Bureau du Plan

A Disequilibrium Macroeconomic
Model of the Belgian Economy :
The Maribel II Model of the
Planning Bureau

H. Bogaert, T. de Biolley, J. Verlinden

A Disequilibrium Macroeconomic Model of the Belgian Economy: the Maribel II Model of the Planning Bureau

H. Bogaert

T. de Biolley

J. Verlinden

July 1989

p

Table of contents

List of tables

Page

List of figures

I. Introduction

As in most European Countries unemployment in Belgium has been rising rapidly during the seventies, and remained very high during the eighties.

Theoretical developments have shown that this situation can be better explained and handled in the framework of the so-called "disequilibrium models" than with the macroeconometric models traditionally used.

The experience with disequilibrium models, however, is relatively new and largely based on small theoretical models, mostly developed in university circles.

In 1987 the Belgian Planning Bureau took the decision to undertake the construction of a complete macroeconometric disequilibrium model to be substituted to the former Maribel I[1].

The main objective of the model is the same as that of the former one, i.e. provide a rapid bench mark for analysing the medium term (roughly from one to eight years) consequences of macropolicy decisions.

As the Planning Bureau also makes use of the larger scale macrosectoral model Hermès[2], the sectoralisation in Maribel II has been limited to the distinction between the enterprises taken globally and a State sector sufficiently detailed to allow for 'real life' economic policy simulations.

This paper presents the new model in the following order. Chapter II gives a detailed overview of the mechanisms of determination of supply, demand and effective transactions on the goods and services and on the labour markets. Chapter III to VI present the other blocks of the model: wages and prices, final demand, money and interest rate, income and accounting identities. In order not to oversize the paper, the monetary submodel, which is taken over from the last version of Maribel I, and is documented elsewhere[3], will not be analysed in detail here. Chapter VII focuses on the long term properties of the model as they result from the combination of the theoretical specifications and the empirical estimations of the equations. Chapter VIII analyses the simulation properties, while a final chapter will summarize the main teachings provided so far by experimenting with this model.

---

[1] **Planning Bureau**: *MARIBEL:. Model for Analysis and Rapid Investigation of the Belgian Economy*, Brussels, 1984, 326 p.

[2] **Bossier, F., Strumelle, P., Standaert, S.**: *Un outil d'analyse macrosectorielle - le Modèle HERMES.*, Planning Bureau, Document DG-4082, December 1987.

[3] **Bogaert, H.**: *Taux d'intérêt et dette publique dans le modèle MARIBEL*, Planning Bureau, Document DG-3973, Brussels, 3d May 1987.

II. Supply and demand on the goods and services and on the labour markets.

Disequilibrium econometric models are based on the fundamental assumption that if, for some reason, relative prices and wages are rigid, then quantitative constraints are taken into account in the rational agents' optimization plans. This leads to the existence of so-called short-term fixed price non walrasian equilibria [1].

The main characteristic of these non-walrasian equilibria is that they are situations in which observed transactions do not coincide with the interaction of notional supply and demand, i.e. do not clear the markets. As the agents who perceive a quantitative constraint on one market choose to react by restricting their supply or demand on another market rather than modifying the price at which they are prepared to operate transactions, effective supply and demand may differ from notional supply and demand which are therefore unobserved.

These assumptions are convenient because they permit to explain short-term disequilibrium situations, such as the patent imbalances on the labour market of most European countries, without having to accept that they result from voluntary choices of the economic agents, as postulated by the classical theory. However the cost of incorporating disequilibrium theory in macroeconometric models is high because it implies the modelisation of the unobserved notional supply and demand functions and the estimation of a complex relation between the effective transactions aggregate and the supply and demand quantitative restrictions.

These problems have been addressed to with success in the now well known work of Sneessens and Drèze[2]. The modelisation of the productive sector of Maribel II is largely inspired by their pioneering model.

The next two sections will describe the main characteristics of the goods and services market and of the labour market in the productive sector of the model. The productive sector, also referred to in the rest of the text as the endogeneous sector of the economy, embodies all the enterprises. Its aggregate value added is equivalent to G.D.P. with the exclusion of the values added of the state sector, the residential sector and the domestic servants sector. Sections 3 and 4 will be devoted to the estimation results of this block of the model.

1. Aggregate supply and demand and effective production and imports

The modelisation of the aggregate supply is based on the following assumptions:

- in the long-run production factors are substitutable along a Cobb-Douglas type technology;

- in the short-run technical coefficients are relatively rigid.

---

[1] For a theoretical exposition of the foundations of disequilibrium models see:
Cuddington, J.T., Johansson, P.O., Loefgren, K.G.: *Disequilibrium Macroeconomics in Open Economies*, Basil Blackwell, Cambridge, 1984.
Picard, P.: *Théorie du Déséquilibre et Politique Economique*, Economica, Paris, 1985.

[2] **Sneessens, H., Drèze, J.**: Discussion of Belgian Unemployment Combining Traditional Concepts and Disequilibrium Econometrics, *Economica*, vol. 53, supplement, p.89-120.

The consequence of these assumptions is that at any period the technical coefficients and the available quantities of factors are given and, therefore, effective production is limited, either by a deficient demand, by a lack of profitable equipment, or by an insufficient or inadequate supply of labour.

a. Effective production

In the absence of short-term substitution three conditions must be fulfilled for a production to become effective: there must be a demand, and an availability of production factors, capital and labour, sufficient to produce the required output in a profitable way given the existing rigid prices and costs. Any of these conditions is limiting so that if all the firms were simultaneously submitted to the same constraint, the effective production would be the minimum of three potential productions:

(1) $YT = min (YD, YP, YS)$

with

YT: the effective domestic production (value added at factor cost);

YD: the "structural demand" for the domestic production of goods and services; i.e. the demand addressed to the domestic productive sector by national and foreign agents at the prevailing relative prices but without regard for the productive capacities;

YP: the potential production of the economy achieved by operating the existing capital stock at the current level of the technical capital productivity;

YS: the potential full employment capacity, i.e. the production achieved when the available supply of labour is employed at the prevailing level of the technical labour productivity.

If we call A and B the technical productivities of respectively labour and capital, we have :

(2) $YP = B.K_{-1}$

(3) $YS = A. LS$

with

K : the capital stock measured at end of period;

LS: the supply of labour.

It is very unlikely that all firms will be submitted simultaneously to the same type of constraint, therefore Lambert [1] proposed to aggregate the heterogeneous individual situation with a CES function type aggregator:

(4) $YT = [YD^{-\rho} + YP^{-\rho} + YS^{-\rho}]^{-1/\rho}$

where $\rho > 0$ is a parameter implying the simultaneous existence at the aggregate level of an insufficient demand on some micro-markets and of unused production capacities (both in terms of available capital and labour) on others. A small ρ corresponds to a situation where there is a wide dispersion of the equilibrium prices on the micro-markets with respect to the general price level. Small open economies represent a typical case, because it can be observed

---

[1] **Lambert, J.P.** : *Disequilibrium Macroeconomic Models. Theory and Estimation of Rationing Models Using Business Survey Data.*, Cambridge University Press, 1988.

that on different micro-markets the achievement of short-term equilibrium situations between supply and demand follows a different logic. In particular after the first oil shock a discrepancy occurred between prices in sheltered sectors and prices in sectors exposed to international competition which tended to rise less than internal costs. This is likely to have provoked a deterioration of supply in the open sector and to have increased the differences between the equilibrium situations at the level of the micro markets. The parameter ρ should be influenced by these sectoral differences in the economy consecutive to the oil shocks the policy responses.

b. Imports

The aggregate supply of goods and services is the sum of domestic and imported supply and corresponds to the aggregate distributed output or to the addition of the various final demand categories.

The demand addressed to the domestic supply can be expressed as a share of the total final demand varying with the relative price of domestic and competitors productions. Moreover the demand addressed to domestic supply follows the long term patterns of the international division of labour:

$$(5) \qquad \ln YD = \ln FD + \eta \ln (P / P_m) + \gamma T$$

with FD the total aggregate demand, P the domestic value added price, P_m the import price and T a time trend to reflect the expansion of the international division of labour.

In a small open economy like Belgium, where an effective liberalization of goods and services in international transactions has been achieved for long, it is reasonable to assume that final demand cannot be constrained by limitations of domestic supply. We consequently adopt the simplifying assumption that imports can always fill the gap. Therefore total aggregate final demand will always be equal to the effective domestic production plus total effective imports, and also be equal to the total demand addressed to the domestic producers augmented with the import demand required by the domestic production within the prevailing context of price competition conditions and international division of labour.

$$FD \equiv YT + MT$$

$$= YD + MD$$

and therefore,

$$(6) \qquad YD - YT = MT - MD$$

where MT are total imports and MD *structural* imports. Equation (6) expresses the fact that excess demand will be satisfied by additional *non structural* imports. It is worth noting here that the assumption of absence of demand rationing implies that total import is obtained as the difference between total final demand FD and effective value added YT.

2. Demand of production factors

a. Labour productivity and employment

The counterpart on the labour market of equation (4), which defines the effective production, can be obtained by dividing each term of (4) by A, the technical labour productivity:

(7) $\quad YT.A^{-1} = [(YD/A)^{-\rho} + (YP/A)^{-\rho} + (YS/A)^{-\rho}]^{-1/\rho}$

giving

(8) $\quad LT^* = [LD^{-\rho} + LP^{-\rho} + LS^{-\rho}]^{-1/\rho}$

where

LD is the employment required to satisfy demand YD, or the keynesian employment;

LP is the employment firms would require when they operate at full capacity YP, or the classical employment;

LS is the supply of labour;

LT* is the theoretical short-term effective employment.

In real life LT, the effective employment, will practically never coincide with LT*=YT/A. Adjustment delays, hiring and firing costs will induce labour hoarding and therefore one can assume that LT ≥YT/A. The consequence is that measured labour productivity is always smaller than technical productivity.

Effective employment LT is therefore equivalent to effective production divided by short-term measured labour productivity A':

(9) $\quad LT = YT/A'$

The determination of A', the short-term employment function of the model, results from the cost minimisation programme of the firms and the technological Cobb-Douglas constraint:

(10) $\quad Min \, (A^{-1}.ZL^{-1}.W + B^{-1}.ZK^{-1}.V)$

$$subject \; to \; 1 = \eta .(A^{-1})^{\alpha}.(B^{-1})^{(1-\alpha)}$$

with

A and B the technical productivities,

V, the user's capital cost,

ZK = YT/YP, the degree of capacity utilisation of the equipment,

ZL = LT*/LT, the ratio of theoretical employment (YT/A) to effective employment; ZL is a measure of labour hording.

The solution of programme (10) leads to the first order conditions:

(11) $\quad B^{-1}.A = [(1-\alpha)/\alpha].(W.ZL^{-1})/(V.ZK^{-1})$

substituting this in the production function we get:

(12) $\quad A = \eta.[(1-\alpha)/\alpha]^{1-\alpha}.[(W.ZL^{-1})/(V.ZK^{-1})]^{1-\alpha}$

(13) $\quad B^{-1} = (1/\eta).[(1-\alpha)/\alpha]^{\alpha}.[(W.ZL^{-1})/(V.ZK^{-1})]^{\alpha}$

Although we reason in a monopolistic competition framework it can be argued that in the long run pure profits disappear due to the entry of additional firms. Therefore long run equilibrium prices are given by the sum of the factor costs

(14) $\quad P = A^{-1}.ZL^{-1}.W + B^{-1}.ZK^{-1}.V$

Combining (12), (13) and (14) one can verify that the technical coefficients are given by

$$A^{-1} = \alpha \ (W/P)^{-1}.ZL$$
$$B^{-1} = (1-\alpha) \ (V/P)^{-1}.ZK$$

The optimal long-run coefficients can be written as

(15) $\quad A^{*-1} = \alpha \ (W/P)^{-1}.\overline{ZL}$

(16) $\quad B^{*-1} = (1-\alpha)(V/P)^{-1}.\overline{ZK}$

where $\overline{ZL}$ and $\overline{ZK}$ are the long term full or normal labour and capacity degrees of utilisation.

Supposing that the short-term rigidity in the technical coefficients, a crucial feature of the Sneessens-Drèze type of disequilibrium models, can be adequately represented by a partial adjustment process, then

(17) $\quad A = A^{*\lambda}.A_{-1}^{1-\lambda}$

Multiplying both sides of (17) by ZL, multiplying and dividing the right hand side by $ZL_{-1}^{1-\lambda}$, and keeping in mind that A' = A.ZL, we obtain the expression for the apparent or measured short-term labour productivity:

$$A' = A.ZL = A^{*\lambda}.\ A_{-1}^{1-\lambda} \quad .ZL.ZL_{-1}^{1-\lambda} \quad .ZL_{-1}^{-(1-\lambda)}$$

(18) $\quad A' = YT/LT = A^{*\lambda}.\ (YT/LT)_{-1}^{1-\lambda} \quad .ZL.ZL_{-1}^{\lambda-1}$

Labour hoarding is mainly a consequence of the adjustment costs of employment when production varies and, in general, effective employment is larger than required employment. The progressive adaptation of employment to its required level can be modelised by a partial adjustment process multiplied by a proportionality factor (greater than unity) depending on the degree of utilisation of the equipment:

$$LT = LT^{*\nu}.\ LT_{-1}^{1-\nu}.\psi \ (ZK)$$

(19) $\quad ZL = LT^{*}/LT = LT^{(1-\nu)/\nu} \ LT_{-1}^{-(1-\nu)/\ \nu} \psi^{-1/\nu}$

Short-term labour productivity, the model's employment function, is obtained by substituing (19) into (18):
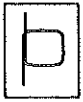
$$(20) \quad A' = YT/LT = A^{*\lambda}.(YT/LT)^{1-\lambda}_{-1} \quad (LT/LT_{-1})^{(1-v)/v} \ (LT_{-1}/LT_{-2})^{(\lambda-1)(1-v)/v}$$
$$.\psi^{-1/v}.\psi^{(\lambda-1)/v}_{-1}$$

b. Capital productivity and investment

In the long period the technical coefficients and the investment plans of the firms are adapted so as to minimize the average production costs according to the programme already defined in (10). The solution of this programme leads to the optimal long-run technical coefficients (15) and (16).

Before analysing investment some explanation is needed about the short-term technical capital coefficient which was left aside in the previous section in order not to obscure the discussion on labour productivity and employment.

Capital productivity

Exactly as for labour, we suppose that the adjustment towards the long-term equilibrium value of the capital coefficient follows a partial adjustment process:

$$(21) \quad B = B^{*\lambda} B^{1-\lambda}_{-1}$$

with B the short-term capital productivity and B* its long-term equilibrium value.

Multiplying both sides of (21) by ZK, multiplying and dividing the right hand side by $ZK^{1-\lambda}_{-1}$, we obtain the expression for the apparent short-term capital productivity:

$$B.ZK = B^{*\lambda}. B^{1-\lambda}_{-1} \quad .ZK .ZK^{1-\lambda}_{-1} \quad .ZK^{-(1-\lambda)}_{-1}$$

$$(22) \quad YT/K_{-1} = B^{*\lambda}. (YT/K_{-1})^{1-\lambda}_{-1} \quad .ZK .ZK^{\lambda-1}_{-1}$$

The λ's are the same in equations (22) and (18) because the repercussions of changes in the factor costs on the choice of technologies are assumed to affect simultaneously and at the same speed the technical coefficients.

To take into account structural modifications due to the oil shocks, the assumption is done that part of the capital stock is affected by an economic obsolescence independently from the physico-technical depreciation.

Thus if $YP = B^{*}. \bar{K}_{-1}$ where $\bar{K}_{-1}$ is the end of period statistically observed capital stock, we may introduce an economic obsolescence function ϕ, depending on energy prices, and

$$(23) \quad \bar{K} = \phi . K$$

so that the technical coefficient becomes B*.ϕ.

Investment

The modelisation of entrepreneurial behaviour in terms of capital accumulation has been based on the following assumptions:

- Firms realise productivity investments in order to adapt the technical coefficients to variations in the relative factor prices.

- Firms increase their production capacity when they anticipate an expansion of demand they will not be able to meet with their available capacities.

- Firms unable to satisfy the present demand because of capacity constraints will invest in order to lower or eradicate the constraint.

The optimal capital stock, $\tilde{K}$ can be specified as:

$$(24) \quad \ln \tilde{K} = \ln YT^e - \ln \tilde{B}$$

with YT^e the anticipated potential markets and $\tilde{B}$ the optimal technical coefficients given the factor and product prices, $\tilde{B} = B^*.\phi$.

If future demand is anticipated as

$$\ln YT_t^e = \lambda \sum_{i=0}^{\infty} (1-\lambda)^i \ln YT_{t-i}$$

and, after a Koyck transformation,

$$\ln \tilde{K} + \ln \tilde{B} = \lambda \ln YT + (1-\lambda) (\ln \tilde{K}_{-1} + \ln \tilde{B}_{-1})$$

or

$$(25) \quad \ln \tilde{K} = \lambda \ln (YT/\tilde{B}_{-1}) - d\ln \tilde{B} + (1-\lambda) \ln \tilde{K}_{-1}$$

According to (25) the optimal capital stock depends on the level of the production capacity, the change in the optimal capital coefficient and the past level of the optimal capital stock . (25) can be rewritten as

$$(26) \quad d\ln \tilde{K} = \lambda [\ln (YT/\tilde{K}_{-1}) - \ln \tilde{B}_{-1}] - d\ln \tilde{B}$$

Effective capital stock can be modelised as an error correction model applied on $\tilde{K}$:

$$(27) \quad d\ln K = \mu \, d\ln \tilde{K} + \nu \, (\ln \tilde{K} - \ln K_{-1})_{-1} + \zeta + \gamma$$

with ζ a set of financial constraints influencing the adjustment, and γ a constant.

The first term of equation (27) can be replaced by equation (26), while past errors made with respect to the evolution of the optimal and/or the fixed investments are repercuted into deviation of the degree of capacity utilisation with regard to its "normal value". On basis of this consideration the second term of (27) can be replaced by $\kappa \ln ZK$. The investment equation becomes then

$$(28) \quad d\ln K = \mu\lambda [\ln (YT/\tilde{K}_{-1}) - \ln \tilde{B}_{-1}] - \mu \, d\ln \tilde{B} + \nu \, \kappa \ln ZK_{-1} + \zeta + \gamma$$

and, replacing $\tilde{B}$ by its value $B^*\phi$, we get

$$(29) \quad d\ln K = \mu\lambda [\ln (YT/\tilde{K}_{-1}) - \ln (B^*.\phi)_{-1}] - \mu \, d\ln (B^*.\phi) + \nu \, \kappa \ln ZK_{-1} + \zeta + \gamma$$

which states that the effective change in the capital stock result from the adaptation of the capital productivity, the change of the capital cost, the degree of capacity utilisation, and financial factors.

3. Technical coefficients and effective production

a. Estimation

Estimates of the labour and capital productivities are based on equations (20) and (22) and appear in table II.1.

The adjustment parameter μ allowing to model the labour hoarding has been itself modelised. This parameter gives the speed of adjustment of effective employment to theoretical employment (defined as the effective production divided by the technical productivity). This speed of adjustment is a function of the ratio between demand and supply of labour. A simple specification is

$$v = \delta \ (LT/LS)^{-\theta}$$

and then:

$$(1 - v)/v = [\delta^{-1} (LT/LS)^{-\theta}] - 1$$

The estimates relate to annual data for the business sector, running from 1959 to 1986. Technical coefficients are estimated simultaneously with a FIML. The capacity utilisation rate used is provided by business survey data regularly updated by the National Bank of Belgium. Employment series have been corrected to take into account the rising share of part-time jobs. Supply of labour is computed as the sum of employment in the business sector and unemployment, less the number of people unemployed for two years and more. The dynamic adjustment coefficients of both productivities are not significantly different from each other, implying a mean lag with respect to changes in real factor prices of 2.7 years for a full repercussion of the price change into the labour productivity and 3.6 years into the capital productivity.

