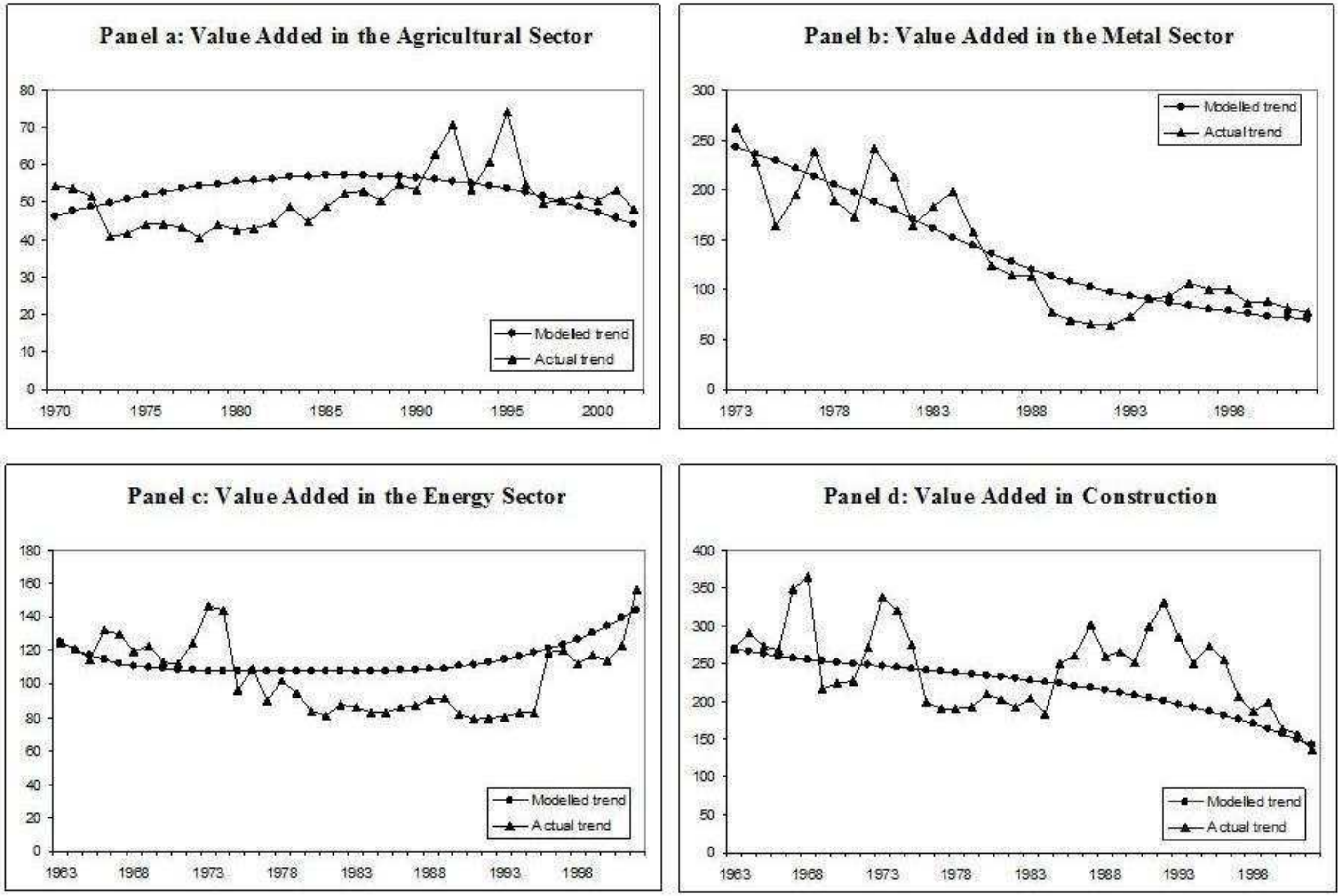


Figure 3 - Modelled and actual trends of regional GDP and value added by sector

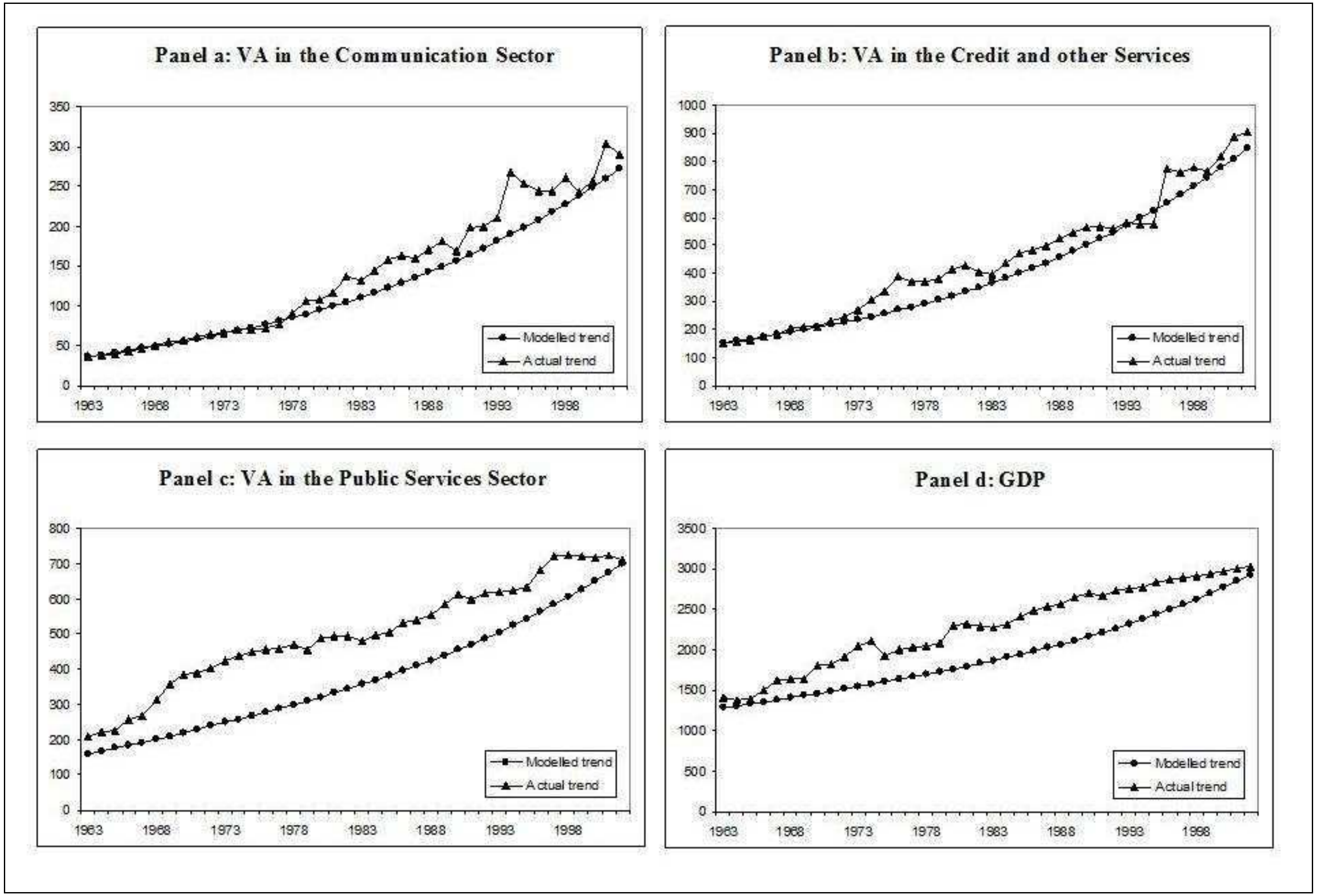


Figure 4 – Actual and modelled trend of the regional stock of capital