The parameter v has been estimated with restriction that δ equals 1 to allow convergence of the estimation process. Historically the extreme values of LT/LS are 0.86 and 0.97. The value of v corresponding to these magnitudes is 0.44 and 0.85 leading to a mean lag of 2.3 and 1.2 years. This result shows that the greater the proportion of firms constrained by labour supply, the smaller the labour hoarding.

Energy prices have an important impact on the evolution of capital productivity. In the short-run a 10 % increase of the relative price of energy results in a 2.3 % fall of capital productivity. The coefficients of the degree of utilisation of capital is positive in both equations and consistent with similar estimations by Sneessens and Drèze [1].

---

[1] **Sneessens, H. and Drèze, J.** (1986), *Op. cit.*

Table II. 1. *Estimates of the technical coefficients.*

a. Equations

Labour productivity

$$\ln (YT/LT) = \alpha + \lambda_1 \ln(W/P) + (1-\lambda_1) \ln(YT/LT)_{-1} + \frac{(1-v)}{v} \, d\ln LT$$

$$- (1 - \lambda_1)\frac{(1-v)}{v} \, d\ln LT_{-1} + \eta_1 \ln ZKF$$

with $\frac{(1-v)}{v} = (LS/LT)^{\theta} - 1$

Capital productivity

$$\ln (YT/K_{-1}) = \beta + \lambda_2 \ln (V/P) + d\ln \phi + \eta_2 \, d\ln ZKF + (1-\lambda_2) \ln (YT/K_{-1})_{-1}$$

$$+ \lambda_2 [\ln \phi_{-1} + \eta_2 \ln ZKF_{-1}]$$

with $\ln \phi = \phi_1 \ln (P_e/P_w)$

$\ln ZKF = \kappa \ln ZK$

b. Definitions of the series

Series codes in the
Maribel database

YT	Business sector value added at factor costs constant prices	QAFF
P	Price of value added at factor costs	PAFF
W	Labour cost rate	WCR4
V	Capital user's cost	PKF3
LT	Employment in the business sector (full time equivalents)	EOFP
ZKF	Capacity utilisation rate (business survey data)	ZKF
K	Net capital stock in the business sector	KNF
Pe	World energy price index	PMWE
Pw	World price index	PWX
LS	Supply of labour (excluding long duration unemployment)	ESF

c. Parameter estimates

Labour productivity	Coefficient	Standard error	t-stat
α	0.14	0.03	11.42
λ_1	0.37	0.05	6.69
θ	5.45	1.27	4.30
η_1	0.14	0.03	4.80

$\bar{R}^2 = 0.99$ DW = 2.32   S.E. = 0.007

Capital productivity	Coefficient	Standard error	t-stat
β	0.49	0.21	2.29
λ_2	0.27	0.12	2.30
ϕ_1	-0.02	0.01	-2.42
η_2	0.48	0.08	5.77

$\bar{R}^2 = 0.94$ DW = 2.16   S.E. = 0.01

Estimation period: 1959-1986

Estimation method: FIML

b.   Computation of technical productivities

To get estimates of the technical coefficients, the terms explaining contemporaneous cyclical movements and labour hoarding have to be dropped as well as the error terms of the equations.

This is done by computing the technical productivity of capital from equation (22) under the assumption that the degree of capacity utilisation is set at its historical maximum $\overline{ZK}$

$$(30) \qquad B = B^{*\lambda} \; (YT/K_{-1})_{-1}^{1-\lambda} \; . \; ZK_{-1}^{\lambda-1} \; . \; \overline{ZK}$$

with ZK a function of the capacity utilisation series from the National Bank.

The technical productivity of labour is obtained from equation (2) in the same way as the technical productivity of capital and by eliminating the variability of the productivity related to the labour hoarding, i.e. assuming $v = 1$ in the contemporaneous variation of employment.

$$(31) \qquad A = A^{*\lambda} \; (YT/LT)_{-1}^{1-\lambda} \; . (LT_{-1}/LT_{-2})^{(\lambda-1)\,[(1-v)/v]} \; . \; \overline{ZK}$$

The average levels of A and B should not receive a special attention since in both equations the full capacity level of the cyclical factor is arbitrary.

Figures II.1 and II.2 display the evolutions of the technical and the effective (apparent) productivities, the former being computed with equations (30) and (31).

Figure II.1: *Labour productivity*
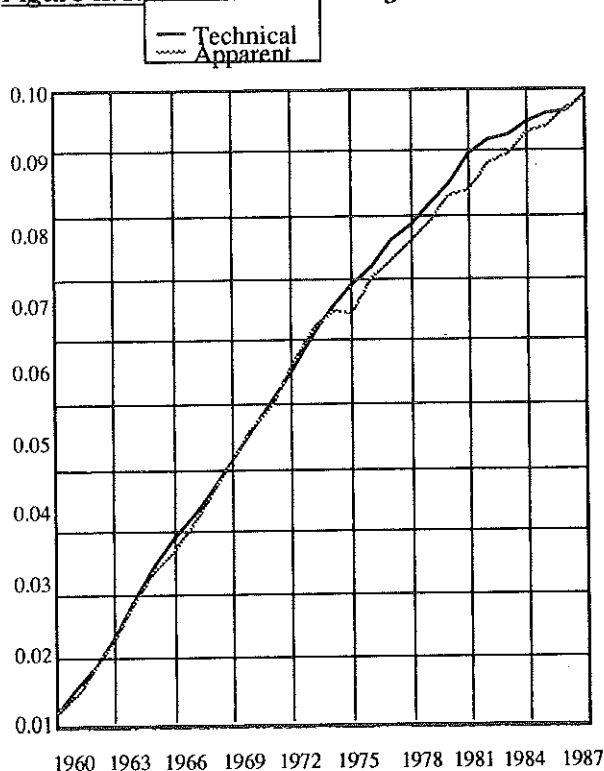
Figure II.2: *Capital productivity*
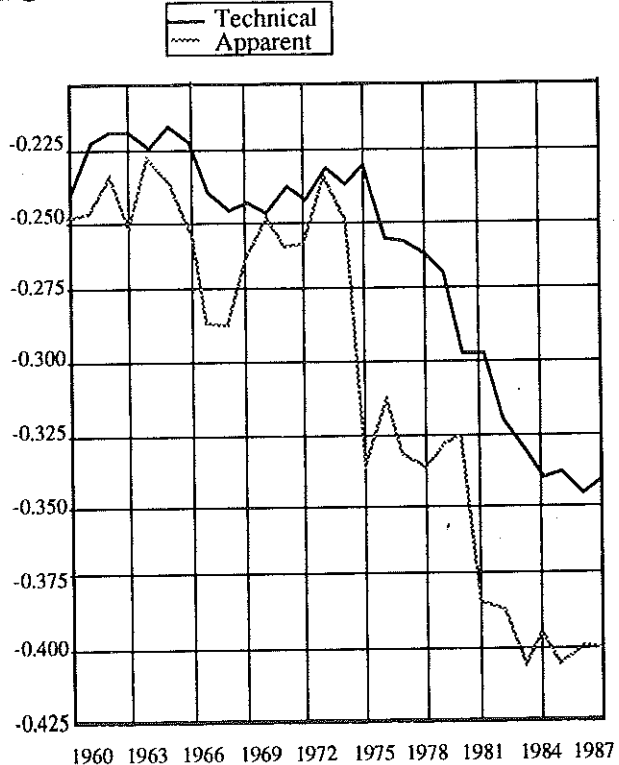
c. Effective production and notional demand

Having computed the technical coefficients, it is straightforward to compute the production capacities given the available capital stock or given the available supply of labour as indicated by equations (2) and (3).

Introducing the expression for the notional demand (5) into the CES-type "smoothing by aggregation function" (4)), one can proceed with the estimation of the parameters of both functions. This has been done in a first step by imposing the value of ρ which comes out from an evaluation of the maximum capacity utilisation when the three constraints are supposed to be effective (in 1972 in the case of the Belgian data). This procedure provided starting values of the parameters. Next, the estimation has been carried out by non linear least squares. Several expressions have been tested to modelise the parameter ρ. So far the best one consisted in estimating two values of ρ, one for the pre-1975 period, another one for the subsequent years.

Estimations results are reported in table II.2.

Table II.2: *Estimation of effective and structural demands*

a. Equations

$$YT = [(FD. (P/P_m)^\eta \ e^{\gamma t + \beta})^{-\rho} + YP^{-\rho} + YS^{-\rho}]^{-1/\rho}$$

with

$$\rho = \rho_1 . (t \le 74) + \rho_2 .(t > 74)$$

b. Definitions of the series

Series codes in the
Maribel database

YT, P	See table II.1	
FD	Final demand at constant prices	FD
t	Time index	TEMPS
YP	Capital constrained capacity	QPF
YS	Labour constrained capacity	QSF
P_m	Non energy import prices	PMABS

c. Parameter estimates

	Coefficient	Standard error	t-stat
η	-0.21	0.06	-3.64
γ	-0.01	0.0008	-12.72
β	0.26	0.06	4.55
ρ_1	54.43	15.67	3.47
ρ_2	22.38	6.23	3.59

R^2 = 0.99   DW = 2.2   S.E. = 17.91

Estimation period: 1960-1986
Estimation method: NLSQ

It can be observed that the values of ρ are significantly different before and after 1975 revealing a large increase in mismatching in the last period [1]. This can also be observed in figure II.3 where the three constraints are plotted with the effective production . The four series are very close to each other until 1974. During this period, the cyclical evolution of the effective production is dominated by the movements of structural demand, leading to non structural imports in the boom periods (see fig. II.4 and infra the discussion of imports).

Figure II.3: Production and capacity

Legend:
— Effective output
...... Capital constrained output
,,,,,, Labour supply constrained output
...... Demand constrained output
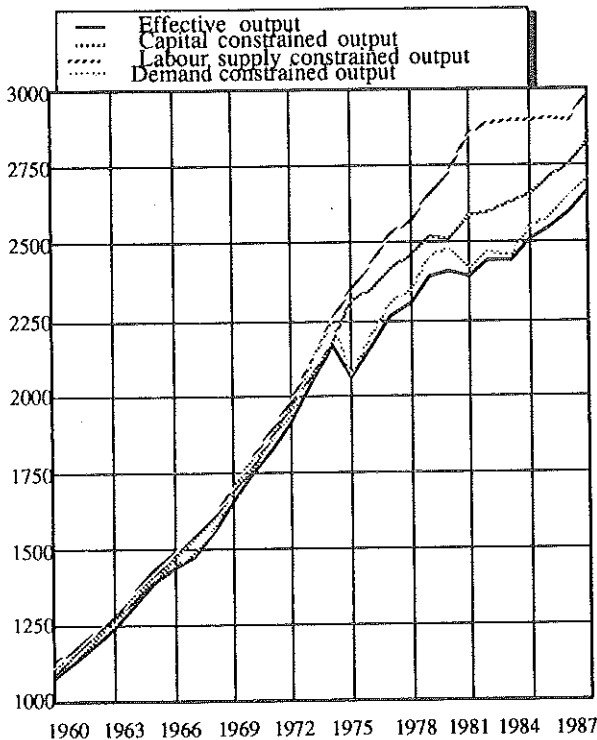
Figure II. 4: Ratio of structural demand to effective output

Legend:
— Structural to effective demand
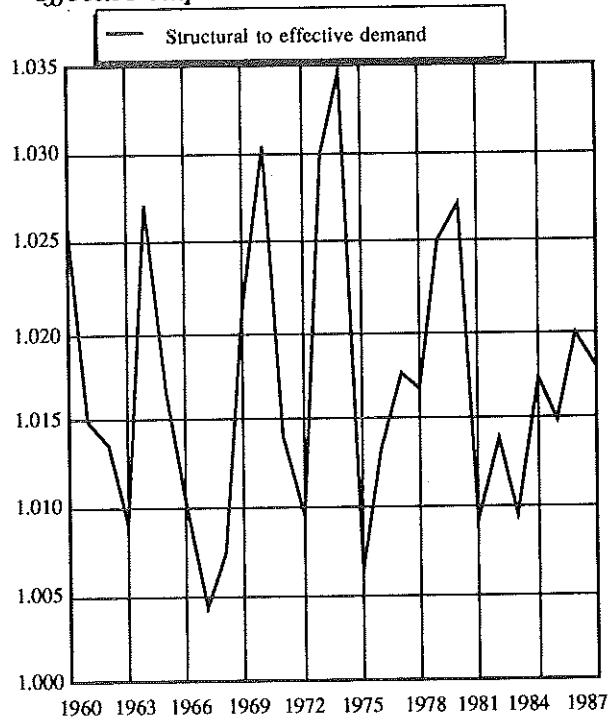
The crisis emerges in 1975 with a deep recession which at first is not associated with a slowing down of the capacity growth. From 1976 onwards production capacity related to capital follows a slower expansion path parallel to the expansion of the effective production. At the opposite, production capacity at full employment of labour continues to grow until 1982 and stabilises at that time. The causes of this stop in the growth of the full employment potential production are multiple: slowing growth of productivity and real wages, increase in the number of the long duration unemployed (people unemployed for two years and more,

---

[1] The degree of mismatching, i.e. the relative unused capacity when global equilibrium is reached between notional demand, supply constrained by capital and labour (YD = YP = YS), is given by the *Structural Unemployment Rate at Equilibrium* (SURE) ;

$$SURE = (LP - LT)/LP = 1 - 3^{-1/\rho}$$

since ρ has two different values, the degree of mismatching is:

	ρ	SURE
Before 1975	54.43	2.00 %
After 1974	22.38	4.79 %

category excluded from the definition of the labour constrained capacity), increase in the number of part-time workers and, finally, stabilisation of the active population due to demographic factors.

It can also be observed that notional demand is increasing during the second half of the 70's. In 1980 capital constrained capacity is almost as large as notional demand. But the 1981 recession followed by several years of austerity maintained the gap between capacity and demand.

Figure II.5 gives the evolution of the proportions of regimes derived from the "smoothing-by-aggregation" technique. The less constraining factor is labour supply. It is also the factor exhibiting the lowest variability. Booms and recessions on the demand side result largely in movements of the proportion of firms constrained by their capital stock.

<u>Figure II.5:</u> *Proportions of regimes of production*
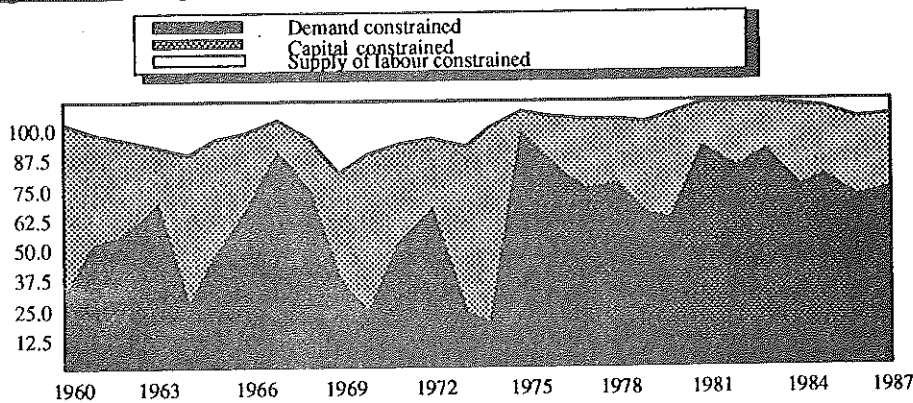
The evolution of total imports is determined by the technical coefficients, the relative prices and the trend of the international division of labour. Equation (5) permits to consider a potential import market expansion as the growth of total output augmented with the trend of international specialisation (roughly 1 % per year, see table II.2). Gains or losses of import market shares are explained by the changes in relative prices, illustrated on figure II.6. On figure II.7 the shady histograms show the yearly gains and losses of the market shares; they clearly move inversely with the relative prices.

<u>Figure II.6:</u> *Relative prices*
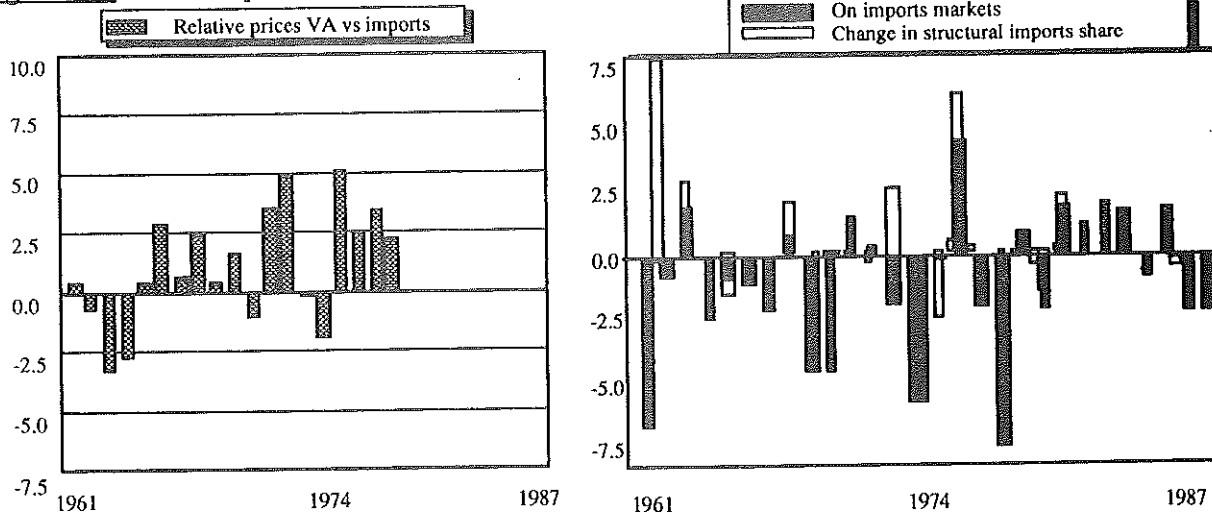
Disequilibrium models provide an additional determinant of total imports. It can be seen, through equation (6), that besides relative prices fluctuations, capacity constraints can be at the origin of additional - called "non structural" - imports, if the total demand addressed to the domestic economy is not rationed when demand exceeds supply. The clear histograms on figure II.7 show the variations of the share of structural imports in total imports.

Relative prices and quantitative constraints may influence imports in the same direction or not according to the circumstances. Four different situations can be observed and are illustrated on figure II.7.

- Years 1962, 1967, 1970, 1971, 1975, 1978, 1980 and 1983 exhibit import market shares gains due to favourable relative price movements. Simultaneously the share of structural imports in total imports has increased, which means a decrease of the imports due to insufficient productive capacities.

- Years 1963, 1964, 1966, 1968, 1969, 1973, 1977, 1979 and 1984 present an inverse situation: losses of import market shares due to adverse relative prices and moreover a decrease of the structural import share, i.e. an increase in the imports due to excess demand.

- Years 1960, 1961, 1976 and 1986 combine import market shares losses due to relative prices and a decreasing pressure on imports due to a relaxation of the domestic supply constraints.

- Years 1974, 1981, 1982 and 1985 combine a favourable evolution of relative prices, and therefore import market share gains, with limiting domestic capacity conditions which stimulate the non structural imports.

The intervention of supply conditions together with relative prices to explain imports is an interesting feature of the disequilibrium approach. One should however point out that due to the difficulty of estimating equation (5) through equation (4) it has been impossible to obtain satisfactory estimation results when trying to take into account the differences of import contents in the various final demand categories.

Figure II.8: *Employment and regimes*

Theoretical employment
Classical employment
Laboursupply
Keynesian employment
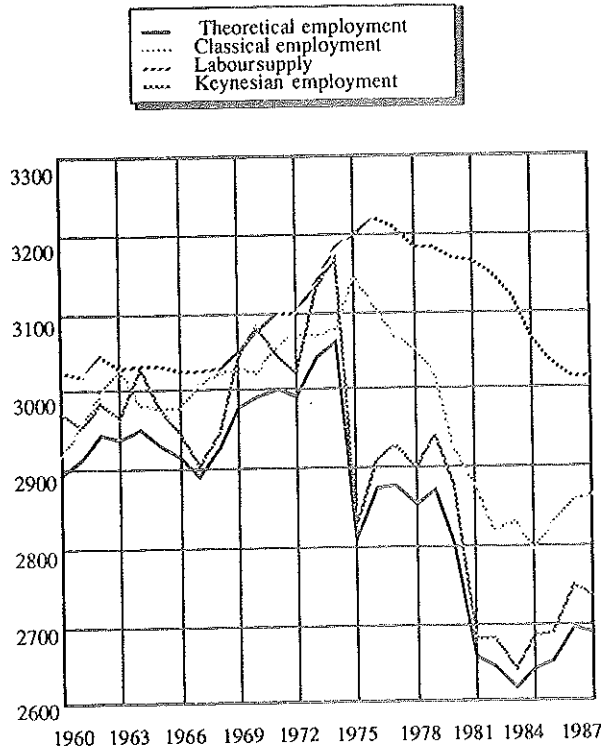
Figure II.9: *Employment and labour hoarding*

Effective employment
Theoretical employment
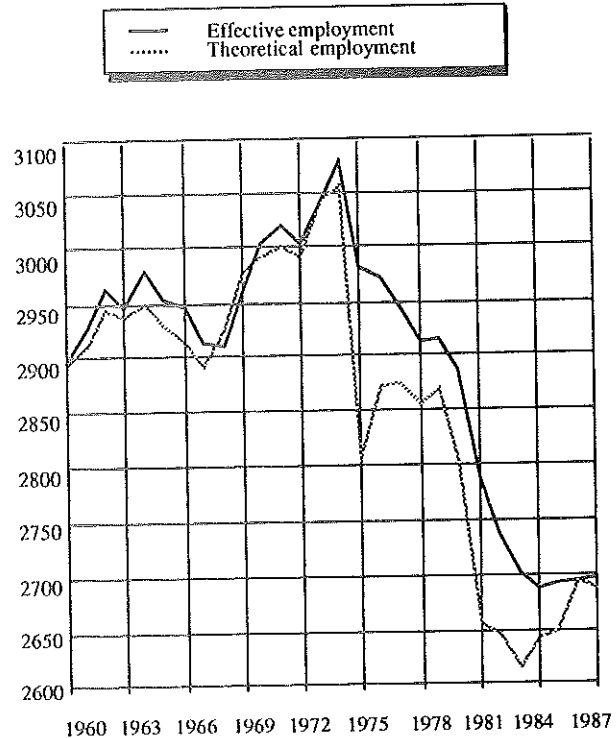
Figure II.8 gives the evolution of effective employment and the three constraints translated in terms of employment. Labour hoarding is displayed in figure II.9 as the difference between two curves: the effective employment and the theoretical employment as it comes out from equation (8). Effective employment in the model is given by the short-term apparent labour productivity equation (see table II.1). To estimate this equation the degree of capacity utilisation has been approximated by the series of the National Bank, which, in the model, is endogenised through the ratio of effective production to capital constrained production, YT/YP. Figure II.10 gives the two indicators of the capacity utilisation rate.

Figure II.10: *Degree of capacity utilisation*

National Bank (homogenised)
MaribelII
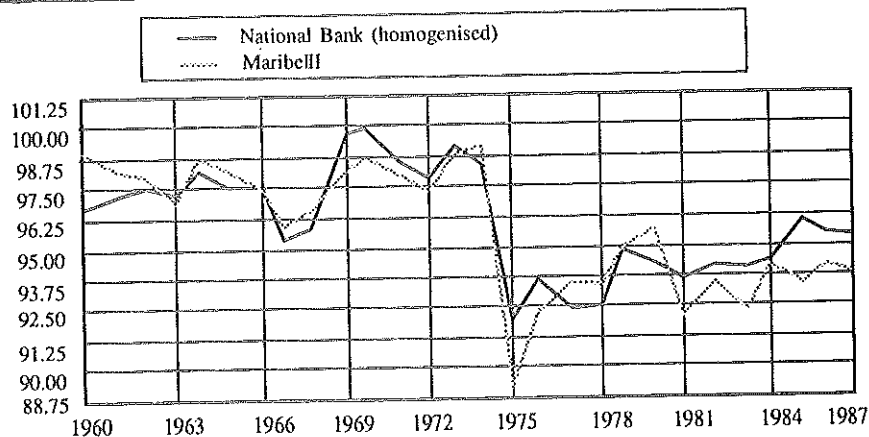
4. Business investment

Equation (29) is the basic specification of the investment behaviour. Best estimation results where obtained with some alteration of the dynamics: it proved worthwhile to introduce the degree of capacity utilisation with one and two periods delay, and the past growth rate of the capital stock. Moreover it was found that the term $[\ln (YT/K_{-1}) - \ln(B^*\phi)_{-1}]$ captures completely the effects of changes in relative prices so that the term $d\ln(B^*\phi)$ had to be dropped in the estimated form of the equation.

Table II.3 gives the estimation results.

Table II.3: *Estimation of the investment equation*

a. Equation

$$d\ln K = \alpha \ [\ln(YT/K_{-1})-\ln(B^*\phi)_{-1}] + \beta \ \ln(YT/YP)_{-1} + \eta \ \ln(YT/YP)_{-2} + \delta \ d\ln K_{-1} + \varepsilon \ \zeta + \gamma$$

b. Definition of the series

See table II.1 and text.

$\zeta, \ B^*, \ \gamma, \ YT, \ K, \ YP$

c. Parameter estimates

	Coefficient	Standard error	t-stat	Long-term elasticities	
α	0.11	0.02	4.05	0.19	$\mapsto$ 0.35
β	0.15	0.04	3.67	0.26	
η	0.05	0.04	1.15	0.09	
δ	0.43	0.13	3.43		
ε	0.09	0.04	2.14	0.16	
γ	-0.16	0.05	-3.36		

All coefficients are significantly different from zero (except η) and have the expected signs. The long term coefficients show that the responsiveness of the capital accumulation rate to the various determinants is generally slow, but both the degree of capital utilisation and the profit rate are important and comparable in their effect to the non-traditional determinants represented by the first terms of the equation. Figures II.11 and II.12 exhibit the evolution of the growth of the capital stock as it is observed and as it would have evolued if either the pure profit rate had been zero, or if the degree of capital utilisation had been equal to 1.

Figure II.11
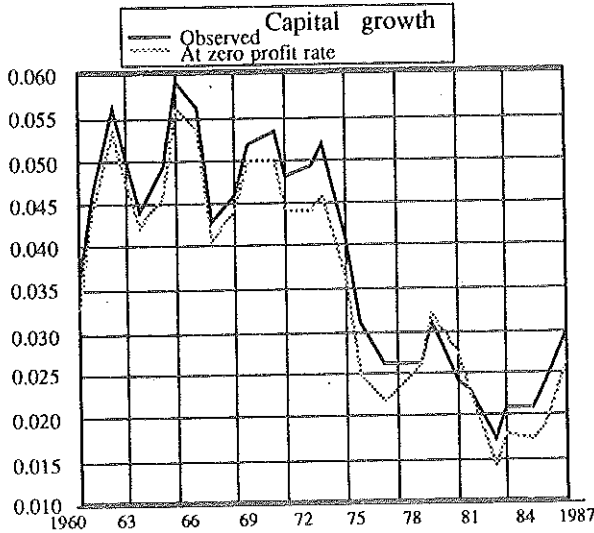
Figure II.12
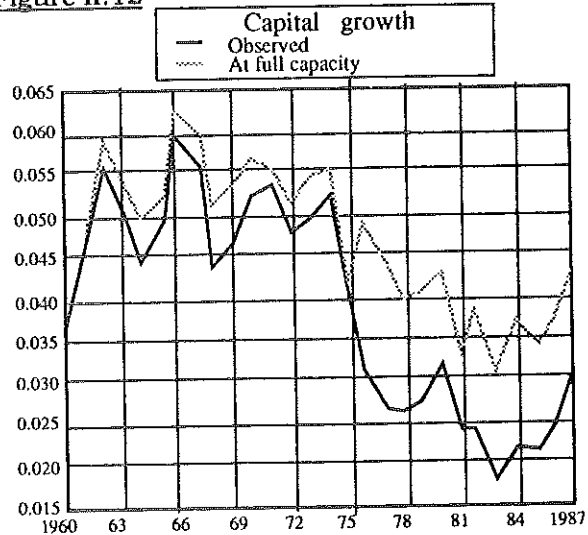
Figure II.13 gives the observed evolution of the pure profit rate. This variable is the difference between the real after tax rate of return on the capital stock and the real rate of interest less the capital withholding tax. It expresses the real after tax difference between the return of an investment in productive activities and an investment in financial assets.

Figure II.13
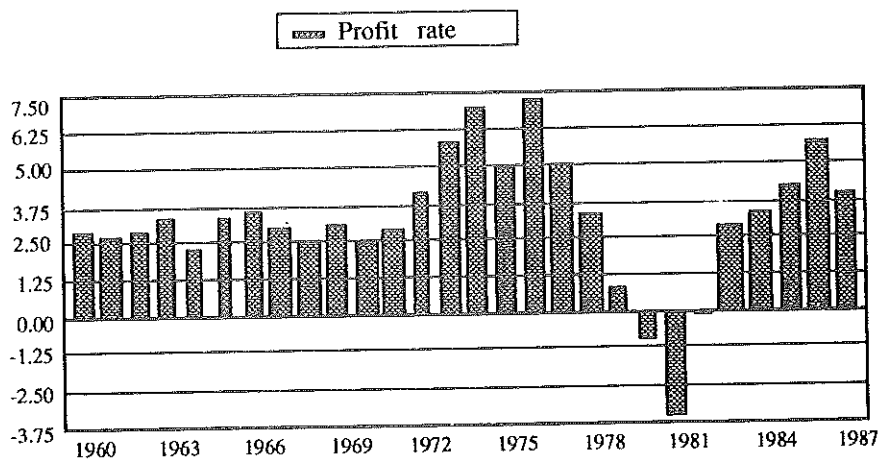
III. Costs and prices

1. Wages

The wage rate determination follows the approach of the trade union models developed by McDonald[1] and Wyplosz[2] ·The main features of this model are:

- the trade unions, acting as a monopoly on the labour market fix the wages knowing the demand for labour by the enterprises;

- firms fix the level of employment.

The trade unions maximize the following utility function:

$$(32) \qquad U = (LT/LS). \, u(W) + \frac{LT - LS}{LS} . u (\Omega)$$

where LT/LS and (LS-LT)/LS represent respectively the employed and unemployed fractions of the labour supply. The utility level of the workers is a weighted average of the utility derived from having a job and the level of the wage attached to it, u(W), and the utility derived from the unemployment allowance, u(Ω), obtained by those who have no job.

Maximizing (32) subject to the demand of labour function of the firms leads to the following first order condition for the wage rate:

$$(33) \qquad \frac{\partial LT}{\partial W} . \frac{W}{LT} . \frac{u(W) - u(\Omega)}{u(W)} + \frac{W}{u(W)} . \frac{\partial u(W)}{\partial W} = 0$$

The solution of this equation gives the wage rate W*, considered as optimal from the trade unions' point of view. If the utility function u(W) is characterised by a constant relative risk aversion we have that $\ln u(W) = \xi + \gamma \ln W$ and, after approximation, reduce to

$$\frac{d\ln LT}{d\ln W} . \, [\, 1 - (\frac{\Omega}{W^*})^{\gamma}] + \gamma = 0$$

i.e.

$$W^* = \Omega \, [\, 1 + \gamma \, / \, (d\ln LT/d\ln W)]^{-1/\gamma}$$

$$(34) \qquad W^* = \Theta \, \Omega$$

Equation (34) shows that the wage target of the trade unions is a function of the unemployment allowance Ω. Θ is greater than 1 and depends on the elasticity of employment with respect to the wages. In a disequilibrium model this elasticity differs according to the type of rationing the firms are facing, and in particular it depends on the proportion of firms which are in a situation of excess demand with respect to the supply of labour,

---

[1] **McDonald, I. and Solow, R.**: Wage bargaining and employment, *American Economic Review*, 1981, vol. 71 n.5,p.896-908.

[2] **Wyplosz, C.**: La France en 1986: bilan et perspectives macro-économiques, *Revue Economique*, volume 38, n.3, mai 1987, p. 677-702.

$$d\ln LT / d\ln W = d\ln (YT/A) / d\ln W$$

$$= \frac{d\ln [\,(YP/A)^{-\rho} + (YS/A)^{-\rho} + (YD/A)^{-\rho}\,]}{d\ln W}$$

$$= \frac{d\ln YP}{d\ln W} \cdot \Pi_p + \frac{d\ln YS}{d\ln W} \cdot \Pi_s + \frac{d\ln YD}{d\ln W} \cdot \Pi_d - \frac{d\ln A}{d\ln W}$$

as

$$\frac{d\ln YP}{d\ln W} = \frac{d\ln B}{d\ln W} + \frac{d\ln K}{d\ln W} = 0$$

$$\frac{d\ln YS}{d\ln W} = \frac{d\ln A}{d\ln W} + \frac{d\ln LS}{d\ln W} = \eta_3 + \eta_1$$

$$\frac{d\ln YD}{d\ln W} = \eta_2$$

we have that

$$\frac{d\ln LT}{d\ln W} = \eta_1 \cdot \Pi_s + \eta_2 \cdot \Pi_d + \eta_3 \cdot (\Pi_s - 1)$$

(35) $$\frac{d\ln LT}{d\ln W} = \eta_2 \cdot \Pi_d - (1 - \Pi_s) \cdot (\eta_1 + \eta_3) + \eta_1$$

$\eta_1 \geq 0$ is the supply elasticity of labour with respect to the wage rate;

$\eta_2 \leq 0$ is the demand elasticity of goods and services with respect to labour (competitiveness effect);

$\eta_3 \geq 0$ is the elasticity of the labour productivity to the wage rate.

Substituting (35) into (34) we obtain the expression of the target wage rate:

$$\ln W^* = \ln \Omega - \frac{1}{\gamma} \ln \{1 + \gamma \cdot [\eta_2 \cdot \Pi_d - (1 - \Pi_s) \cdot (\eta_1 + \eta_3) + \eta_1]^{-1}\}$$

giving by approximation:

(36) $$\ln W^* = \ln \Omega - [\eta_2 \cdot \Pi_d - (1 - \Pi_s) \cdot (\eta_1 + \eta_3) + \eta_1]^{-1}$$

Equation (36) gives the equilibrium level of the wages provided the trade unions have a perception of the elasticities η_i and of the disequilibrium situations on the goods and services and the labour markets. If they perceive only the short-term technical coefficients, η_3 is zero and the wage rate they will claim will be:

(37) $$\ln W^* = \ln \Omega - [\eta_2 \cdot \Pi_d + \eta_1 \cdot \Pi_s]^{-1}$$

and only the constraints on the supply of labour and competitiveness will intervene in the wage rate which maximizes their utility function.
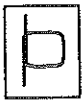
If the supply of labour is inelastic in the short-term, $\eta_1 = 0$, an hypothesis common to many macro-econometric models with exogenous active population, the desired wage rate becomes:

(38) $\ln W^* = \ln \Omega - [\eta_2 . \Pi_d - (1 - \Pi_s) . \eta_3]^{-1}$

and, finally, if the competition is not taken into account i.e. if the only non zero elasticity is that of the labour productivity, we get:

$$\ln W^* = \ln \Omega - [(1 - \Pi_s) . \eta_3]^{-1}$$

(39) $\ln W^* = \ln \Omega - \dfrac{1}{\eta_3} . [\dfrac{LS \cdot LT}{LS}]^{-\rho}$

These developments on the wage equation call for the following remarks:

- Whatever the disequilibrium situation, there exists a stable short-run wage rate level: this wage rate is not a walrasian equilibrium wage rate. According to the type of disequilibrium the wage rate can be higher or lower than would be required to restore a general equilibrium position.

- The natural wage rate results from the wage equation; its level is conditional to a stable disequilibrium situation.

2. Prices

The domestic prices determination is based on the same assumptions than those adopted by Sneessens and Maillard[1] for a similar model: a framework of monopolistic competition with endogenous price settings. Under those assumptions these authors show that, when the production price of each individual firm is obtained by maximising the expected profit under constraint of the demand curve for its output, the aggregate price function becomes:

(40) $P = (1 + \mu) A^{-1} W$

with

(41) $\mu = [1 - \varepsilon . (YD/YT)^{-\rho}]^{-1}$

where ε is the aggregation of the individual demand elasticities and $(YD/YT)^{-\rho}$ is the proportion of firms facing a demand constraint.

Equations (4) and (40) define a solution on the goods and services market but nothing guarantees that the system will reach an equilibrium point characterized by equality between supply and demand:

(42) $YT = YD = \min (YP, YS)$

---

[1] **Sneessens, H. and Maillard, B.**: Investment, Sales Constraints and Profitability in France, 1957-1985., *Recherches Economiques de Louvain*, vol.54 (2), 1988.

Equation (40) is a correct representation of the output price under imperfect competition in a closed economy but it fails to take into account important features of the price formation in an open economy where it is important to make a distinction between output prices and value added prices. Output prices themselves follow different rules of formation whether they concern domestic or international markets.

On the domestic markets equation (40) is adapted to include imported input costs:

$$(43) \qquad d\ln P_j = d\ln\,(\,1 + \mu\,) + \delta d\ln\,(\,A^{-1}\,W) + (\,1\text{-}\delta\,)d\ln P_m$$

where P_j is the price of jth category of domestic final demand and P_m is the import price in national currency. It should be noted that in (43), the long-term equilibrium price equation is expressed in growth rates and not in level. All empirical estimations of the price equations have produced considerable support for this specification rather than a specification in level.

Export prices in a small open economy tend to align on international prices but this alignment in the short period is perturbed by the supply and demand constraints firms are facing. When the ratio of structural demand to effective production rises export prices are pushed upwards and this might divert some national production towards exports if the price rise is parallelled by an increase in the profitability of the export sector (see next section for the determinants of exports). On the contrary if demand is slackening exporters will tend to enhance their competitiveness provided their profitability is sufficient.

Therefore the (non energetic goods and services) export price equation takes the form:

$$(44) \qquad \ln P_x = \eta + \zeta \, \ln P_m + \xi \, d\ln\,(YD/YT)$$

with P_x and P_m the export and import prices. Here again empirical work influenced the theoretical specification by pointing out that, in the case of the Belgian economy, it is the variation, and not the level, in the degree of tension of demand that influences exporters' price behaviour.

The value added price is obtained by its definition's accounting identity.

3. Simultaneous estimation of wages and domestic prices

Wages, domestic consumption and investment prices and the remuneration rate of the self-employed are estimated simultaneously.

a. Domestic prices

The long-term form of the equation is given in (43). The estimation is carried on prices exclusive of indirect taxes. This implies that a change in the tax rate has an immediate and full effect on the deflator. A separation of indirect taxes between those which are immediately and fully transmitted in the prices (e.g. the VAT) and those which have an indirect effect (e.g. excize duties on energy products which are transmitted through the intermediary demand) has proved unsuccessful in the estimation.

The short-term equations have been estimated with an error correction model. For the private consumption price, as well as for business investment prices, the best dynamics proved to be a partial adjustment, i.e. the two dynamic coefficients of the error correction model were set at the same value.

Table III.1 gives the detailed results for the private consumption price equation.