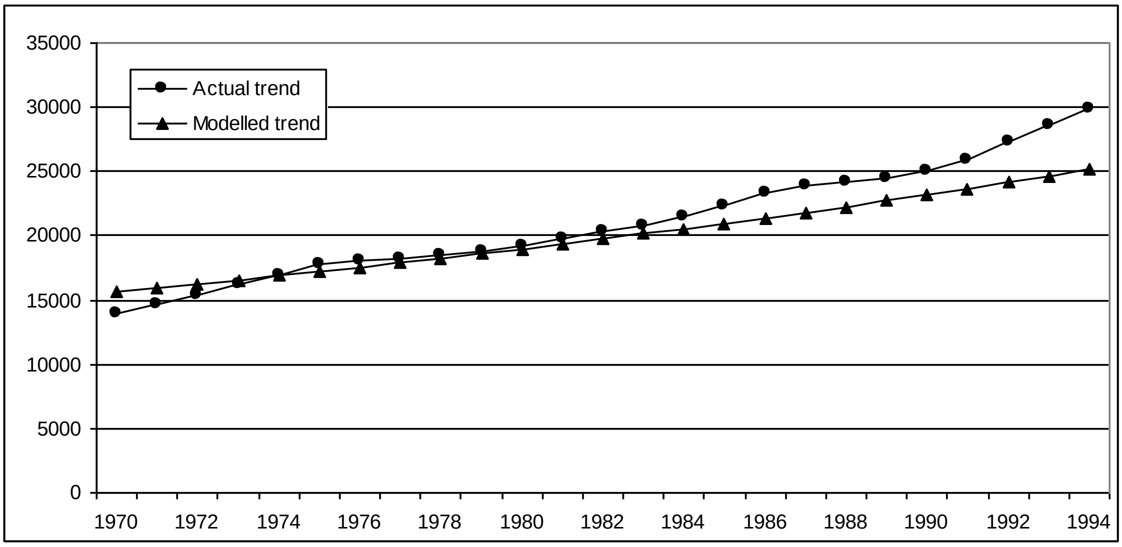


Figure 5 – Actual and modelled trend of the regional total investment

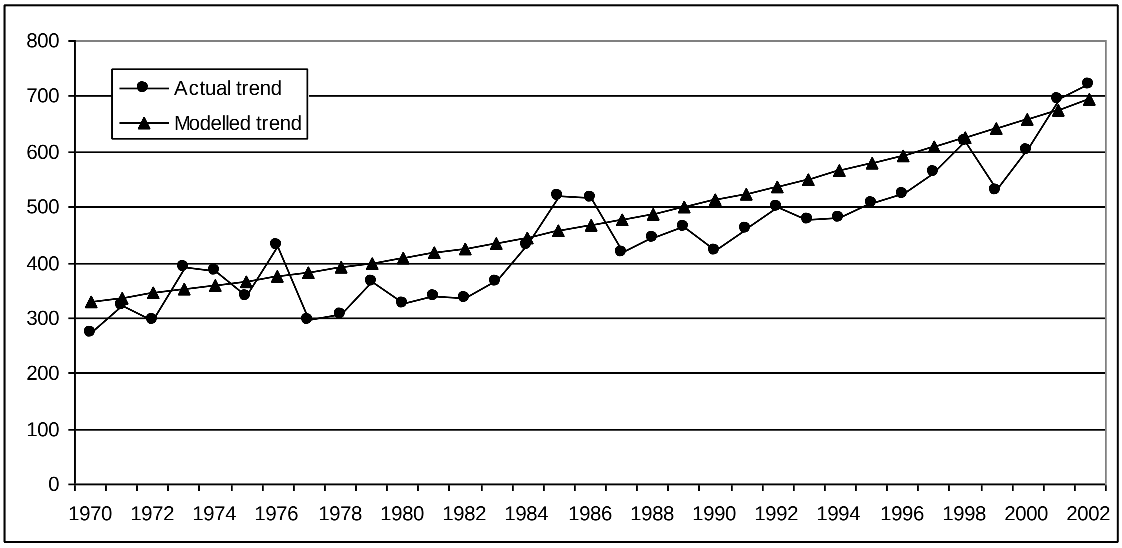
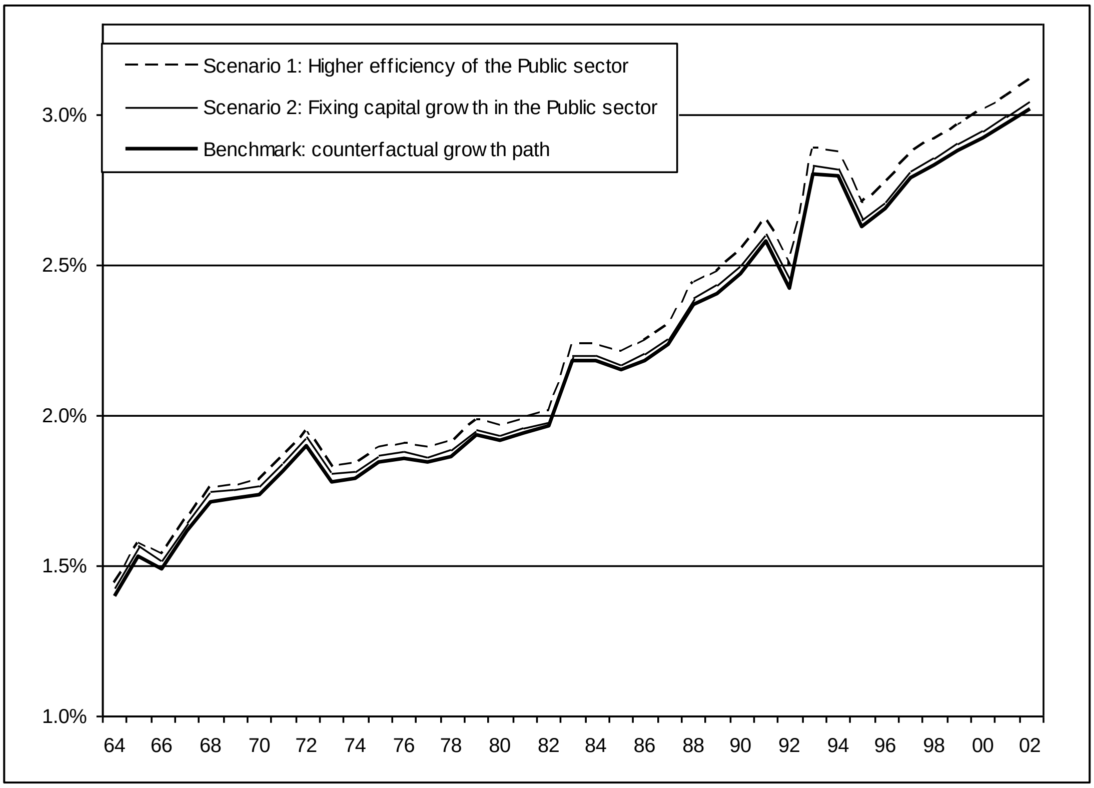


Figure 6 – Counterfactual and simulated regional GDP growth rates



Appendix – The model

The equations adopted in the model and the symbols listed in the following tables correspond largely to those presented in Lofgren and Robinson (2001).