⊡

Table III.1: *Estimation of the private consumption price*

a. Equations

Long term

$$dln\ [P_c/(1+t)]^* = \mu\ dln\ (A^{-1}.W) + (1-\mu)\ dlnPm + \upsilon\ dln\ (YD/YT)$$

Short term

$$ddln\ [P_c/(1+t)] = \lambda_1\ ddln\ [P_c/(1+t)]^*$$
$$+ \lambda_2\ \{dln\ [P_c/(1+t)]^* - dln\ [P_c/(1+t)]\}_{-1}$$

b. Definitions of the series

<table>
<tr><td></td><td></td><td>Series codes in the
Maribel database</td></tr>
<tr><td>P_c</td><td>Consumption price</td><td>PCO</td></tr>
<tr><td>$A^{-1}.W$</td><td>Unit Labour costs</td><td>WCR4/QAFEFP</td></tr>
<tr><td>P_m</td><td>Import price</td><td>PMBS</td></tr>
<tr><td>YD/YT</td><td>Demand pressure</td><td>QDF/QAFFT</td></tr>
<tr><td>t</td><td>Indirect tax rate on consumer goods</td><td>TIPCOR</td></tr>
</table>

c. Parameter estimates

Long term variables	Coefficient	Standard error	t-stat
μ	0.667	0.075	8.9
υ	0.608	0.325	1.9

Dynamic adjustments

	Coefficient	Standard error	t-stat
$\lambda_1 = \lambda_2$	0.451	0.0615	7.3

$\bar{R}^2 = 0.768$ DW = 2.04   S.E.E. = 0.0083

Estimation period : 1961-1986
Estimation method :   Three stages least squares with equation of business
                      investment, government investment, residential investment

Table III.2 compares the coefficients obtained for the different domestic price categories. They follow all the same specification as the private consumption price equation.

Table III.2: *Coefficients of the domestic price equations*

	Private consumption	Investment		
		Business	Government	Residential
Unit labour costs μ	0.67	0.64	0.68	0.87
Imports $1-\mu$	0.33	0.36	0.32	0.13
Demand pressures v	0.61	0.76	2.1	1.4
Dynamic adjustment :				
$\lambda 1$			0.81	0.86
$\lambda 2$	} 0.45	0.83	0.44	0.55

These equations reveal a very similar cost structure for all prices except for the residential investments which have a lower import content. Government investment and residential investment prices are much more sensitive to demand pressure than the other categories. Finally, one note that the response of changes in the long-term determinants is more rapid for investment prices than for private consumption ones.

b.   **Wage cost rate for employees in the private sector**

The general form of the wage equation is (36) which calls for the following remarks:

-   The wage function depends on elasticities η_i. In the present version of the model η_1 and η_2 are supposed to be zero, i.e. the basic form of the wage equation is (39).

-   The desired level of the wage rate is only one element influencing the behaviour of the trade unions. Besides this "structural" element one must take into account such factors as indexation, wage wedge, etc...

-   Ideally the reasoning on the link between the desired wage level and the unemployment allowance should be conducted in net terms. Due to statistical problems it is more operational to use a wage cost concept and to compute Ω as the amount a firm would have to pay to provide a worker with a net income equivalent to the unemployment allowance.

The estimation results are presented in table III.3.

Wages in the private sector are fully indexed, though the full indexation takes two years due the present indexation system. The increase in wages is also explained by the level of what could be called the labour utilisation rate, i.e. the ratio of employed over the labour supply for the endogenous sector all in full time equivalents. An increase in this rate moves wages up. Finally, the level of the real minimum wage, net of employer's social security taxes, proved very significant.

The fact that the wage rate exclusive of employer's social security payments is the dependent variable implies that a change in this rate of contribution will have a full and immediate effect on the wage cost rate. It has been tried without success to incorporate the employer's social security tax rate and the direct income tax rates in the estimation.

In the retained equation, the labour utilisation rate in long-term equilibrium is only dependent on a constant and the real minimum wage :

$$\ln (LT/LS) = -.159 - 0.169 \ln (\Omega / W)$$

The coefficients show that the long-term unemployment rate would be 15 % in the extreme case where the unemployment allowance and the average cost are identical. If the unemployment allowance were half the average wage (roughly the present situation) the long-term unemployment rate would be 4.1 %.

c. **Remuneration for self-employed**

The equation explains the gap between the remuneration rate of the self-employed and the wage cost rate for employees in the private sector. The explanatory variable taken into account is the import price deflator estimated with a negative elasticity. This elasticity can be understood in several ways. One way is that an increase in the import price squeezes the revenue of self-employed who cannot sell at higher prices due to competition with domestic producers. Another way is that wages for the employees in the private sector are indexed so that an increase in the import price will lead to a rise in their wage rate. The remuneration for self-employed, however, is not indexed in an institutional way, so that the gap between their wage rates decrease.

The estimation results equation are presented in Table III.4

þ

Table III.3: *Wage cost rate for employers in the private sector*

a. Equation

$$dln\ [W(1\text{-}ts)] = \alpha + \beta\ dln\ P_c + (1\text{-}\beta)\ dln\ P_c\text{-}1 - \gamma\ ln\ \frac{LT}{LS} + \delta\ ln\ (\Omega/W_{\text{-}1})$$

b. Definitions of the series

Series codes in the
Maribel database

W	Wage cost rate in the private sector	WCR1
ts	Rate of social security employer's contributions	TSFDOR
P_c	Private consumption price	PCO
LT	Effective employment, full time equivalent	EOFP
LS	Labour supply addressed to the private sector	ESF
Ω	Wage cost equivalent of the net unemployment allowance	WRMIN

c. Parameter estimates

		Coefficient	Standard error	t-stat
Short term indexation	β	0.970	0.139	7.0
Phillips term	γ	0.440	0.052	8.5
Unemployment allowance	δ	0.0744	0.013	5.6
Constant	α	0.07	0.0077	5.6

$\bar{R}^2 = 0.90$ DW = 2.01   S.E.E. = 0.011

Estimation period : 1961-1986
Estimation method :   Three stages least squares with equation of business
investment, government investment, residential investment
self employed remuneration and private wage rate.

An error-correction mechanism has been applied on the long-term equation. While the demand pressure variable proved insignificant in the long-term equation, in the short-term equation in difference form it had the expected properties.

Table III.4 : Remuneration for the self-employed

a. Equation

Long-term :

$$(\ln WIR - \ln W)^* = \alpha + \beta \ln P_m$$

Short-term :

$$d(\ln WIR - \ln W) = \delta\, d\ln P_m + \eta\, d\ln \frac{YD}{YT} + \lambda\, [(\ln WIR_{-1} - \ln W_{-1}$$
$$- (\ln WIR_{k-1} - \ln WIR_{-1})]$$

b. Definitions of the series

Series codes in the
Maribel database

WIR	Rate of remuneration of the self employed	WIF0/EIF
W	Wage cost rate	WCR1
P_m	Import price	PMBS
YD	Structural demand	QDF
YT	Effective demand	QAFFT

c. Parameter estimates

Long term variables		Coefficient	Standard error	t-stat
Constant	α	0.062	0.030	2.1
Import prices	β	-0.503	0.043	11.8
Short term variables				
Import price variations	δ	-0.398	0.091	-4.4
Demand pressure	η	0.946	0.492	1.9
Error-correction	λ	0.321	0.0996	3.2

$\bar{R}^2 = 0.482$ DW = 1.77   S.E.E. = 0.032

Estimation period : 1961-1986
Estimation method :   Three stages least squares with equation of business
investment, government investment, residential investment
self employed remuneration and private wage rate.

IV. Final demand

Apart from the gross fixed capital formation of the enterprises sector, three categories of final demand are endogenous in the model: private consumption, residential investments and exports.

1. Private consumption expenditure

Private consumption is specified as a function of the financial wealth of the household, the interest rate and the disposable income. The structure of the disposable income, and in particular, the relative importance of transfers with respect to other incomes, is affecting the magnitude of the propensity to consume. The stationary form of the equation is

$$(45) \qquad C = [\alpha + \beta (TR/YH)] . (YH/P_c) + \gamma (WH/P_c) + \delta \; RL$$

with C, the private consumption, TR the transfers to the household, YH, the disposable income of the household, P_c, the private consumption price, WH, the financial wealth of the household and RL the rate of interest.

Results are presented in table IV.1.

The propensity to consume will increase with an increase in the share of transfer income in total disposable income. The introduction of other structural changes in disposable income (e.g. the increased importance in proprietor's income) did not improve the estimation or was statistically not significant.

2. Residential investments

Gross residential investment is the addition of the net investment and the replacement required by the depreciation of the existing stock of buildings.

To satisfy the demand for housing new investments and the existing stock are close substitutes. New investments will therefore crucially depend on the ratio of the user's cost of the housing capital stock to the cost of hiring an existing building.

The optimal housing capital stock depends on the disposable income of the households and the relative price just mentioned:

$$(46) \qquad KH^{**} = f(YH/P_c , RCH)$$

with KH^{**}, the optimal housing stock and RCH the relative capital cost of holding a house compared to the rent.

Equation (46) is the relation between the optimal stock and the anticipated values of the disposable income and the relative user's cost. The desired stock in period t, i.e. the stock which will trigger the investment decision, is the result of a partial adaptation process:

$$(47) \qquad KH^* = \lambda \, KH^{**} + (1-\lambda) \, KH_{-1}$$

The desired capital KH^* is also defined by the accounting identity:

$$(48) \qquad KH^* = IH^* + (1-\delta) \, KH_{-1}$$

with IH^* the desired gross investment in housing, KH the actual residential capital stock, and δ the depreciation coefficient of that stock

Table IV.1 :*Estimation of private consumption*

a. Equations

Long-term :

$$C^* = a_0 + [a_1 + a_2 \, (TR/YH)] \cdot (YH/PC)$$

Short-term :

$$d\,C = \lambda_1 \, d\,C^* + \lambda_2 \, (C^* - C)_{t-1} + \delta \, (WHt_{-1}/PC) + \mu \cdot RR_{t-1}$$

b. Definitions of the series

Series codes in the
Maribel database

C	Private consumption at constant prices	QC0
TR	Transfers tot the households	THG
YH	Disposable income of the households	YDH0
PC	Private consumption price	PC0
WH	Financial wealth of the households	WH0
RR	Long terme interest rate, corrected for withholding tax	RLBE

c. Parameter estimates

Long term variables		Coefficient	Standard error	t-stat
Real disposable income	a_1	0.454	0.042	10.8
Transfers share	a_2	0.324	0.107	3.0
Constant	a_0	486	40.3	12.1

Short term variables				
Real wealth	δ	0.186	0.030	6.3
Interest rate	μ	-834	332	-2.5
Adjustment to long term	λ_1	0.79	0.184	4.3
Error correction	λ_2	0.937	0.145	6.4

$\bar{R}^2 = 0.84$ DW = 1.90   S.E.E. = 12.3

Estimation period : 1961-1985
Estimation method : NLSQ

The desired gross investment, IH*, is usually not realised within one period and effective investment, IH, can also be regarded as resulting from a partial adjustment process, giving :

$$(49) \qquad IH = \mu \, IH^* + (1-\mu) \, IH_{-1}$$

Integrating (46) to (48) into (49) leads to the estimated form of the function.

$$(50) \qquad IH_t = (1 - \mu) \, IH_{t-1} - \mu \, (1-\delta)KH_{t-1} + \mu \, (KH_t^*)$$

The estimation results are presented in table IV.2.

Table IV.2 : Estimation of residential investment

a. Equations

$$IH = \gamma\, IH_{t-1} + \beta\, KH_{t-1} + \delta\, (YH/P_c)_{t-1} + \eta \cdot RCH + \alpha$$

b. Definitions of the series

Series codes in the Maribel database

IH	gross residential investment in constant prices	QI5
KH	gross residential capital stock in constant prices	KN5
YH/P_c	real disposable households income	YDH0/PC0
RCH	relative price : user cost of the housing capital stock to rent cost	$(PI5/PC0)_{t-1}.RLBE-\dfrac{dln(PC0/PC0)}{5}_{t-5}$

c. Parameter estimates

		Coefficient	Standard error	t-stat
Past investment	γ	0.323	0.124	2.61
Past capital stock	β	-0.0618	0.028	-2.21
Past real disposable income	δ	0.130	0.049	2.64
Relative price	η	-1263	274.3	-4.60
Constant	α	67.6	21.8	3.10

$$\bar{R}^2 = 0.86 \qquad DW = 1.98 \qquad S.E.E. = 17.41$$

Estimation period : 1959-1985
Estimation method : NLSQ

3. Exports

The export model is supply oriented and the market share depends on the profitability of the export sector, i.e. the ratio of export prices to average production costs:

$$(51) \qquad ln\, Q_x - ln\, QW = \alpha + \beta\, [ln\, P_x - ln\, AQC\,]$$

with AQC the average production cost:

$$(52) \qquad AQC = W/A' + C_k/B'$$

where A' and B' are the measured labour and capital productivities, and W and C_k the labour and capital costs.

The estimation has been conducted simultaneously for the quantities - equation (50) - and for the prices - equation (44).

No distinction has been made between goods and services, due to the lack of international indicators on price and volume evolution of services in world trade. Energy, however, has a separate simple treatment that will be commented hereafter.

The international indicators for price and volume concern only goods, energy excluded.

The static form of the equation for quantities gave the best results meaning that Belgian exporters and foreign competitors react quickly on changes in external conditions. The acceleration of the world trade, introduced as a short-term perturbating factor, proved significant, which suggests a dampening effect of the repercussion of international trade fluctuations on Belgian exports.

Export prices align substantially on international prices, with a margin of fluctuation depending on the demand pressure.

Results of estimation appear in table IV.3.

Remarks concerning the energy sector:

Although the model is very aggregated imports and exports of energy products are identified in view of their crucial role in the balance of trade of the Belgian economy and in the output prices.

Total imports of goods and services result directly from the production block through identity (6):

$$MT = FD - YT$$

Imports of energy are technically linked with total output and also influenced by a relative price factor:

(53) $\ln Q_{me} = \alpha \ln FD + \beta \ln P_{re}$

with Q_{me}, the imports of energy, and P_{re} the relative price of energy imports to domestic products.

Energy exports are treated as a fatal product, which they largely are in the case of Belgium. They are thus a fraction of imports fluctuating with the degree of capacity utilization. When large capacities are unused re-export of imported energy tends to increase:

(54) $\ln Q_{xe} = \alpha \ln Q_{me} + \beta \ln ZK + \gamma$

with Q_{xe} and Q_{me} the exports and imports of energy, ZK the degree of capacity (capital) utilisation.

Table IV.3 : *Exports*

a. Equations : price and volume

Volume :

$$\ln QX = \alpha + \beta \ln QW + \gamma \,(\ln P_x - \ln AQC) + \delta \cdot d\ln QW$$

Price :

$$d\ln P_x = \kappa + \eta \cdot \ln PW + \theta \cdot d\ln \frac{YD}{YT} + \xi \ln P_{x_{t-1}}$$

b. Definitions of the series

		Series codes in the Maribel database
QX	Exports of goods and services, energy excluded	QXABS
P_x	Exports price of goods and services, energy excluded	PXABS
QW	Weighted average of imports of main trading partners	QWX
AQC	Average value added cost	AQC
P_m	Import price for non energetic goods in Belgian francs	PMABS
YD/YT	Demand pressure	QDF/QAFFT

c. Parameter estimates

	Coefficient	Standard error	t-stat
Volume :			
β	1.000	0.052	19.0
γ	0.349	0.114	3.1
δ	-0.310	0.167	-1.9
α	7.556	0.0138	548

$\bar{R}^2 = 0.979$ DW = 2.0   S.E.E. = 0.0267

	Coefficient	Standard error	t-stat
Price :			
η	0.931	0.0386	24.1
ξ	-0.967	0.0365	26.5
θ	0.206	0.186	1.1
κ	0.008	0.003	2.8

$\bar{R}^2 = 0.98$ DW = 1.72   S.E.E. = 0.007

Estimation period : 1974-1986

V. Money and interest rates

A complete financial submodel is incorporated in Maribel II. As it has been documented elsewhere [1] it will not be explained here, and only the interest rate equations will be commented.

Interest rates are the main bridge between the real and financial blocks of the model. They affect the profitability of business investments and play an important role in the household's decisions concerning residential investments and the allocation of the disposable income between consumption and saving. They are of course also crucial in the evaluation of the total public expenditure. On the other hand, interest rates are themselves influenced by domestic prices, the balance of payments, the public sector deficit, and the growth of the economy, all variables which serve as a basis for the expectations of the agents regarding the exchange rate.

The long term interest rate is influenced by the national and international interest rates' structure and by the pressure on the state sector deficit:

$$(55) \qquad d\,RL = c_1 + c_2\,RS + c_3\,RL_{-1} + c_4\,RS_{-1} + c_5\,RL_{us} + c_6\,(PSBR/V_a)_{-1}$$

where RL is the long-term rate of interest, RS the short-term rate of interest, RL_{us} the short-term rate of interest in the USA, PSBR the public sector deficit, and V_a the value of the GNP.

The short-term interest rate equation is a reduced form and results from the hypothesis that the National Bank aims to keep a certain level of foreign exchange. Since it is obliged to maintain the exchange rate fluctuations within narrow limits, this target must be achieved through manipulations of the interest rate, the equation of which becomes:

$$(56) \qquad RS = c_1\,(FB/V_{a,-1}) + c_2\,d\,RS_{eud} + c_3\,(d\ln P_{wx} - d\ln P_c) + c_4\,d\ln P_a + c_5\,RS_{eud,-1} +$$
$$(1-c_5)RS_{-1} + c_6 + c_7\,d\ln Q_a$$

with FB, the balance of the current account, RS_{eud}, the Eurodollar interest rate, P_{wx} the world export price expressed in dollar, P_a the price of the GNP and Q_a, the GNP.

Table V.1 presents the estimation results

---

[1] **Bogaert, H.:** *Taux d'intérêt et dette publique dans le modèle MARIBEL,* Planning Bureau, Document DG-3973, Brussels, 3d May 1987.

Table V.1 : Estimation of the short-term interest rate equation

a. Equations

$$RS = c_1 (FB/V_{a,-1}) + c_2\, d.\, RS_{eud} + c_3 (dln\, P_{wx} - dln\, P_c)$$

$$+ c_4\, dln\, P_a + c_5\, RS_{eud,-1} + (1 - c_5)\, RS_{-1} + c_6 + c_7\, dln\, Q_a$$

b. Definitions of the series

		Series codes in the Maribel database
RS	Short-term interest rate	RRS'
FB	Current account and exogenous capital movements	FB
V_a	Cross National Product in current value	VAO
RS_{eud}	Euro dollar rate of interest	RSEUD
P_{wx}	World export price	PWX
P_c	Private consumption deflator	PCO
P_a	Deflator of the G.N.P.	PAO
Q_a	Gross National Product in constant prices	QAO

c. Parameter estimates

	Coefficient	Standard error	t-stat
c_1	-44.4	13.84	-3.21
c_2	0.74	0.11	7.01
c_3	-7.42	3.42	-2.17
c_4	30.55	9.01	3.39
c_5	0.43	0.14	3.01
c_6	-3.48	0.75	-4.69
c_7	51.32	12.31	4.17

$\bar{R}^2 = 0.942$ DW = 1.85   S.E.E. = 0.867

Estimation period : 1962-1985
Estimation method : There stage least squares estimation of the monetary block.

VI. Income and accounting identities

1. Reconstruction of production, income and expenditure sides of the G.N.P

The accounting equilibrium between the three sides of the GNP is represented in the next table.

It should be noted here that the terms 'private', 'endogenous' and 'business' sector refer here (as it did in the previous chapters) to the same aggregation.

Table VI.1 : The three sides of the GNP (current values)

Production		Expenditure		Incomes	
	Maribel variable		Maribel variable		Maribel variable
Gross Value Added		Private consumption	VC	Incomes	W+WIF
Endogenous sector	QAFF.PAFF	Unadjusted	VC0	Of employees	W
State sector	QAG.PAG	Statistical adjustment	SAVC*	Paid by enterprises	WF
Domestic servants	QA9.PA9	Public consumption	VG	Paid by the State	WG
Residential sector	QA5.PA5	Wages and pensions	VYHG	Others	YWHW+W9
Total : unadj.GDP		Other expenditures	VG0AM	Statistical adj.	SAW*
at factor costs	QADP.PAD	Gross capital formation	VIV	Of self-employedWIF	
		Business investments	VIF	Non adjusted	WIF0
Statistical adjustment	SAVA*	Public	VIG	Statistical adj.	SAWIF
Net indirect taxes	TIGF	Residential	VI5	Property income of	
Total : adj. GDP		Stock building	VVF	households	YHK
at market prices	QAD.PAD	Statistical adjustment	SAVIV*	Non distributed profits	BF
				Corporate taxes	TGF
Val.added of the rest		Final domestic		Property income of	
of the world	BVY0	demand	VC+VG+VIV	the State	YAPG0
				Minus : Interest on	
Total : adjusted		Exports of goods and		public debt	-YA0G
GNP	VA	services	VXBS		
		Imports of goods and		Net national income	
		services	-VMBS	at factor costs	
		Net factors income from		(adjusted)	Y
		abroad	BVY0		
		Foreign balance	BV0	Capital consumption	VK0
		of which : Energy	BVE	Indirect taxes	TIGF
				Minus : Subsidies	-TFG
		Gross national product	VA		
				Gross national product at market prices (adjusted)	VA

* Exogenous variable

The equations determining the various flows of table IV.1 are given in Appendix 2. Let us note here that all estimations are normally carried out in excluding the statistical adjustments from the series. They are reintroduced in the identity system as exogenous variables and set at zero in the forecasting period. The closing variable of the system is the enterprises gross profits which permits the equality between the three sides of the GNP. This variable therefore absorbs all statistical adjustments and errors of the system.

2. Labour market identities

The labour market balance is given in table VI.2.

Table VI.2 : *Labour force and employment (In thousands, as of June 30 of each year)*	
	Maribel variable
Employment	(EG0*+E0F+E9*+EFB*)
Domestic	(EG0*+E0F+E9*)
Public sector	EG0*
Private sector	(E0F+E9*)
Wage and salary earners	(EF+E9*)
Self-employed	EIF*
Border workers	EFB*
Unemployment	UL
Labour force	NA*
Memorandum items	
Full time equivalent employment	EOFP
Partial unemployment	ULPM
Long duration unemployment	ULLD
* Exogenous variable	

Employment data in Belgium refer to the situation on June 30th of each year and offer the disadvantage of taking no account of partial (or multiple) employment situations. A preliminary work has been done by Bogaert and de Biolley [1] to obtain full time equivalents employment data. These data are used in the model and reconverted in the usual statistical definition in the simulation outputs.

3. Agents' current and capital operations

The model produces the complete set of accounts of the economic agents, the most detailed being the current account of the households and the current and capital account of the State sector, presented in tables VI.3 and VI.4.

---

[1] **Bogaert, H.J., and de Biolley, T.J.**: *Employment and Quantity of Labour Data for the Aggregate Enterprises' sector.* Planning Bureau, Document DG/HJB-TdB/4037, Brussels, October 13, 1986.

Table VI.3 : *Households Disposable Income and Spending*

	Maribel variable
Compensation of employees	W
Paid bt the enterprises	WCR1xEFP
Paid by the State	WG
Others	(W9+YWHW+SAW*)
Income of self-employed	WIF
Property income	YHK
Primary income	(W+WIF+YHK)
Direct taxes	-TGH
Social security contributions	-TS000
Wage earners	
Employer's contributions	-TSFD0
Employees' contributions	-TSHD0
Self-employed	-TSHI0
Net transfers abroad	THWB
Net income	W+WIF+YHK-(TGH+TS000-THWB)
Transfers from the State	(THC+THL)
Transfers from the social security	THS00
Unemployment allowances	THSS3
Other	THS0A
Disposable income	W+WIF+YHK-(TGH+TS000-THWB)+THC+THL+THS00
Expenditure	
Consumption	VC
Net savings	BH
Gross capital formation	VI5

* Exogenous variable

Table VI.4 : *Revenue and Expenditure of General Government*	
	Maribel variable
Current revenue	YAPG0+TIGF+TGH+TGF+TS000+TCW
Property income	YAPG0
Computed interest	YAPGG
Interests and dividend	YAPGF
Indirect taxes	TIGF
Direct taxes	TGH+TGF
Individuals	TGH
Corporations	TGF
Social security contributions	TS000
Foreign transfers	TCW
Current expenditures	-(VG+YA0G+TFG+THG+TWC)
Public consumption	-VG
Wages and social costs	-VYHG
Wages	-WWG
Pensions	-WPG
Purchases and amortization	-VG0AM
Interest payments	-YA0G
Transfers	-(TFG+THG+TWC)
To households	-THG
To enterprises	-TFG
To the rest of the world	-TWC
Current savings	BG
Capital operations	VKG-(VIG+TKAFC)
Amortization	VKG
Investments	-VIG
Transfers to enterprises	-TKAFC
Capital balance	VKG-(VIG+TKAFC)
General balance	BG+VKG-VIG-TKAFC
Borrowing requirements	
Central government	PSBR
Local government	dA0L
Adjustment	ADJG
Total	-BG-VKG+VIG+TKAFC

VII. Steady state properties [1]

This section attempts to identify analytically the long-term structural determinants of growth, prices and productivity which are embedded in the model structural form. The analysis will be carried out neglecting short-term dynamic. It will start by the investigation of the steady state relations between labour productivity, wages and prices. Output and the proportion of regimes in the long-run will be followed and be completed by an analysis of long-term investment behaviour.

1. Productivity, wages and prices

Neglecting dynamics and labour hoarding, the model can be summarised by the following relationships between growth rates and parameters or shares.

a. Productivity

From (15) we have that the long term growth of the labour productivity is

$$(57) \qquad \dot{a} = \dot{w} + \dot{p_a}$$

with p_a the price of the value added.

The growth of the long-term real wage can be written, given the estimated form of equation (39) in Table III.3, as the wage rate growth minus the output price growth and is determined by three factors : the Phillips term, the gap between the average wage rate and the unemployment allowance, and a constant term.

$$(58) \qquad \dot{w} - \dot{p_c} = \varphi_1 \, (l - l_s) + \varphi_2 \, (\omega - w) + \varphi_3$$

It is important to observe that the growth of the real wage rate is a function of variables in level, especially tension variables. The constant term φ_3 represents the addition of three constant terms : the "normal" or "minimum" unemployment rate, the "normal" gap between employment allowance and effective wage rate and a trend of real productivity.

b. Domestic output prices

The growth of this price index is a weighted sum of unit labour costs and import price increases.

$$(59) \qquad \dot{p_c} = \gamma \, (\dot{w} - \dot{a}) + (1-\gamma) \, \dot{p_m}$$

c. Value added price P_a

Finally, the value added price growth is also a weighted sum of three components: the growth of the output price, the growth of world prices (represented by the import price index) in the absence of terms of trade movements, and the impact of terms of trades changes.

---

[1] Throughout this chapter small letters will indicate logarithms and dotted letters variations of logarithms or growth rates.

(60) $\quad p'_a = d.p' + p'_m\ (x\text{-}m) + x.\ (p'_x - p'_m)$

d, x, m are the shares of the domestic final demand, exports and imports in value added. The export and import prices are assumed to be exogenous.

The reduced form of the above-mentioned set of equations can be derived so as to provide the long term determinants of the growth of prices and productivity :

(61) $\quad p' = p'_m + \dfrac{\gamma x}{1-\gamma d}\ (p'_x - p'_m)$

(62) $\quad p'_a = p'_m + \dfrac{x}{1-\gamma d}\ (p'_x - p'_m)$

assuming that the terms of trade are constant in the long run, the following remarkable identity is verified :

(63) $\quad p' = p'_a = p'_m$

All the prices are growing at the same pace and are determined by the world price. This seems a sensible hypothesis for a very small open economy like Belgium.

Accordingly, the increase in labour productivity is only determined by the real wage rate determinants :

(64) $\quad a' = w' - p' = \phi_1\ (1 \text{-} 1_s) + \phi_2\ (w_{min} \text{-} w) + \phi_3$

If it is assumed that the gap between the unemployment allowance and the average wage rate is constant over time, the labour productivity will behave along the line of figure VII.1.

Figure VII.1: *Relationship between labour productivity and labour market tension.*
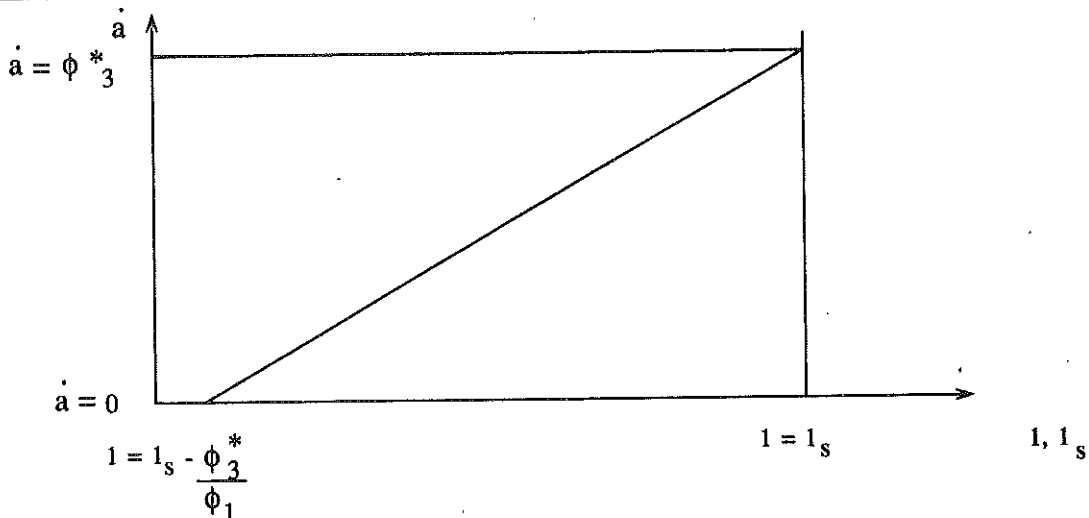
$\phi_3^* = \phi_2\ (w_{min} - w) + \phi_3$

The maximum growth of the productivity a'_{max} is reached when $1 = 1_s$, i.e. at full employment. The growth of the productivity is zero when

$$(65) \qquad 1 - 1_s = -(\phi_2 / \phi_1) \cdot (w_{min} - w) - (\phi_3 / \phi_1)$$

To analyse the behaviour of the labour-productivity it is thus important to describe the long run employment determinants and this cannot be done without explaining the sources of growth in the model.

2. Output and the proportion of regimes in the steady state

The CES-type relationship between output and the three constraints leads to a natural decomposition of the growth rate of output into three proximate components, corresponding respectively to the growth rates of output demand (q_d), of capacity output (q_c) and of full employment output (q_s), each being weighted by the proportion of firms encountering that constraint :

$$(66) \qquad q' = \pi_d \cdot q'_d + \pi_c \cdot q'_c + \pi_s \cdot q'_s$$

By construction the capacity growth is defined as :

$$(67) \qquad \dot{q}_c = \dot{k} + \dot{b} \text{ and } \dot{q}_s = \dot{a} + \dot{l}_s$$

with b the capital productivity and k the capital stock.

Due to the fact that the capital user's cost includes a constant real interest rate (see section II.3.a) it varies mostly with the price of new capital goods. This price it selfs moves in line with final demand prices for in the long run the same growth rate applies as for the value added price, therefore we have that $\dot{b} = \dot{p}_1 - \dot{p}_a = 0$.

Under the assemption of constant active labour supply in the long run, we also have $\dot{l}_s = 0 = \dot{b}$.

As $\dot{k} = \dot{q}$ (a result which will be explained later we have that :

$$(68) \qquad q' = \pi_d q'_d + \pi_c q' + \pi_s (q' - \dot{l})$$

and, recalling that $(1 - \pi_c - \pi_s) = \pi_d$

$$(69) \qquad q' = q'_d - \frac{(\pi_s)}{\pi_d} l'$$

with q'_d largely exogenous in a small open economy.

The last equation can be used to determine employment.

$$(70) \quad \dot{l} = \frac{\pi_d}{\pi_s} \cdot (\dot{q}_d - \dot{q})$$

Employment will grow if demand grows faster than production, the elasticity depending on the ratio of proportions of regimes π_d and π_s.

The higher the demand constrained proportion relative to the supply of labour proportion, the higher this elasticity. The rate of increase of employment can be zero for two reasons, either because $\dot{q}_d = \dot{q}$, or because all enterprises are supply constrained, i.e. : $\pi_d = 0$ (which implies $\pi_c + \pi_s = 1$).

Expressions (64) and (70) form a system of differential equations allowing to determine the value of a and l. Inserting (64) into (70) leads to a first order differential equation in l :

$$(71) \quad \dot{l} \left(1 + \frac{\pi_s}{\pi_d}\right) = \dot{q}_d - \phi_1 (1-l_s) - \phi_2 (w_{min} - w) - \phi_3$$

or

$$(72) \quad \dot{l} = \frac{\pi_d}{\pi_d + \pi_c} \left[\dot{q}_d - \phi_1 (1-l_s) - \phi_2 (w_{min} - w) - \phi_3\right]$$

Where it can be seen that the growth rate of employment tends to be zero when $\pi_d = 0$ (or $\pi_s + \pi_c = 1$)

or when

$$(73) \quad \dot{q}_d = \phi_1 (1-l_s) + \phi_2 (w_{min} - w) + \phi_3$$

This condition is nothing else than the equality of labour productivity with the growth rate of demand and with the determinants of the growth of the real wage rate. As the growth of demand is largely exogenous, equation (73) gives the long run unemployment rate which is a function of the growth rate of demand, the gap between unemployment allowance and average wage rate and a productivity trend represented by the constant term.

Numerically, the estimated coefficients of the wage equation lead to the following expression.

$$(74) \quad 1-l_s = -(0.07/.44) - (0.0744/0.44) (w_{min} - w) + (1/0.44) \dot{q}_d$$

or

$$(75) \quad 1-l_s = -0.159 - 0.169 (w_{min} - w) + 2.27 \dot{q}_d$$

In other words, the long run unemployment rate, and accordingly the proportion of firms constrained by the labour supply, depends crucially on two figures : the ratio of the unemployment allowance to the average wage rate, and the long run growth of demand which

mainly results from the growth of world demand. When the long run unemployment rate is reached, employment will no longer increase and the proportion of firms constrained by the labour supply will be stable.

3. Investments

When looking at the growth of capital, an analogous reasoning determines the proportion of firms constrained by capacity.

The investment function can be written as :

$$(76) \qquad \dot{k} = \lambda_1 (q - k_{-1} - b_{-1}) + \lambda_2 (q - q_c) + \lambda_3 \cdot \mu + \lambda_4$$

which is also a first order differential equation

As $q_c = k_{-1} + b_{-1}$, the above equation can be reexpressed as

$$(77) \qquad \dot{k} = (\lambda_1 + \lambda_2) (q - b_{-1}) + (1 - \lambda_1 - \lambda_2) k_{-1} + \lambda_3 \cdot \mu + \lambda_4$$

and has the following general solution

$$(78) \qquad k = [e^{-(\lambda_1 + \lambda_2)t} - (\lambda_1 + \lambda_2) (q - b) - \lambda_3 \mu - \lambda_4] / (-\lambda_1 - \lambda_2)$$

or

$$(79) \qquad (q - k - b) = \frac{e^{-(\lambda_1 + \lambda_2)t}}{(\lambda 1 + \lambda 2)} - (\lambda_3 / \lambda_1 + \lambda_2) \mu - (\lambda_4 / \lambda_1 + \lambda_2))$$

or in growth rates :

$$(80) \qquad (\dot{q} - \dot{k} - \dot{b}) = e^{-(\lambda_1 + \lambda_2)t} \cdot \frac{(1 - e^{-(\lambda_1 + \lambda_2)})}{(\lambda_1 + \lambda_2)}$$

which tends to zero for sufficiently large values of t[1]. It can be deduced that in the long run

$\dot{k} = \dot{q} - \dot{b}$, and, since $\dot{b} \cong 0, \dot{k} = \dot{q}$.

The gap between effective production and the capital constrained capacity, i.e. $q - k - b = q - q_c$, is directly linked to the proportion of firms constrained by their equipment. So, according to equation (79), in the long run, the proportion of firms constrained by their capital is clearly a negative function of the macro-economic "pure profit" rate μ. When profits decline, due e.g. to a tax increase or an adverse shock on the terms of trade, or when the real interest rate increases once and for all, the long term share of firms constrained by their capital will also increase, and then reduce the growth opportunities. (The capital growth is following the production growth, or put in another way, growth is less or not driven by supply). Since the wage equation determines the proportion of firms constrained by the labour

---

[1] According to the estimation $\lambda_1 + \lambda_2 \approx 0.54$ so that for $t = 20$ the right handside of equation

(80) equals 10^{-5}

supply, and since the investment equation determines the proportion of firms constrained by capital, the proportion of firms constrained by demand is obtained as a residue.

4.   Conclusions :

This analysis, conducted and valid under stable terms of trade, suggests that in the long run, the proportion of firms constrained by labour supply, which is closely linked to the unemployment rate, is a function of factors influencing the demand growth and factors influencing the labour supply (the gap between minimum and average wage rate, long duration unemployment ...).

As a consequence cycles in demand growth will mainly result in compensated cycles in labour and demand constrained regimes, without much impact on the capital constrained regime.

At the opposite, supply shocks on profitability like changes in business taxes will have a lasting effect on the capital constrained regime compensated by the demand constrained regime.

A supply shock on the terms of trade will affect all the regimes since it affect both labour productivity and the rate of profits.

Finally, for given long term proportions of regimes, the growth rate of production and capacity tends to converge at a pace approximately equal to the growth of productivity and the real wage rate.

VIII. Simulation properties

1. Introduction

In order to analyse the sensitivity of the model to changes in economic policy instruments and international environment variables, a series of simulations have been made and are compared to the results of a reference projection.

The simulations and the order of magnitude of the initial impacts are similar to those analysed in the preceding version of Maribel [1].

It is obviously interesting to see to what extent the introduction of the disequilibrium macroeconomic theory in a complete empirical model will modify the economic policy message. The reader should however be particularly attentive to two points which limit the possibilities of comparisons between these exercises:

- In the 1984 publication on Maribel I, the sensitivity analysis was based on a reference simulation with an exogenous real wage rate in the business sector. This corresponded to the reality of that time, but is not the case any more as completely free wage negotiations have been reintroduced since 1988.

- In non linear models the sensitivity of one particular endogenous variable to an exogenous shock may depend largely on the state of the economy as described by the solution of the model in the baseline projection. This was true for Maribel I but reveals much more important for Maribel II, as the direction and the magnitude of the effects of variations of an exogenous variable may change completely according to the proportion of enterprises in the different disequilibrium regimes. In this regard both models differ fundamentally and, moreover, the baseline projections on which the multipliers were computed in both exercises are very different.

The simulations have been carried out on the period 1989-1995 which, in most cases, appeared sufficient to analyse the consequences of the effects of an exogenous impact. (In fact all simulations have been extended until 2010 but it has been found that no significant changes in the multipliers appeared after 1995).

Each simulation (except simulation 10 to 12) has been based on an impulse equivalent to 1 % of the 1989 GNP in the baseline projection, i.e. 58.7 billion francs. This impulse is then maintained throughout the subsequent periods.

Following simulations have been done:

Simulation 1:   Reduction of the state's investments.
Simulation 2:   Reduction of the wage sum in the public sector without modification of the number of persons employed.
Simulation 3:   Reduction of total employment in the public sector without modification of the individual wage rate.
Simulation 4:   Reduction of the social security transfers to the households.
Simulation 5:   Increase of the personal income tax.
Simulation 6:   Increase of the VAT on private consumption products.
Simulation 7:   Increase of the employers' social security contributions.
Simulation 8:   Increase of the excise duties on energetic products.
Simulation 9:   Reduction of the minimum wage cost.