Sets

Symbol	Descriptions
$i, ii \in I, Y$	Sectors/products
$f \in F$	Factors
$h \in H$	Institutions (households, government and rest of the world)
$h \in HD \subset H$	Domestic institutions (households and government)
$h \in HDNG \subset H$	Domestic nongovernment Institutions (households)

Parameters

Symbol	Explanation	Symbol	Explanation
a_i	Efficiency parameter in the CES activity function	g_i	TFP growth rate by sector
aq_i	Armington function shift parameter	n	Population growth rate
at_i	CET function shift parameter	ρ^{Xs}	CES production function exponent
$cwts_i$	Weight of good i in the CPI	ρ^{VA}	CES value – added function exponent
$depk$	Capital depreciation rate	ρ^{q}	Armington function exponent
δ^{VA}_{fi}	CES value added share parameter for factor f in activity i	ρ^{t}	CET function exponent
δ^{q}_{fi}	Armington function share parameter	σ^{INV}	CES Investment function exponent
δ^{t}_{fi}	CET function share parameter	σ^{GOV}	CES government exponent

Updated parameters

Symbol	Explanation	Symbol	Explanation
α_i^{d}	Share parameter in the utility function	$Gcons$	Percentage of government expenditure of value added
α_i^{INV}	Share parameter in the investment demand function	$ica_{i,ii}$	Quantity of i as intermediate input per unit of ii
α_i^{GOV}	Share parameter in the government demand function	tq_i	Rate of sale taxes
α_i^{d}	Share parameter in the utility function	ty	Direct tax rate
δ_i^{Xs}	CES activity share parameter		

Exogenous variables	
Symbol	Explanation
PM_i	Price of imports
PE_i	Price of exports
EXR	Exchange rate
CPI	Consumer price index
TFR_i	Total factor productivity
MPS_h	Marginal propensity to save
$tr_{h,hh}$	Transfer within institutions

Endogenous Variable			
Symbol	Explanation	Symbol	Explanation
C	Aggregate consumption	QFS_f	Factor supply
EG	Government aggregate expenditure	$QINT_{i,ii}$	Quantity of intermediate input
FSAV	Foreign savings	$QINV_i$	Quantity of investment demand
$INT_{i,ii}$	Intermediate input demand	QM_i	Quantity of imports of goods
$INTtot_i$	Aggregate intermediate input	QQ_i	Quantity of goods supplied to the domestic market (composite supply)
PD_i	Domestic price for goods produced and sold domestically	TOTinv	Aggregate investment
PG	Price of aggregate government expenditure	VA_i	Value added
$PINT_i$	Price of aggregate intermediate input	Xs_i	Marketed quantity of domestic output
PINV	Price of aggregate investment	w_f	Price of factors
PQ_i	Composite product price	XD_i	Household demand of good i
PVA_i	Value added price	XG_i	Government consumption of good i
PX_i	Producer price	YF_f	Factor income
QD_i	Quantity sold domestically of domestic output	YH_h	Household income
QE_i	Quantity of exports of goods	$YIF_{h,f}$	Income from factor f to institution h
QF_{fi}	Quantity demanded of factor f from sector i		

Model equations (time subscription omitted)