---

[1] Planning Bureau: *MARIBEL. Model for Analysis and Rapid Investigation of the Belgian Economy* , Brussels, 1984, 326 p.

Simulation 10: Increase of the volume of exports induced by an accelerated world trade growth.
Simulation 11: Increase of 1 % of the short-term rates of interest.
Simulation 12: Decrease of 1 % of the active population.

In the next two sections the simulations 1 and 7 will be discussed in detail. This provides a good insight in the main mechanisms and characteristics of the model. In section 4 a global comparative analysis will be presented.

An appendix provides the tables with the main simulation results. For each simulation two sets of results are presented. The first one gives for five categories of important indicators the percentage of variation of the variant with respect to the baseline projection. As the simulated shocks are always of the same order of magnitude, 1 % of the 1989 GNP (with he exception of simulations 10 to 12), the figures of this table may be interpreted as impact multipliers. A second set for each simulation gives the difference between the variant and the baseline projection for some selected significant ratios. The absolute variations are also provided for certain variables for which it is of interest to know the absolute order of magnitude of the variations, such a unemployment or public sector deficit.

2.   Consequences of a reduction in the State investments

A decrease of public investment of 58.7 billion francs of 1989 has been simulated, from 1989. The simulation is carried out with reference to the base line scenario. From 1990 onwards, the growth rate of the baseline projection is applied to the 1989 volume of public investments in the variant. General results are provided in the tables of the appendix to this chapter.

a. Short-run effects (first year)

Volume effects

To facilitate the comprehension of the results, the effects with and without changes in relative prices are separated

```
                    ┌─────────────────────────┐
                    │   Public investment     │
                    └─────────────────────────┘
                                │ +
                                ▼
                    ┌─────────────────────────┐
                    │      Total output       │
                    └─────────────────────────┘
                                │ +
                                ▼
┌──────────────────┐  ┌─────────────────────┐  ┌──────────────────────┐
│    Capacity      │  │ Demand constrained  │  │ Labour constrained   │
│   constrained    │  │     production      │  │     production       │
│   production     │  └─────────────────────┘  └──────────────────────┘
└──────────────────┘            │ +                      +
           +                    ▼
┌──────────────────┐  ┌─────────────────────┐
│ Imports of goods │  │  Effective production│
│   and services   │  │  (Value added of en- │
└──────────────────┘  │   dogenous sector)   │
                      └─────────────────────┘
```
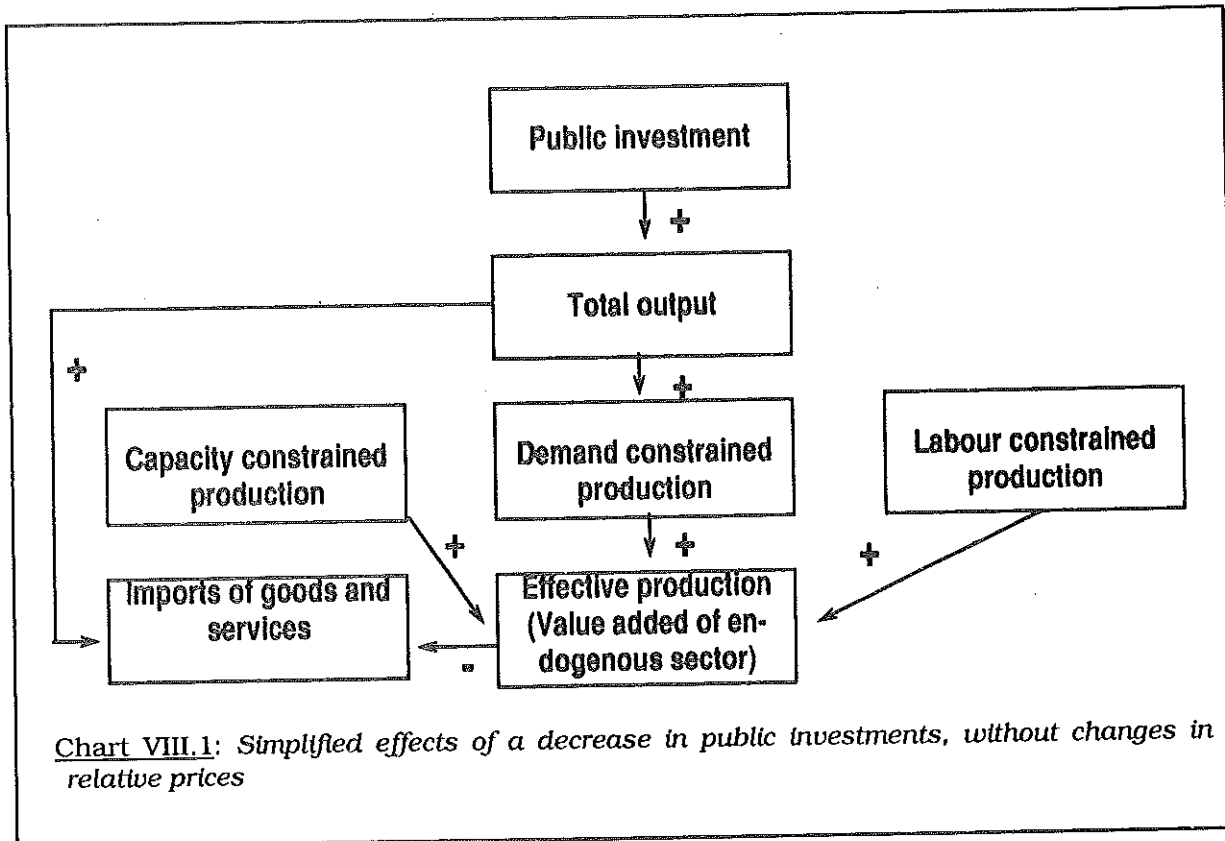
<u>Chart VIII.1</u>: *Simplified effects of a decrease in public investments, without changes in relative prices*

Table VIII.1 describes, for the first simulation period, these quantitative impacts :

Table VIII.1: *First year volume impact of a decrease in public investments*

	Billion constant BEF	%
Variation with respect to the baseline scenario:		
Government investments	- 43	- 58.4 %
Total output	- 46	- 0.8 %
Demand constrained production	- 24	- 0.8 %
Effective value added	- 13	- 0.5 %
Imports	- 31	- 1.0 %
Gross Domestic Product	-15	- 0.4%
Proportion of demand constrained firms: In the baseline scenario In the variant	51.3 % 55.4 %	

The initial decrease of public investments in current prices (58.7 billion) is translated into a decrease of public investments in constant prices (43 billion). This leads to a slightly amplified decrease of total output. Demand constrained production will diminish with the same percentage (- 0.8 %) as total output, since the elasticity is equal to unity.

Capacity and labour constrained production have to be taken into account to assess the impact of a reduction of demand on the effective value added of the endogenous sector. It is indeed a major peculiarity of the disequilibrium models, which take into account and aggregate the various disequilibrium situations prevailing on the micro-markets, that the impact multipliers will depend on the proportion of demand constrained firms. These firms are the only ones in position to respond to an increase of demand. The multipliers take therefore the form:

$$M = 1 \, / \, [\, (1/\Pi_d) - c]$$

where M is the multiplier, Π_d is the proportion of demand constrained firms, c is the marginal propensity to consume.

This formula, written here for the elementary case of a closed economy without taxation, shows that if all enterprises are demand constrained, i.e. $\Pi_d = 1$, the multiplier will correspond to the usual keynesian textbooks' example. With a rising proportion of supply constrained firms the multiplier will decrease.

In the present case the simulated policy consists in reducing the budget deficit and therefore demand has been squeezed. This rose the share of demand constrained firms from 51.3 % in the basis projection to 55.4 % in the variant. This last percentage applied to the 24 billion drop of demand will produce the 13 billion fall of effective production.

The discrepancy between the fall of total output and the reduction of effective value added is covered by a fall of imports of 31 billion.

From this simplified description of the working of the model one can already draw the attention on several points:

- The proportion of enterprises in the various regimes is of paramount importance to assess the impact of a shock in demand.

- Due to the assumption that national agents are never constrained in their demand for goods and services, any variation in demand which is not covered by a corresponding change in effective production leads to a compensatory change in imports. This means that the marginal propensity to import in the model depends strongly on the disequilibrium situation and can vary from 0 to 1.

- Consequences of negative and positive identical budgetary impulses will never be symmetrical. Other things being equal, an increase in public expenditure will increase the share of demand constrained enterprises and therefore produce a positive impact smaller than the negative impact resulting from an identical decrease of public expenditure.

The result for the labour market and the financial balances are straightforward. Employment in the endogenous sector decreases (- 4960 full time equivalents, or - 0.13 %) due to a lower effective production. This diminution does not reflect entirely the fall of the value added as there is some labour hoarding. An increase in the unemployment is nevertheless the outcome.

Exports in value remain rather constant while imports in current value decrease drastically due to the fall of imports in constant prices. This leads to a considerable increase in net export (+ 40 billion). Consequently the interest rates show a small decrease.

The combined effect of a slower growth and more unemployment on the one hand, and a 59 billion decrease in public investments together with a small effect on interest payments due to the interest rate decrease, on the other hand, leave the public sector with a lighter deficit (-44 billion).

Price changes

Chart VIII.2 provides a short description of the channels of transmission of a volume shock into the prices
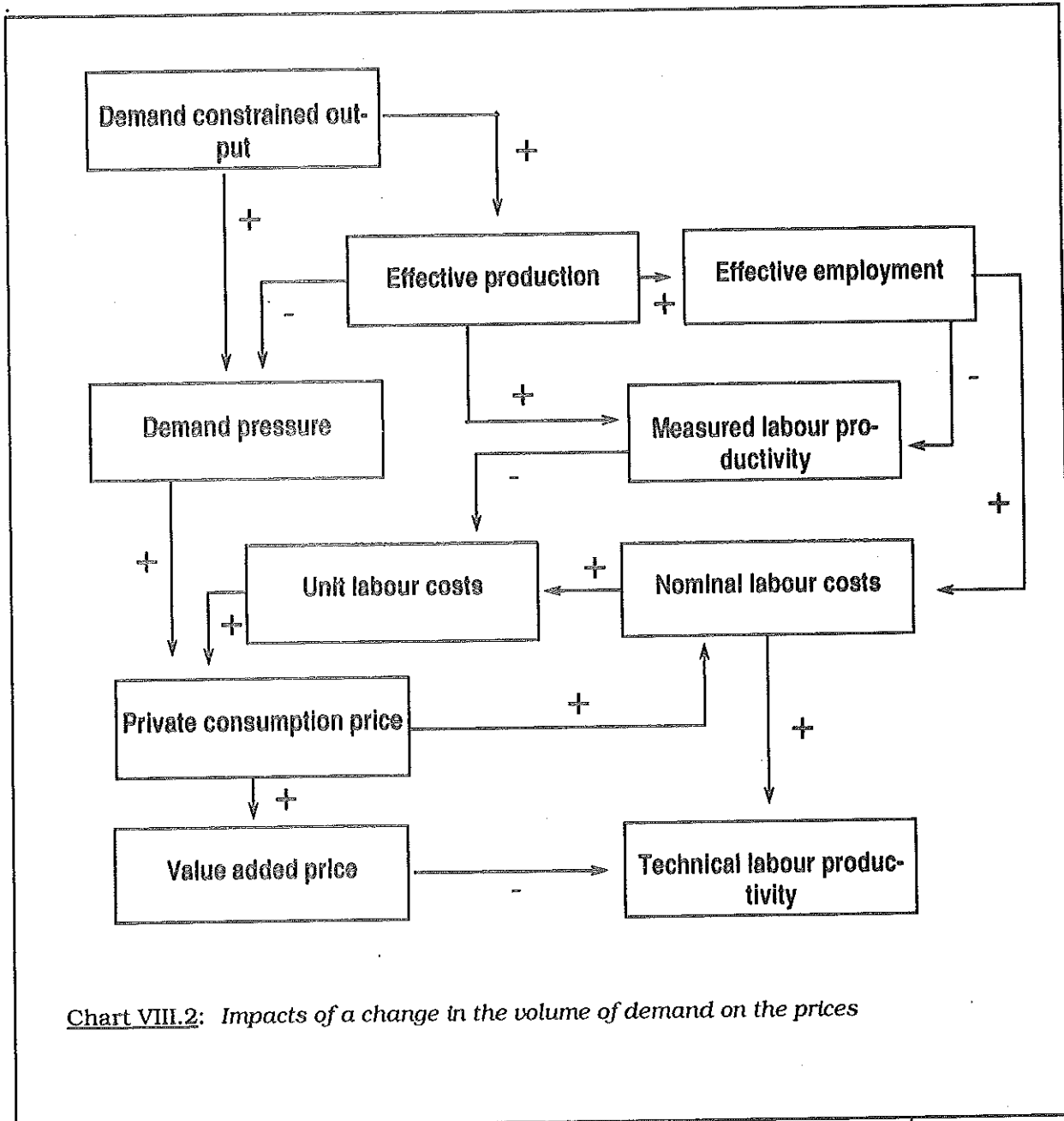
Chart VIII.2: *Impacts of a change in the volume of demand on the prices*

As seen in the preceding paragraph, a fall in demand decreases both the demand constrained output and the effective production. This will affect the price through two different channels:

- A decrease in the indicator of demand tension, as demand constrained output decreases more than effective production. This will result in a decrease of the private consumption price.

● A decrease in effective employment which will imply a decrease in the apparent labour productivity, as labour will not respond fully to the fall of output given the existence of labour hoarding and rigidities in the adaptation process of the level of labour to that of activity. On the other hand, the decrease in employment will affect the nominal wage rate through the Phillips curve. Unit labour costs will vary according to the relative speed of adjustment of the nominal wages and the measured labour productivity.

Table VIII.2 quantifies this process for the first simulation period

Table VIII.2: *First year price changes due to the fall in public investments*

	Changes with respect to the basis projection
Demand pressure **A**	- 0.36 %
Measured labour productivity Nominal labour cost Unit labour costs **B**	- 0.29 % - 0.25 % + 0.04 %
Private consumption price **C** **C** = 0.45 x (0.608 x **A** + 0.667 x **B**)	-0.09 %

Private consumption prices decrease in the first period by 0.09 % with respect to the baseline projection. This decrease reflects two contradictory phenomena: a decrease of 0.36 % in the demand pressure which is affected by a coefficient of 0.608 in the price equation and passed in the price of the current period in a proportion of 45 %. This means that the relaxation of the demand pressure provokes a decrease of 0.1 % of the consumption price in 1989. On the other hand unit labour costs increase slightly and, given the equation's coefficients, they provoke a rise of 0.01 % of the consumption deflator in 1989.

The upward variation of the unit labour costs is a noticeable feature of the model. One should not forget that disequilibrium models are based on the assumption that in the short-run price and wage adjustments do not clear the markets and agents adapt their rational behaviour to the quantitative constraints they perceive.

Econometric estimation of the wage and productivity equations tend to support these underlying assumptions of the theoretical model. Results of table 2 show that the sharp drop of effective production and measured productivity is only partially compensated by the setback of the nominal wages brought by the fall of employment. This difference in response of productivity and wages explain the rigidity, and even the small rise, of the unit labour costs.

b.   Dynamic effects

Government's investments are maintained at a lower level than throughout baseline projection. Exactly as for the short-term this induces a decrease of total output, effective production and imports. The GDP multiplier stabilises after five years at a value of -0.8.

Simultaneously prices continue to reflect the squeeze of the margins due to the fall of activity and the upward pressure of the unit labour costs. The latter rise because measured productivity decreases more than the wages. Progressively prices catch up so that the real product wage rate (wages deflated by the value added price) decreases at the same speed than productivity.

Table VIII.3 resumes the medium term effects of this simulation

Table VIII.3: *Impact multipliers of a reduction of the public investments*		
Variations in % with respect to the baseline projection:	*t*	*t + 6*
G.D.P.	- 0.3	- 0.8
Value added	- 0.5	-1.0
Value added price	- 0.0	0.2
Employment	- 0.1	- 0.3
Productivity	- 0.3	- 0.6
Labour costs	- 0.3	- 0.5
Real product labour costs rate	- 0.2	- 0.7
Unit labour costs	0.0	0.2

After six years, activity and employment are lower than in the baseline scenario, while prices and unit labour costs are higher, although wages have been depressed. The differences in the reactions of prices, wages and productivity to a fall of public expenditure explain these results:

- The fall of employment does not match the reduction of activity (because of labour hoarding) and there is a reduction of labour productivity.

- The fall of employment is not entirely passed on in the reduction of the wages so that wages decrease less than productivity.

- Unit labour costs are fully passed on into prices.

This means that the fall in activity brings wages down, but not enough to compensate for the rise of costs due to the slowing down of the productivity. Prices tend to remain rigid, and even to grow slightly. The reduction of public expenditure is eventually entirely supported by the households in the form of reduced wages and less employment. It is so because although wages are not fully flexible, they are more flexible than prices.

Some additional effects on the demand components deserve further attention. First, private consumption, and in the medium term residential investments, will slow down due to a decrease in real disposable income. This is the result of lower real wages and increased unemployment. Second, private investment will also slow down because the effective production declines more than the capital constrained production. The rate of return on the capital stock also declines because value added decreases more than costs and the capital stock remains constant. All these effects are rather small but taken together they decrease investment and the capital stock.

The decrease in GNP, after some years, does not reflect entirely the variations of the various components of final demand and import. This is due to an increase in the net factor incomes resulting from a diminution of the capital incomes paid to the rest of the world. A significant share of these capital incomes paid to non resident consists of interests of the public debt in foreign currency. In the hypothesis, active in the model, that foreign exchange gained from the current account surplus are affected in priority to the repayment of the foreign debt, reductions of the public sector deficit produce a higher current account, accelerated repayments of the foreign debt and therefore progressively dry out the flow of interest payments to the rest of the world. In terms of GNP the resulting increase of the net factor payments received from the rest of the world partially compensates the reduction in the different demand components.

In case of an alternative hypothesis regarding the repayment of the debt, namely that the reduction of the public sector borrowing requirements be in priority devoted to the repayment of the debt in Belgian francs, the impact multiplier on GNP would not be significantly different from that on the GDP, because net factor incomes would not increase.

3. Simulation of an increase in the employers' social security contributions rate

In this simulation the rate of the employers' social security contributions has been increased from 1989 onwards by 3.2 % [1]. This represents the necessary change in the rate to increase, a priori and all other things remaining equal, by 58.7 billion BEF the amount of the social security contributions in 1989.

a. Short-run effect (first year)

Chart VIII.3 provides a simplified representation of the path of the initial impact of a variation of the employers' social security contributions through the model.

The first effect is a rise in the nominal labour cost, which is 3.2 % in the present simulation. This rise in the nominal labour cost affects the final demand prices on the one hand, the real labour costs on the other hand.

The increase in the rate of social security contributions has a direct mechanical repercussion on the nominal labour cost. In the present simulation this amounts to an increase of 3.7 % of the wage cost rate and of 3.6 % of the macroeconomic labour cost (including wage paid labour and self employed remunerations) which is relevant in the model. This affects two key variables: prices and labour productivity which will be discussed separately in order to disentangle the problems.