#	Equation	Domain	Description
	Price block		
1	$PQ_i \cdot QQ_i = (PD_i \cdot QD_i + PM_i \cdot QM_i)\cdot(1+tq_i)$	$i \in I$	Absorption
2	$PX_i \cdot Xs_i = (PD_i \cdot QD_i + PE_i \cdot QE_i)$	$i \in I$	Marketed output value
3	$PVA_i \cdot VA_i = \sum_f w_f \cdot QF_{fi}$	$i \in I$	Value added price
4	$PG \cdot EG = \sum_i PQ_i \cdot XG_i$		Price of aggregate government expenditure
5	$PINT_i \cdot INTtot_i = \sum_{ii} PQ_{ii} \cdot QINT_{i,ii}$	$i \in I$ $i, ii \in I$	Price of aggregate intermediate input
6	$PINV \cdot TOTinv = \sum_i PQ_i \cdot QINV_i$		Price of aggregate investment
7	$CPI = \sum_i cwts_i \cdot PQ_i$	$i \in I$	Consumer price index
	Production and trade block		
8	$Xs_i = a_i(\delta_i^{Xs} \cdot VA^{-\rho^{Xs}} + (1-\delta_i^{Xs}) \cdot INTtot^{-\rho^{xs}})^{-\frac{1}{\rho^{xs}}}$	$i \in I$	CES technology: activity production function
9	$\frac{VA_i}{INTtot_i} = \left(\frac{PINT_i}{PVA_i} \cdot \frac{\delta_i^{Xs}}{1-\delta_i^{Xs}}\right)^{\frac{1}{1+\rho^{Xs}}}$	$i \in I$	CES technology: Value-added intermediate input quantity ratio
10	$VA_i = TFP_i \cdot \sum_f (\delta_{fi}^{VA} \cdot QF_{fi}^{-\rho^{VA}})^{-\frac{1}{\rho^{VA}}}$	$i \in I$	Value added and factor demands
11	$QF_{fi} = \delta_{fi}^{VA} \cdot \frac{PVA_i}{w_f} \cdot VA_i \cdot TFP_i^{\sigma_{VA}-1}$	$i \in I$ $f \in F$	Factor demand
12	$INT_{i,ii} = ica_{i,ii} \cdot INTtot$	$i \in I$ $i, ii \in I$	Disaggregate intermediate input demand
13	$QQ_i = aq_i(\delta_i^q \cdot QM^{-\rho^q} + (1-\delta_i^q) \cdot QD^{-\rho^q})^{-\frac{1}{\rho^q}}$	$i \in I$	Composite supply (Armington) function
14	$\frac{QM_i}{QD_i} = \left(\frac{PD_i}{PM_i} \cdot \frac{\delta_i^q}{1-\delta_i^q}\right)^{\frac{1}{1+\rho^q}}$	$i \in I$	Import-domestic demand ratio
15	$XS_i = at_i(\delta_i^t \cdot QM^{-\rho^t} + (1-\delta_i^t) \cdot QD^{-\rho^t})^{-\frac{1}{\rho^t}}$	$i \in I$	Output transformation (CET) function
16	$\frac{QE_i}{QD_i} = \left(\frac{PE_i}{PD_i} \cdot \frac{\delta_i^t}{1-\delta_i^t}\right)^{\frac{1}{1+\rho^t}}$	$i \in I$	Export – domestic supply ratio
	Institution Block		
17	$YF_f = \sum_i w_f \cdot QF_{fi}$	$f \in F$	Factor income
18	$YIF_{h,f} = shif_{h,f}(YF_f - tr_{row,f} \cdot EXR))$	$h \in HD$ $f \in F$	Institutional factor income

19	$YH_h = \sum_f YFI_{f,h} + tr_{h,gov} \cdot CPI + tr_{h,row} \cdot EXR$	$h \in HDNG$	Income of domestic non-government institutions
20	$C = (1 - MPS_h) \cdot YH_h (1 - ty) - tr_{row,h} \cdot EXR$	$h \in HD$	Household aggregate consumption
21	$XD_i = \alpha_i^d \dfrac{C}{PQ_i}$	$i \in I$	Household demand for goods
22	$QINV_i = \left(\alpha_i^{INV}\right)^{\sigma_{INV}} \cdot \left(\dfrac{PINV}{PQ_i}\right)^{\sigma_{INV}} \cdot TOTinv$	$i \in I$	Investment demand
23	$EG \cdot PG = Gcons \cdot VA \cdot PVA$		Government aggregate expenditure
24	$XG_i = \left(\alpha_i^{GOV}\right)^{\sigma_{GOV}} \cdot \left(\dfrac{PG}{PQ_i}\right)^{\sigma_{GOV}} \cdot EG$	$i \in I$	Government consumption demand
	Constrain Block		
25	$\sum_i QF_f = QFS_f$	$f \in F$	Factor market
26	$QQ_i = XD_i + \sum_{ii} QINT_{i,ii} + QINV_i + Ggov_i$	$i \in I$	Good market
27	$\sum_i PM_i \cdot QM_i + \sum_{HD} tr_{row,h} + \sum_f tr_{row,f} = \sum_i PE_i \cdot QE + \sum_{HD} tr_{h,row} + FSAV \cdot EXR$		Current account balance
28	$Pinv \cdot TOTinv = YH(1 - ty) - C - \sum_{HD} tr_{row,h} \cdot EXR + YG - PG \cdot EG - tr_{h,gov} \cdot CPI$		Saving – investment balance
	Dynamic block		
29	$QFS_{K,t+1} = QFS_{K,t} \cdot (1 - depk) + TOTinv$		Capital accumulation
30	$QFS_{L,t+1} = QFS_{L,t} \cdot (1 + n_t)$		Population growth
31	$TFP_{i,t+1} = TFP_{i,t} \cdot (1 + g_i)$		TFP growth
32	$\theta_t = \theta_0 + c^t$		Updating mechanism