---

1 The rate of social security contributions is computed in the model with reference to the total wage cost. The simulated variation of this "inside rate" is in fact 2.5 points which amounts to 3.2 points of the more usually adopted "outside rate" based on the gross wage.
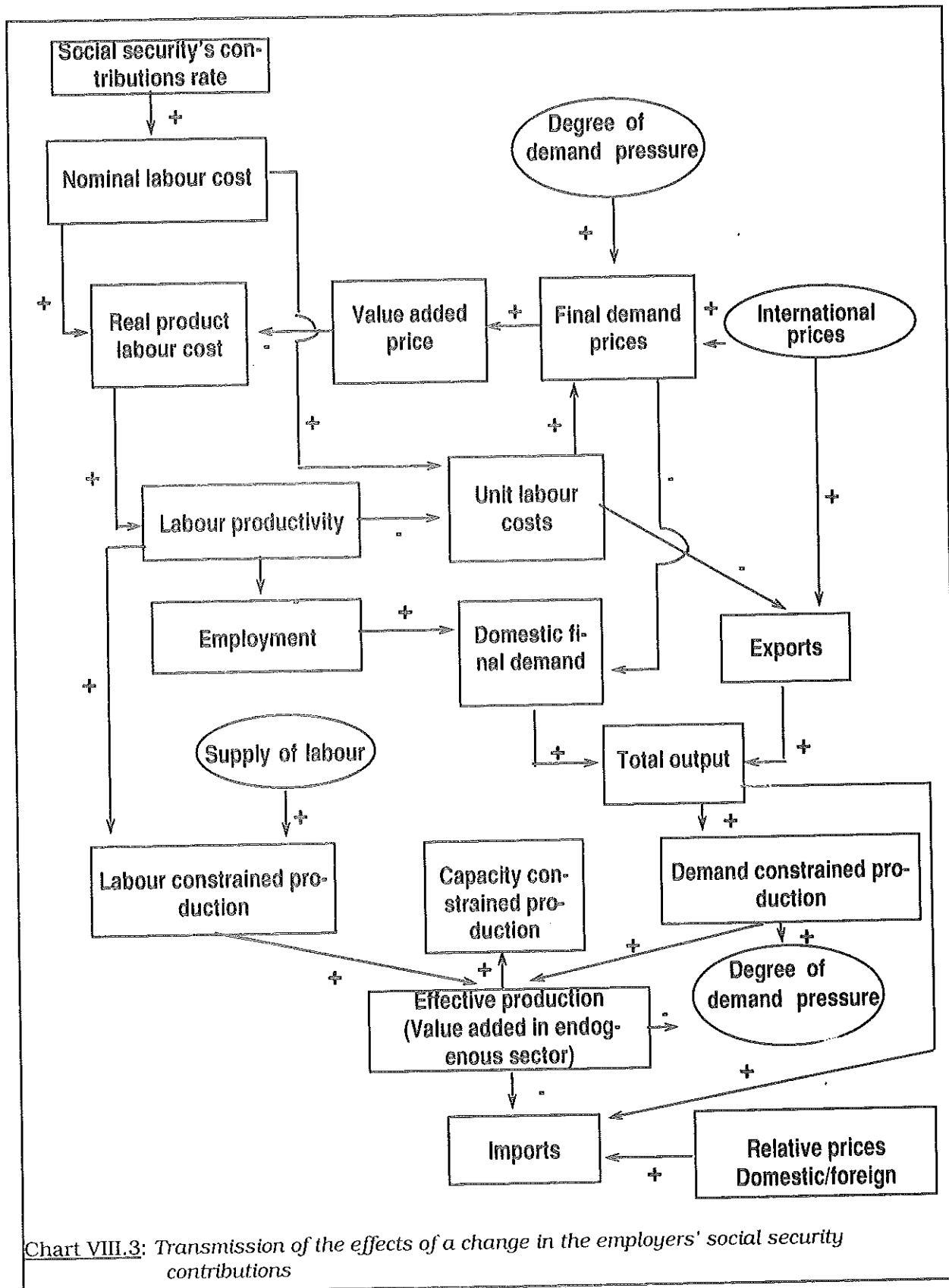
Chart VIII.3: *Transmission of the effects of a change in the employers' social security contributions*
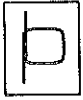
Final demand prices

Final demand prices depend on production costs, a combination of unit labour costs and import prices. Margins come above cost and are affected by the degree of demand pressure, i.e. by the ratio of demand constrained production to effective production.

Taking for example the private consumption price one observes an increase in 1989 by 0.74 % with respect to the baseline projection, a variation that can be decomposed as shown in table VIII.4:

Table VIII.4: First year price changes due to the rise of the employers' share to social security contributions	
	Changes in % with respect to the baseline projection
Demand pressure A	- 0.51
Apparent labour productivity	+ 0.61
Nominal labour cost :	+ 3.60
Unit labour costs B :	+ 2.97
Private consumption price C C = .45 x (.608 x A + .667 x B)	+ 0.74

Labour productivity and employment

Technical labour productivity depends on real product labour costs, i.e. nominal labour costs deflated by the value added deflator. The latter depends on the various final demand prices and the composition of the final demand.

In the present case, in the first period, the rise in the value added price is 0.76 % and the variation in the real labour cost rate is 2.85 %. Due to the relative rigidity of the technological coefficient only 37.3 % of the rise is passed in the technical productivity of the current year. The effect on the measured productivity, and therefore on effective employment, is attenuated by fluctuations in the labour hoarding. Nevertheless we observe (see appropriate tables of the appendix) that the total impact on employment is a loss of 20 thousand full time equivalent jobs, or a rise of unemployment by 16 thousand units. This is entirely to be accounted for by the change in the production techniques induced by the higher wage rate as the effective production remained quasi unchanged.

Effective production and imports

The increase in the labour costs result, in the first period, in a decrease of total output by 0.59 %. Part of it comes from the reduction of the domestic final demand due to higher domestic prices, lower real disposable income (less employment), and part of it from the reduction of exports due to a lower export profitability.

Total output is reduced by 33.7 billion BEF of 1980 in 1989, of which 26.1 billion are a drop in exports, therefore the final demand category the most vulnerable to domestic input costs rises.

The variation in total output induces variations in the demand constrained production and imports. The distribution between these two effects depends on the evolution of the domestic prices relative to the foreign ones, on the one hand, and on the initial proportion of enterprises in the different regimes, on the other. The estimation of the model confirmed a result of former empirical studies, i.e. a fairly low sensitivity of goods and services imports to relative prices, with an elasticity of about -0.20 which moreover produces its effect after one year. The totality of the variations on imports in the model comes therefore from changes in

the production regimes. Table VIII.5 provides the absolute variations in total output, the different constrained production and the effective value added, a well as the proportions of enterprises in each regime before and after the change in the social security rate of contribution.

Table VIII.5: *First year repercussions on output and imports of a rise in the employers' share of social security contributions*

| | Variant minus baseline billion BEF | Proportion of enterprises | | constrained by |
		Baseline %	Variant %	
Total output	- 33.7			
Structural demand	17.5	51.4	57.3	Demand
Production capacity (capital)	+ 4.1	27.8	26.3	Capital
Production capacity (labour)	+ 31.2	21.0	16.4	Labour
Effective value added	- 2.8			
Imports		- 29.8		

The contraction in total output of 33.7 billion francs provokes a fall of 17.5 billion of the structural demand but has only a marginal negative impact on the effective value added. This result, at first glance surprising, comes from the fact that the reduction of the structural demand is offset by the increase in the production capacity. In particular the partial adaptation of the labour productivity to the rise in the labour costs produces an important increase in the production capacity linked with the available quantity of labour. Therefore the effective value added, in other words the effective domestic production, is unchanged with respect to the baseline projection and the initial changes in total demand is entirely supported by the rest of he world as it results in a reduction of our imports.

Thus at the end of the first period the consequences of a rise in the tax rate on labour is a change in the choice of production techniques by the enterprises - they adopt more capital intensive technologies - but quasi no change in domestic production.

This result is very contingent to the existence of micromarkets facing different situations and to the distribution of enterprises in the different identified regimes. The same initial rise in the taxation of labour simulated in a situation where no enterprises are supply constrained would produce both higher unemployment and significantly lower growth.

b. **Medium term effects**

Wages, prices and productivity

The increase in the social security contributions rate is maintained through the simulation and two key variables will progressively adapt to this new situation: the labour productivity and the wage rate exclusive of the employer's social security contributions. Table

p

VIII.6 illustrates these evolutions.

Table VIII.6: *Medium term wages and productivity responses to a rise in the employers' rate of social security contributions*

	Procentual variations in % with respect to the baseline projection					
	t	t+1	t+2	t+3	t+4	t+5
SS contribution rate	3.2	3.2	3.2	3.2	3.2	3.2
Real product labour cost rate	2.8	2.1	1.4	0.8	0.4	0.0
Labour productivity (technical)	1.0	1.3	1.3	1.1	0.9	0.5
Labour productivity (measured)	0.6	1.1	1.4	1.4	1.1	0.6
Unit labour costs	3.0	1.7	0.3	- 0.6	-1.1	-1.2
Value added prices	0.8	0.7	0.3	- 0.1	- 0.4	- 0.6
Real wages exclusive SS.	- 0.3	-1.1	-1.8	- 2.4	- 2.8	- 3.1
Memorandum item Ratio of employment to labour supply	-0.8	-1.3	-1.3	-1.1	-0.7	-0.1

The preceding table gives the order of magnitude and the dynamics of the spreading of the injected 3.2 % rise in the wage cost through the price-wage and productivity circuit of the model.

In the beginning of the period labour cost rates increase with nearly the full amount of the rise induced by the taxation (the difference comes from the fact that labour cost includes also the self-employed workers' rate of remuneration which is unaffected by the measure simulated). As a consequence employment decreases and measured productivity rises, but less than the technical labour productivity which is pushed forward by the rise in the real wage cost. This induces a slowing down of unit labour costs and prices. However, due to the change in technologies by the firms, unemployment is higher and real wages exclusive of the employer's social security contributions react to this new situation by growing less than in the base line simulation. After 6 years the three percent exogenous rise of the real product labour cost is brought back to nil because real wages exclusive of social security employers's contributions have declined by 3.1 %. Progressively wages costs, productivity and employment tend to come back to their long term path of the baseline scenario, the increase in the taxation of labour being in the long run completely paid by the workers.

Production and imports

The variations in wages, prices and productivity affect in different directions the final demand categories.

Households disposable income is permanently depressed by the increased unemployment and by the lower real wages; this in turn depresses private consumption and residential investments which grow at a slower pace than in the baseline projection.

On the other hand business investment and exports are at first depressed by the increase in the unit labour costs but after three years they are progressively stimulated by an increased profitability of the enterprises resulting of the slower growth of the unit labour costs.

On the whole the changing composition of demand produces little change in the growth of total output but production is more and more oriented towards the foreign sector as internal personal incomes have diminished while the competitiveness and the profitability of the firms remain intact.

4.Comparative results of the simulations

All simulation results, compared to the baseline scenario, are regrouped in the appendix.

Figures VIII.1, VIII.2 and VIII.4 tend to provide a synthetic view of the most significant results.

Figure VIII.1 shows , for the 12 simulation, the GDP and employment multipliers, in t and t+6. In the case of simulations 1 to 8 these are the impacts of budgetary impulses in t equivalent to 1 % of the GNP.

Figure VIII.1: *Impact on GDP and employment of an initial decrease of 1 % of the GNP of the Government's deficit.*
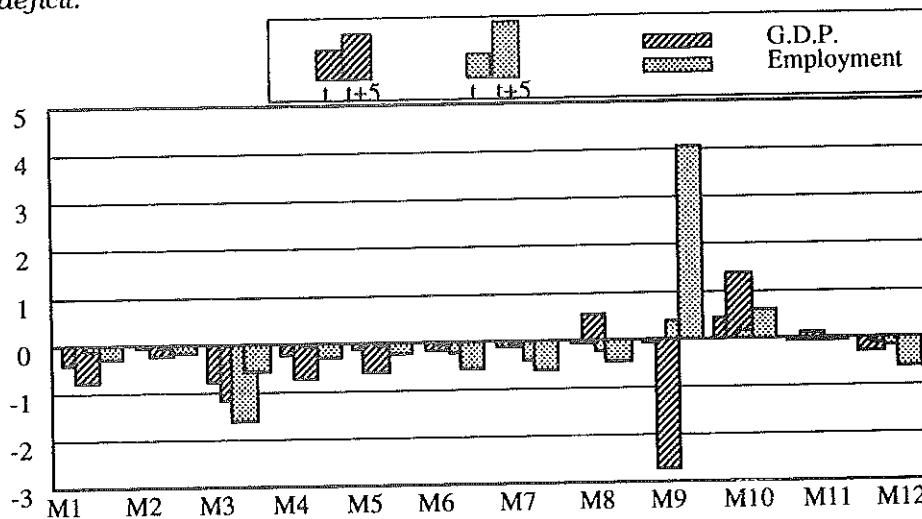
Figure VIII.2: *Effects on the share of net exports and net financing requirement in GNP of an initial decrease of 1 % of the GNP of the Government's deficit*
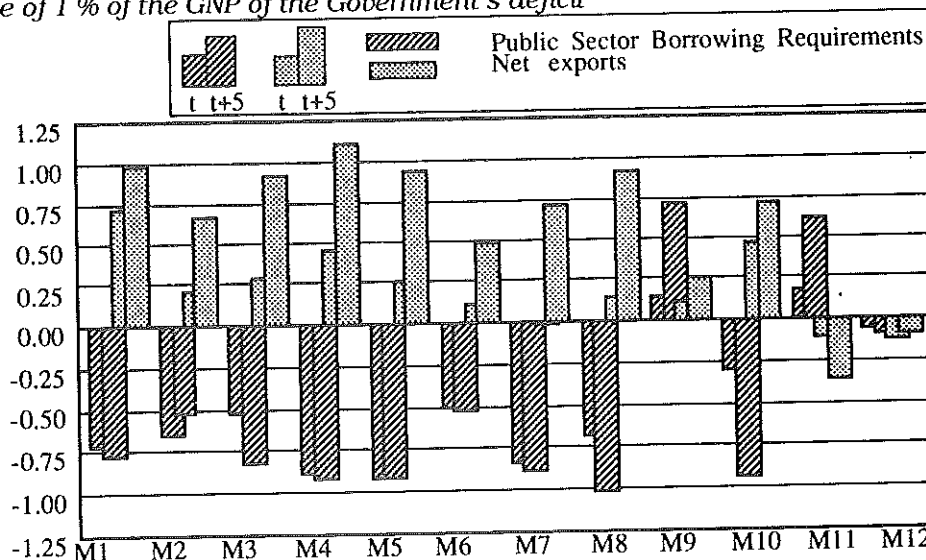
Considering first simulations 1 to 8 we may note the following points:

- These results confirm the often stressed fact that multipliers are weak in Belgium.

- The exogenous budgetary impulsions provoke responses involving important changes in the labour productivity so that employment and output do not react in parallel.

- The apparently awkward positive impact on GDP growth of a tax on excise duties on energetic products, comes from the dissuasive effect of this tax on the imports of energy.

Simulation 9 claims for a further explanation. In this simulation the minimum wage has been reduced in 1989 so as to provoke a reduction of the negotiated wage cost up to the point where the total wage bill is spontaneously reduced by 58.7 billion, i.e. 1 % of the GNP. This result is achieved by a fall of 32 % of the minimum wage. In the subsequent periods the new minimum wage-unemployment allowance is permitted to grow at the same speed, in real terms, than in the base line projection. Figure VIII.3 shows the evolution of the unemployment allowance and the average wage cost in both simulations. The results are spectacular and exhibit some fundamental features of the model due to the relatively strong flexibility of the wage rate in the long run. Lower wages provoke a decline in the labour productivity and a sharp increase in the level of employment (+ 154 000 full time equivalent jobs after 6 years). Simultaneously production decreases sharply for two main reasons:

Figure VIII.3: *Average real wage and unemployment benefits*
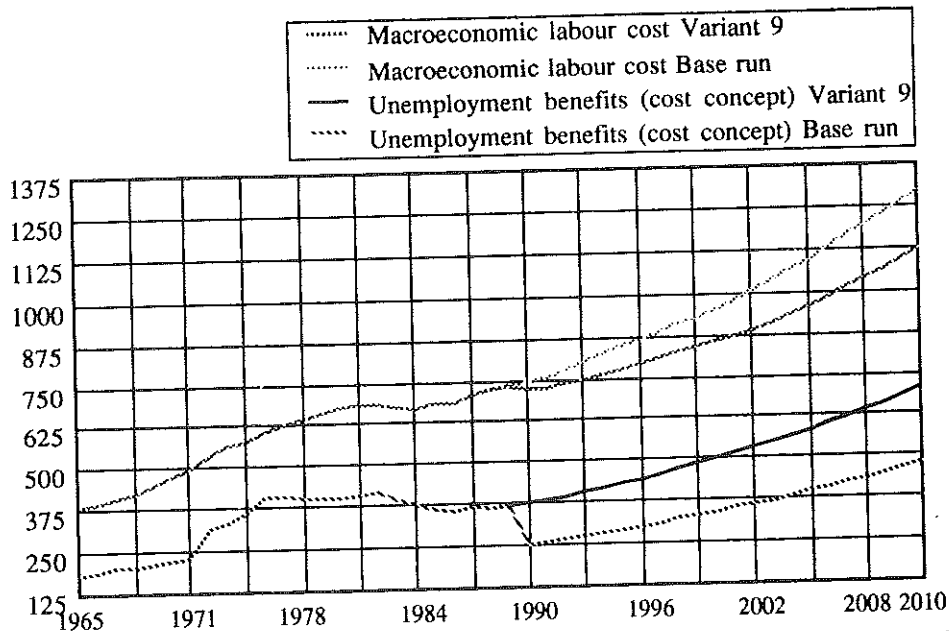
- Demand is depressed both on the national and international market. Internal demand is weakened by the fall in the disposable income of the households, while sales on international markets face competitiveness problems in view of the very high unit production costs geared by the productivity drop.

- The proportion of supply constrained firms tend to become overwhelming which brings more downward pressure on production.

The model in fact exhibits here a situation of repressed inflation where demand exceeds supply on the employment market as well as on the goods and services market. As

pointed out in the chapter on the long term properties, the model can always find a stationary solution but this solution can imply any proportion of supply and demand constrained firms.

Simulations 10 to 12 are of a different nature than the others and should not be directly compared.

Simulation 10, shows the beneficial (and expected) effects of an increase in the world trade volume by 1 %, while simulation 11 assesses the consequence of an increase by 1 % of the international interest rates.

Simulation 12 analyses the consequences of a decrease of the active population by 1 %. It shows that the contraction of the supply of labour induces a rise in the wages and therefore in the labour productivity. The productivity decrease does not match the decrease in labour supply so that, although there is a decline in employment, unemployment also decreases. The wage rise is limited by the fact that due to the decline of the active population a larger fraction of the long duration unemployment enters the labour supply.

Figure VIII.2 shows for the 11 simulations the results in t and t+6 on the share of the current balance and the public deficit in the GNP. This graph does not call for special comments.

Figure VIII.4 permits an evaluation of the degree of competition between the objective of public finances and those of employment and external equilibrium. It shows in t+6 the impact on both employment and net exports of the simulated measures.

Focusing on simulations 1 to 8 we may observe that, not unexpectedly, the most painful measure in terms of employment is the increase in the social security contributions, the less destructive being the reduction of wages in the public sector.

In terms of net exports the most efficient measure is the reduction of social security transfers. This comes from the fact that these transfers have a higher marginal propensity to consume, and therefore to import, than the other categories of incomes.