Table A1 - SAM 1963 in million of euro at constant price 2002

		1	2	3	4	5	6	7	8	9	10	12	13	13	14	Labor	Capital	Hhs	Gov	Sav	RoW	Tot
1	Agriculture	38.96	0.78	0.13	0.00	0.37	65.33	1.21	0.25	0.01	0.12	3.92	0.12	0.08	0.17			35.3	0.9	3.7	0.4	151.73
2	Mining	0.00	0.24	32.06	0.00	16.20	0.06	0.97	2.22	3.58	0.03	0.59	0.19	0.02	0.07			0.4	0.0	2.6	35.3	94.52
3	Metals	0.13	0.88	499.66	3.94	0.51	0.21	0.27	14.19	0.35	0.00	0.00	0.07	0.01	0.16			0.0	0.0	7.5	615.3	1143.20
4	Machinery	0.62	1.19	4.19	5.47	1.04	2.20	0.56	7.78	2.69	1.87	3.53	4.92	1.46	3.87			39.4	0.0	7.0	15.7	103.49
5	Chemicals	4.75	2.32	39.86	0.55	24.66	6.76	3.78	6.59	4.23	4.14	11.72	7.28	2.55	1.10			29.4	0.0	0.6	31.9	182.24
6	Food/textiles	6.65	0.00	0.00	0.10	1.88	55.03	0.48	0.11	0.00	0.57	28.95	0.47	0.33	0.03			118.8	2.7	1.7	34.5	252.25
7	Others	0.52	0.10	10.02	1.11	2.34	4.11	7.20	50.26	0.47	3.55	10.88	1.87	3.59	1.52			25.9	3.2	2.0	16.3	144.88
8	Construction	0.05	0.00	2.29	0.04	0.21	0.19	0.06	0.21	1.11	0.54	6.28	0.95	39.79	2.77			0.4	0.0	254.6	81.6	391.01
9	Energy	1.22	2.15	36.07	0.33	3.07	1.97	0.92	1.15	1.51	1.88	7.85	0.77	1.05	0.70			7.6	0.0	0.0	103.4	171.68
10	Trade	2.93	0.45	1.92	0.50	0.93	4.61	0.41	5.10	0.41	6.16	8.39	1.29	0.98	0.69			121.6	0.0	3.2	47.7	207.28
11	Hotels	0.04	0.86	1.99	0.35	1.23	1.02	0.75	1.70	2.10	4.23	0.77	4.86	7.88	5.60			40.4	66.0	0.0	32.7	172.44
12	Transports	0.69	1.18	25.54	0.72	2.35	3.42	0.98	7.68	0.52	3.62	14.67	9.98	1.66	1.27			14.4	4.6	1.2	29.5	123.93
13	Services	2.65	4.02	102.68	0.81	3.52	3.55	1.00	15.23	2.13	5.21	15.81	3.72	4.63	6.83			21.3	38.1	0.0	83.8	314.96
14	Public services	0.01	0.00	0.17	0.00	0.02	0.02	0.00	0.14	0.00	0.12	0.00	0.05	0.02	1.14			7.6	138.5	0.0	43.5	191.310
	Labor	8.50	7.74	83.26	8.58	4.66	9.76	5.67	79.35	17.30	13.71	22.06	5.15	23.64	151.82							441.20
	Capital	27.60	31.61	191.85	1.82	6.91	10.48	13.15	190.28	107.38	62.81	36.24	31.48	128.32	9.49							849.42
	Institutions															221.7	368.03		99.99		40.0	729.72
	Government	0.63	1.22	24.22	0.14	22.80	20.69	1.07	6.85	7.11	8.20	0.25	4.22	5.55	0.50		2.18	103.18			156.44	365.25
	Savings																	164.11	11.29			175.40
	RoW	55.78	39.78	87.29	79.03	89.54	62.84	106.40	1.92	20.78	90.52	0.53	46.54	93.40	3.58	219.5	479.2			-108.7		1367.92
	Tot	151.73	94.52	1,143	103.49	182.24	252.25	144.88	391.01	171.68	207.28	172.44	123.93	314.96	191.31	441.2	849.42	729.72	365.25	175.40	1,368	

Table A2 - SAM 2002 in million of euro at current price 2002

		1	2	3	4	5	6	7	8	9	10	12	13	13	14	Labor	Capital	Hhs	Gov	Sav	RoW	Tot
1	Agriculture	8.81		0.08	0.01	0.06	47.47	0.88	0.05	0.03	0.04	6.38	0.05	0.90	0.84			26.2	0.1	0.1	52.6	144.68
2	Mining	0.01	2.10	5.92	0.01	0.15	0.12	1.95	2.59	24.80	0.03	0.01	0.01	0.02	0.01			0.0	0.0		21.2	58.90
3	Metals	0.10	0.09	82.37	19.66	0.17	1.68	10.19	28.64	2.22	2.82	0.31	1.02	3.28	3.15			2.4	0.0	31.6	308.2	497.94
4	Machinery	0.06	0.43	3.16	10.44	0.10	0.92	1.84	2.98	1.58	1.96	0.52	3.18	2.54	4.71			13.7	0.0	119.4	74.3	241.83
5	Chemicals	2.28	0.58	8.77	0.85	5.39	1.57	20.54	2.83	1.53	1.68	1.62	0.82	3.43	36.21			30.7	0.0		14.6	133.43
6	Food/textiles	7.47	0.00	0.40	0.06	0.54	61.59	1.75	0.29	0.02	0.53	78.73	0.88	4.55	5.21			281.4	1.0		206.8	651.24
7	Others	1.15	2.85	35.34	9.35	1.74	11.37	131.51	77.60	4.85	31.70	6.97	62.43	32.53	40.65			295.7	0.0	199.9	320.8	1266.48
8	Construction	0.02	0.05	2.24	0.20	0.05	0.27	1.25	38.03	4.42	1.53	1.16	5.68	24.40	10.78			4.3	0.0	264.9	10.5	369.73
9	Energy	1.38	1.26	20.05	1.24	0.85	4.36	8.97	1.89	109.14	8.79	7.48	5.41	12.35	13.39			72.1	0.3		77.5	346.47
10	Trade	2.73	1.06	21.26	3.23	0.90	19.72	14.45	5.91	1.55	13.45	12.59	14.59	8.76	12.74			397.4	0.0	55.8	52.7	638.89
11	Hotels	0.01	0.05	1.97	0.56	0.19	0.33	1.93	2.45	0.71	2.92	1.16	10.26	13.21	5.87			379.5	0.5		2.7	424.31
12	Transports	1.39	1.10	23.79	5.30	1.45	11.82	16.73	11.62	2.70	21.84	7.43	89.57	45.38	31.72			209.9	6.2	17.9	233.8	739.68
13	Services	2.03	2.03	27.77	8.19	1.45	11.15	26.33	24.16	7.04	94.60	16.01	59.65	249.31	95.84			436.6	167.8	161.9	133.0	1524.79
14	Public services	0.30	0.07	2.22	0.55	0.26	2.53	1.66	1.52	0.94	6.02	3.84	3.52	39.83	134.80			165.8	718.7	4.8	58.7	1146.08
	Labor	9.14	6.32	65.45	15.08	3.21	25.35	45.79	80.24	36.06	79.21	140.64	159.78	224.92	422.61							1313.80
	Capital	28.96	5.60	11.55	3.77	2.33	43.67	50.35	55.76	120.74	176.30	115.07	130.73	680.68	278.79							1704.30
	Institutions															1,188.8	1,591.98		781.60		90.9	3653.26
	Government	0.09	0.01	1.69	2.57	4.78	65.21	113.15	21.51	15.59	60.44	21.62	18.58	49.89	25.74		112.32	982.18			186.85	1682.22
	Savings																	355.37	6.00			361.37
	RoW	78.75	35.30	183.91	160.76	109.81	342.11	817.21	11.66	12.55	135.03	2.77	173.52	128.81	23.02	125.0				-495.0		1845.24
	Tot	145	59	498	242	133	651	1266	370	346	639	424	740	1525	1146	1314	1704	3653	1682	361	1845	

Table A3 – Actual SAM 2002 in million of euro at current price aggregated for comparison with model outcomes

		1	2	3	4	5	6	7	8	9	10	12	13	13	14	Value added	Hhs	Gov	Sav	Tot
1	Agriculture	8.81		0.08	0.01	0.06	47.47	0.88	0.05	0.03	0.04	6.38	0.05	0.90	0.84		26.2	0.12	0.11	**92.04**
2	Mining	0.01	2.10	5.92	0.01	0.15	0.12	1.95	2.59	24.80	0.03	0.01	0.01	0.02	0.01					**37.73**
3	Metals	0.10	0.09	82.37	19.66	0.17	1.68	10.19	28.64	2.22	2.82	0.31	1.02	3.28	3.15		2.4		31.60	**189.73**
4	Machinery	0.06	0.43	3.16	10.44	0.10	0.92	1.84	2.98	1.58	1.96	0.52	3.18	2.54	4.71		13.7		119.41	**167.57**
5	Chemicals	2.28	0.58	8.77	0.85	5.39	1.57	20.54	2.83	1.53	1.68	1.62	0.82	3.43	36.21		30.7			**118.80**
6	Food/textiles	7.47	0.00	0.40	0.06	0.54	61.59	1.75	0.29	0.02	0.53	78.73	0.88	4.55	5.21		281.35	1.03		**444.40**
7	Others	1.15	2.85	35.34	9.35	1.74	11.37	131.51	77.60	4.85	31.70	6.97	62.43	32.53	40.65		295.7		199.93	**945.66**
8	Construction	0.02	0.05	2.24	0.20	0.05	0.27	1.25	38.03	4.42	1.53	1.16	5.68	24.40	10.78		4.3		264.89	**359.27**
9	Energy	1.38	1.26	20.05	1.24	0.85	4.36	8.97	1.89	109.14	8.79	7.48	5.41	12.35	13.39		72.1	0.31		**268.94**
10	Trade	2.73	1.06	21.26	3.23	0.90	19.72	14.45	5.91	1.55	13.45	12.59	14.59	8.76	12.74		397.4		55.82	**586.19**
11	Hotels	0.01	0.05	1.97	0.56	0.19	0.33	1.93	2.45	0.71	2.92	1.16	10.26	13.21	5.87		379.5	0.45		**421.57**
12	Transports	1.39	1.10	23.79	5.30	1.45	11.82	16.73	11.62	2.70	21.84	7.43	89.57	45.38	31.72		209.9	6.23	17.91	**505.89**
13	Services	2.03	2.03	27.77	8.19	1.45	11.15	26.33	24.16	7.04	94.60	16.01	59.65	249.31	95.84		436.59	167.76	161.85	**1391.76**
14	Public services	0.30	0.07	2.22	0.55	0.26	2.53	1.66	1.52	0.94	6.02	3.84	3.52	39.83	134.80		165.8	718.72	4.83	**1087.40**
	Value added	38.10	11.92	77.00	18.85	5.54	69.02	96.14	136.00	156.80	255.51	255.71	290.51	905.60	701.40					**3018.10**
	Institutions															2780.77		781.6		**3562.37**
	Government	0.090	0.010	1.690	2.570	4.780	65.21	113.150	21.510	15.590	60.440	21.620	18.580	49.89	25.740	112.32	982.177			**1495.37**
	Savings																355.4	6		**361.37**
	BoP	26.1	14.1	-124.3	86.5	95.2	135.27	496.4	1.2	-65.0	82.3	0.03	-60.3	-4.22	-35.7	125.01	-90.9	-186.85	-494.98	**0.00**
	Tot	**92.04**	**37.73**	**189.7**	**167.6**	**118.8**	**444.40**	**945.66**	**359.27**	**268.94**	**586.19**	**421.57**	**505.89**	**1391.8**	**1087.4**	**3018.10**	**3562.37**	**1495.4**	**361.37**	

Table A4 – Model generated SAM for the year 2002

		1	2	3	4	5	6	7	8	9	10	12	13	13	14	Value added	Hhs	Gov	Sav	Tot
1	Agriculture	9.85	0.00	0.07	0.00	0.11	75.17	0.78	0.05	0.02	0.04	6.61	0.05	0.80	0.60		25.98	0.21	1.47	**121.80**
2	Mining	0.00	2.00	5.61	0.00	0.31	0.21	1.96	2.75	19.62	0.03	0.01	0.01	0.02	0.01				2.35	**34.89**
3	Metals	0.13	0.09	83.24	24.15	0.38	3.20	10.93	32.37	1.87	0.00	0.00	1.15	3.51	2.72		2.41		25.20	**191.36**
4	Machinery	0.07	0.37	2.67	7.82	0.18	1.47	1.65	2.82	1.12	1.81	0.54	2.99	2.27	3.40		13.62		94.61	**137.41**
5	Chemicals	3.12	0.60	9.00	1.06	26.64	3.04	22.38	3.25	1.31	1.88	2.05	0.94	3.73	31.73		30.43		0.00	**141.15**
6	Food/textiles	8.37	0.00	0.00	0.06	0.99	109.16	1.56	0.27	0.00	0.49	81.68	0.82	4.05	3.74		278.88	1.55	1.28	**492.91**
7	Others	1.29	2.41	29.79	9.58	3.21	18.08	117.71	73.17	3.41	29.20	7.25	58.54	29.04	29.26		293.09	5.86	158.20	**869.11**
8	Construction	0.03	0.00	2.33	0.25	0.11	0.53	1.38	44.18	3.83	1.74	1.49	6.56	26.84	9.56		4.26	0.00	218.62	**321.72**
9	Energy	2.27	1.56	24.79	1.86	2.30	10.17	11.78	2.61	112.64	11.88	11.41	7.44	16.17	14.14		71.44	0.32		**302.79**
10	Trade	3.05	0.89	17.82	3.29	1.65	31.19	12.86	5.54	1.08	12.32	13.02	13.61	7.78	9.12		393.94		43.71	**570.88**
11	Hotels	0.02	0.07	2.67	0.92	0.56	0.86	2.77	3.71	0.80	4.32	1.94	15.44	18.93	6.78		376.16	0.43	0.00	**436.38**
12	Transports	1.43	0.85	18.41	4.99	2.45	17.25	13.74	10.05	1.74	18.46	7.09	77.08	37.18	20.95		208.06	10.26	14.19	**464.20**
13	Services	2.31	1.74	23.74	8.51	2.71	17.98	23.90	23.10	5.02	88.37	16.89	56.73	225.74	69.96		432.75	251.20	128.17	**1378.84**
14	Public services	0.61	0.11	3.37	1.01	0.86	7.24	2.67	2.58	1.19	9.98	7.19	5.94	64.01	174.67		164.33	610.74	5.31	**1061.84**
	Value added	44.06	11.07	72.99	16.92	6.67	77.60	86.60	142.87	147.99	243.38	281.61	272.59	891.60	694.01					**2989.96**
	Institutions															2749.42		822.26		**3571.68**
	Government	0.14	0.01	1.72	2.11	5.66	72.34	104.31	19.25	17.75	58.95	22.28	16.90	48.68	25.28	114.56	960.66			**1470.60**
	Savings																352.82	-86.86		**265.95**
	BoP	45.05	13.11	-106.87	54.86	86.34	47.42	452.11	-46.86	-16.62	88.04	-24.68	-72.59	-1.52	-34.10	125.99	-37.14	-145.37	-427.17	**0.00**
	Tot	**121.8**	**34.89**	**191.36**	**137.1**	**141.1**	**492.91**	**869.11**	**321.72**	**302.79**	**570.88**	**436.38**	**464.20**	**1378.8**	**1061.8**	**2989.96**	**3571.68**	**1470.6**	**265.95**	