Figure VIII.4: *Effects in t + 6 on net exports and employment of a decrease in t of the Government's deficit by 1 % of the GNP.*

Δ Employment
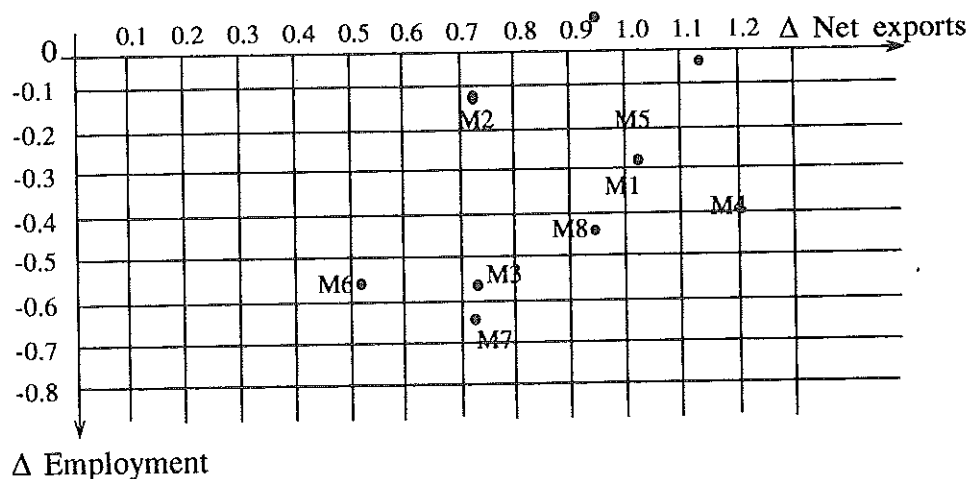
5. Appendix: main simulations results of variants 1 to 12, compared with the baseline projection

Significance of the variants:

Variant 1:   Reduction of the state's investments.

Variant 2:   Reduction of the wage sum in the public sector without modification of the number of persons employed.

Variant 3:   Reduction of total employment in the public sector without modification of the individual wage rate.

Variant 4:   Reduction of the social security transfers to the households.

Variant 5:   Increase of the personal income tax.

Variant 6:   Increase of the VAT on private consumption products.

Variant 7:   Increase of the employers' social security contributions.

Variant 8:   Increase of the excise duties on energetic products.

Variant 9:   Reduction of the minimum wage cost.

Variant 10: Increase of the volume of exports induced by an accelerated world trade growth.

Variant 11: Increase of 1 % of the short-term rates of interest.

Variant 12: Decrease of 1 % of the active population.

All variants are simulated from 1989 to 2010. Results are presented from t = 1989 to t+6 = 1995, no significant changes occuring after this period.

Variant 1	1989	1990	1991	1992	1993	1995

Sensitivity analysis : multipliers (percentage deviations from baseline)

1. Labour Market (June 30)

	1989	1990	1991	1992	1993	1995
Total employment	-0.10	-0.14	-0.17	-0.20	-0.23	-0.27
Enterprises sector	-0.13	-0.18	-0.21	-0.25	-0.29	-0.34
State sector	0.00	0.00	0.00	0.00	0.00	0.00
Active population	0.00	0.00	0.00	0.00	0.00	0.00
Unemployment	0.86	1.35	1.76	2.33	2.93	3.80

2. Demand and output

Private consumption	-0.03	-0.07	-0.13	-0.22	-0.29	-0.38
Public consumption	0.00	0.00	0.00	0.00	0.00	0.01
Gross capital formation	-6.06	-6.52	-7.07	-7.54	-7.80	-7.37
- GFCF enterprises	-0.48	-1.20	-1.92	-2.38	-2.53	-1.72
- GFCF state	-53.38	-53.43	-53.46	-53.49	-53.52	-53.57
- GFCF residential sector	0.00	0.14	0.43	-0.13	-0.59	-0.89
Exports of goods and services	0.01	0.05	0.03	-0.01	-0.05	-0.12
Imports of goods and services	-1.02	-0.99	-0.99	-1.03	-1.04	-0.98
Gross domestic product	-0.38	-0.46	-0.57	-0.67	-0.76	-0.81
Gross national product	-0.36	-0.38	-0.44	-0.50	-0.53	-0.49

3. Prices, wages and incomes

Private consumption deflator	-0.09	-0.11	-0.09	-0.04	0.01	0.06
Terms of trade (goods and serv.)	-0.05	0.00	-0.02	-0.02	-0.01	0.04
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00
Wage cost rate	-0.18	-0.28	-0.33	-0.35	-0.38	-0.47
Interest rate	-0.75	-1.65	-0.89	-0.52	-0.30	0.05
Households disposable income	-0.23	-0.34	-0.37	-0.39	-0.40	-0.42
Enterprises gross profits	-0.92	-0.58	-0.93	-0.89	-0.27	2.21

4. Endogeneous sector

Value added (constant prices)	-0.46	-0.60	-0.72	-0.84	-0.93	-0.98
Value added deflator	-0.02	0.04	0.05	0.09	0.14	0.24
Total output	-0.81	-0.88	-0.95	-1.02	-1.06	-0.99
Demand constrained production	-0.81	-0.87	-0.95	-1.03	-1.08	-1.03
Capacity constrained production	-0.05	-0.16	-0.32	-0.51	-0.73	-1.08
Labour constrained production	-0.09	-0.29	-0.43	-0.55	-0.64	-0.78
Labour cost rate	-0.25	-0.32	-0.35	-0.36	-0.38	-0.47
Unit labour costs	0.04	0.07	0.15	0.22	0.24	0.17

5. Productivities

Technical labour productivity	-0.11	-0.28	-0.40	-0.49	-0.56	-0.66
Apparent labour productivity	-0.29	-0.39	-0.49	-0.58	-0.63	-0.64
Technical capital productivity	-0.05	-0.11	-0.13	-0.14	-0.14	-0.16
Apparent capital productivity	-0.46	-0.54	-0.53	-0.47	-0.35	-0.06

Sensitivity analysis : ratios and variations (absolute deviations from baseline)

Significant ratios

1. Share in GNP of :

Public sector deficit	-0.72	-0.78	-0.77	-0.75	-0.74	-0.78
Interests of the public debt	-0.01	-0.10	-0.13	-0.17	-0.20	-0.25
Total public debt	-0.12	-0.90	-1.56	-2.21	-2.85	-4.10
Net exports	0.69	0.81	0.85	0.91	0.95	0.99
Wages and self employed incomes	0.09	0.03	0.03	0.02	-0.03	-0.16
2. Saving ratio	-0.10	-0.14	-0.14	-0.11	-0.10	-0.08
3. Unemployment rate	0.09	0.13	0.15	0.18	0.22	0.26

4. Degrees of capacity utilisation

Total capacity	-0.34	-0.41	-0.37	-0.30	-0.19	0.09
Equipments constrained capacity	-0.39	-0.41	-0.37	-0.30	-0.19	0.09
Labour constrained capacity	-0.34	-0.29	-0.27	-0.28	-0.28	-0.19
5. Demand pressure (QDF/QAFFT)	-0.36	-0.29	-0.25	-0.20	-0.15	-0.05

6. Proportion of enterprises

Demand constrained	4.13	3.56	3.11	2.67	2.10	0.63
Capacity constrained	-2.46	-2.07	-1.54	-1.04	-0.61	0.36
Labour supply constrained	-1.67	-1.49	-1.57	-1.63	-1.49	-0.99

Absolute variations

Unemployment	3.95	5.59	6.55	7.86	9.34	11.03
Total full time equiv. employment	-4.96	-5.94	-6.47	-7.70	-9.12	-10.34
Net exports	39.70	49.55	54.51	62.15	69.04	82.57
Public sector deficit	-44.11	-50.25	-52.83	-55.08	-57.66	-67.90

Maribel II

Variant 2	1989	1990	1991	1992	1993	1995

Sensitivity analysis : multipliers (percentage deviations from baseline)

1. Labour Market (June 30)

	1989	1990	1991	1992	1993	1995
Total employment	-0.03	-0.06	-0.08	-0.10	-0.12	-0.15
Enterprises sector	-0.03	-0.08	-0.10	-0.13	-0.15	-0.19
State sector	0.00	0.00	0.00	0.00	0.00	0.00
Active population	0.00	0.00	0.00	0.00	0.00	0.00
Unemployment	0.23	0.58	0.85	1.20	1.56	2.07
2. Demand and output						
Private consumption	-0.43	-0.68	-0.77	-0.87	-0.94	-1.01
Public consumption	0.00	0.14	0.34	0.53	0.71	1.24
Gross capital formation	-0.04	-0.59	-0.91	-1.31	-1.59	-1.52
- GFCF enterprises	-0.07	-0.31	-0.72	-1.14	-1.46	-1.36
- GFCF state	0.00	0.00	0.00	0.00	0.00	0.00
- GFCF residential sector	0.00	-1.93	-2.13	-2.60	-2.79	-2.60
Exports of goods and services	0.01	0.03	0.05	0.04	0.03	-0.01
Imports of goods and services	-0.25	-0.45	-0.50	-0.56	-0.60	-0.59
Gross domestic product	-0.08	-0.15	-0.17	-0.22	-0.25	-0.21
Gross national product	-0.09	-0.11	-0.12	-0.13	-0.13	-0.03
3. Prices, wages and incomes						
Private consumption deflator	-0.03	-0.07	-0.09	-0.09	-0.08	-0.05
Terms of trade (goods and serv.)	-0.01	-0.01	-0.01	-0.01	-0.01	0.01
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00
Wage cost rate	-0.06	-0.13	-0.19	-0.24	-0.27	-0.33
Interest rate	-1.18	-2.17	-1.22	-0.71	-0.41	0.09
Households disposable income	-1.12	-1.25	-1.28	-1.30	-1.30	-1.26
Enterprises gross profits	-0.67	-0.60	-0.61	-0.71	-0.59	0.79
4. Endogeneous sector						
Value added (constant prices)	-0.10	-0.22	-0.29	-0.38	-0.46	-0.52
Value added deflator	-0.05	-0.07	-0.08	-0.08	-0.07	0.00
Total output	-0.19	-0.37	-0.44	-0.53	-0.58	-0.57
Demand constrained production	-0.19	-0.36	-0.43	-0.51	-0.57	-0.56
Capacity constrained production	0.00	-0.03	-0.07	-0.15	-0.26	-0.51
Labour constrained production	-0.01	-0.06	-0.14	-0.20	-0.27	-0.38
Labour cost rate	-0.07	-0.16	-0.21	-0.25	-0.28	-0.33
Unit labour costs	-0.02	-0.03	-0.03	-0.01	0.01	-0.01
5. Productivities						
Technical labour productivity	-0.01	-0.06	-0.13	-0.18	-0.23	-0.32
Apparent labour productivity	-0.06	-0.13	-0.18	-0.24	-0.29	-0.32
Technical capital productivity	0.00	-0.02	-0.03	-0.04	-0.04	-0.04
Apparent capital productivity	-0.10	-0.21	-0.25	-0.27	-0.24	-0.05

Sensitivity analysis : ratios and variations (absolute deviations from baseline)

Significant ratios

1. Share in GNP of :

	1989	1990	1991	1992	1993	1995
Public sector deficit	-0.66	-0.66	-0.63	-0.59	-0.56	-0.53
Interests of the public debt	0.04	-0.06	-0.09	-0.12	-0.14	-0.17
Total public debt	0.71	0.10	-0.51	-1.03	-1.54	-2.50
Net exports	0.21	0.42	0.49	0.57	0.62	0.67
Wages and self employed incomes	-0.28	-0.28	-0.26	-0.25	-0.26	-0.32
2. Saving ratio	-0.58	-0.44	-0.36	-0.29	-0.24	-0.17
3. Unemployment rate	0.02	0.06	0.07	0.09	0.12	0.14
4. Degrees of capacity utilisation						
Total capacity	-0.09	-0.18	-0.20	-0.21	-0.18	-0.01
Equipments constrained capacity	-0.10	-0.18	-0.20	-0.21	-0.18	-0.01
Labour constrained capacity	-0.09	-0.15	-0.15	-0.17	-0.18	-0.13
5. Demand pressure (QDF/QAFFT)	-0.09	-0.14	-0.14	-0.13	-0.11	-0.05
6. Proportion of enterprises						
Demand constrained	1.05	1.73	1.75	1.76	1.55	0.67
Capacity constrained	-0.62	-0.95	-0.86	-0.75	-0.58	-0.02
Labour supply constrained	-0.44	-0.78	-0.89	-1.01	-0.97	-0.65

Absolute variations

	1989	1990	1991	1992	1993	1995
Unemployment	1.03	2.40	3.17	4.06	4.96	6.01
Total full time equiv. employment	-1.30	-2.73	-3.27	-4.07	-4.90	-5.67
Net exports	10.32	23.18	29.42	36.43	42.48	52.91
Public sector deficit	-43.01	-45.66	-46.58	-46.74	-47.22	-50.60

Variant 3	1989	1990	1991	1992	1993	1995

Sensitivity analysis : multipliers (percentage deviations from baseline)

1. Labour Market (June 30)

	1989	1990	1991	1992	1993	1995
Total employment	-1.60	-1.34	-1.05	-0.79	-0.62	-0.53
Enterprises sector	0.23	0.52	0.85	1.15	1.35	1.45
State sector	-10.24	-10.26	-10.27	-10.27	-10.27	-10.10
Active population	0.00	0.00	0.00	0.00	0.00	0.00
Unemployment	13.38	12.56	11.10	9.29	7.75	7.31

2. Demand and output

	1989	1990	1991	1992	1993	1995
Private consumption	-0.15	-0.30	-0.40	-0.52	-0.63	-0.82
Public consumption	-6.33	-6.33	-6.36	-6.38	-6.39	-6.39
Gross capital formation	0.50	1.15	1.67	1.35	0.31	-2.26
- GFCF enterprises	0.73	2.11	3.11	3.04	1.71	-2.77
- GFCF state	0.00	0.00	0.00	0.00	0.00	0.00
- GFCF residential sector	0.00	-1.43	-2.10	-2.88	-3.21	-2.30
Exports of goods and services	0.40	0.55	0.55	0.49	0.43	0.34
Imports of goods and services	0.05	0.10	0.09	-0.06	-0.25	-0.62
Gross domestic product	-0.81	-0.69	-0.65	-0.71	-0.85	-1.18
Gross national product	-0.82	-0.66	-0.60	-0.63	-0.74	-0.98

3. Prices, wages and incomes

	1989	1990	1991	1992	1993	1995
Private consumption deflator	-0.51	-0.93	-1.17	-1.22	-1.11	-0.72
Terms of trade (goods and serv.)	0.03	0.12	0.10	0.04	-0.03	-0.13
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00
Wage cost rate	-1.37	-2.25	-2.64	-2.65	-2.42	-1.85
Interest rate	-1.95	-3.01	-2.25	-1.59	-1.13	-0.39
Households disposable income	-1.44	-1.96	-2.18	-2.18	-2.05	-1.73
Enterprises gross profits	4.21	7.15	7.14	5.01	1.21	-4.62

4. Endogenous sector

	1989	1990	1991	1992	1993	1995
Value added (constant prices)	0.47	0.58	0.62	0.56	0.40	0.06
Value added deflator	-0.74	-0.99	-1.19	-1.24	-1.19	-0.94
Total output	0.31	0.43	0.44	0.28	0.02	-0.48
Demand constrained production	0.31	0.58	0.65	0.54	0.29	-0.25
Capacity constrained production	-0.05	-0.02	0.20	0.55	0.87	0.95
Labour constrained production	1.79	1.25	0.86	0.61	0.47	0.39
Labour cost rate	-1.39	-2.21	-2.59	-2.59	-2.37	-1.81
Unit labour costs	-1.54	-2.15	-2.22	-1.88	-1.35	-0.43

5. Productivities

	1989	1990	1991	1992	1993	1995
Technical labour productivity	-0.45	-0.54	-0.68	-0.83	-0.96	-1.13
Apparent labour productivity	0.16	-0.06	-0.38	-0.73	-1.04	-1.38
Technical capital productivity	-0.05	-0.11	-0.11	-0.07	0.00	0.14
Apparent capital productivity	0.47	0.49	0.30	-0.06	-0.47	-0.75

Sensitivity analysis : ratios and variations (absolute deviations from baseline)

Significant ratios

1. Share in GNP of :

	1989	1990	1991	1992	1993	1995
Public sector deficit	-0.53	-0.71	-0.81	-0.87	-0.88	-0.82
Interests of the public debt	0.02	-0.09	-0.11	-0.15	-0.19	-0.25
Total public debt	1.05	0.50	-0.13	-0.89	-1.66	-3.13
Net exports	0.31	0.51	0.54	0.60	0.68	0.91
Wages and self employed incomes	-0.72	-0.91	-0.85	-0.64	-0.39	-0.08
2. Saving ratio	-0.69	-0.65	-0.54	-0.39	-0.28	-0.17
3. Unemployment rate	1.43	1.21	0.96	0.73	0.57	0.49

4. Degrees of capacity utilisation

	1989	1990	1991	1992	1993	1995
Total capacity	-1.21	-0.55	0.39	0.01	-0.42	-0.81
Equipments constrained capacity	0.49	0.56	0.39	0.01	-0.42	-0.81
Labour constrained capacity	-1.21	-0.62	-0.22	-0.05	-0.06	-0.30
5. Demand pressure (QDF/QAFFT)	-0.16	0.00	0.03	-0.02	-0.12	-0.31

6. Proportion of enterprises

	1989	1990	1991	1992	1993	1995
Demand constrained	1.86	-0.06	-0.42	0.25	1.64	4.41
Capacity constrained	3.44	3.18	1.74	0.03	-1.31	-2.87
Labour supply constrained	-5.30	-3.12	-1.32	-0.29	-0.34	-1.54

Absolute variations

	1989	1990	1991	1992	1993	1995
Unemployment	61.25	52.15	41.26	31.34	24.65	21.23
Total full time equiv. employment	8.74	18.25	29.02	37.88	42.80	43.16
Net exports	15.82	28.54	31.20	37.18	44.79	70.06
Public sector deficit	-36.12	-50.20	-59.97	-68.04	-72.47	-77.40

Variant 4	1989	1990	1991	1992	1993	1995

Sensitivity analysis : multipliers (percentage deviations from baseline)

1. Labour Market (June 30)

	1989	1990	1991	1992	1993	1995
Total employment	-0.07	-0.14	-0.17	-0.21	-0.24	-0.27
Enterprises sector	-0.09	-0.17	-0.22	-0.26	-0.30	-0.34
State sector	0.00	0.00	0.00	0.00	0.00	0.00
Active population	0.00	0.00	0.00	0.00	0.00	0.00
Unemployment	0.57	1.30	1.84	2.43	2.99	3.77

2. Demand and output

	1989	1990	1991	1992	1993	1995
Private consumption	-1.03	-1.44	-1.53	-1.64	-1.73	-1.87
Public consumption	0.00	0.00	0.00	0.00	0.00	0.01
Gross capital formation	-0.21	-1.38	-2.02	-2.54	-2.75	-2.28
- GFCF enterprises	-0.31	-0.97	-1.74	-2.33	-2.60	-1.89
- GFCF state	0.00	0.00	0.00	0.00	0.00	0.00
- GFCF residential sector	0.00	-3.66	-4.22	-4.65	-4.64	-4.23
Exports of goods and services	0.03	0.08	0.10	0.08	0.06	-0.02
Imports of goods and services	-0.62	-0.94	-0.99	-1.04	-1.05	-1.00
Gross domestic product	-0.20	-0.39	-0.49	-0.61	-0.69	-0.75
Gross national product	-0.19	-0.33	-0.38	-0.44	-0.47	-0.43

3. Prices, wages and incomes

	1989	1990	1991	1992	1993	1995
Private consumption deflator	-0.08	-0.16	-0.19	-0.18	-0.17	-0.14
Terms of trade (goods and serv.)	-0.04	-0.02	-0.01	-0.01	0.00	0.04
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00
Wage cost rate	-0.14	-0.30	-0.42	-0.50	-0.56	-0.67
Interest rate	-0.51	-1.86	-1.03	-0.78	-0.54	-0.10
Households disposable income	-1.67	-1.88	-1.99	-2.07	-2.13	-2.22
Enterprises gross profits	-0.46	-0.46	-0.61	-0.64	-0.17	2.21

4. Endogeneous sector

	1989	1990	1991	1992	1993	1995
Value added (constant prices)	-0.26	-0.48	-0.60	-0.73	-0.82	-0.88
Value added deflator	-0.14	-0.16	-0.18	-0.18	-0.16	-0.08
Total output	-0.48	-0.79	-0.88	-0.97	-1.01	-0.95
Demand constrained production	-0.48	-0.76	-0.85	-0.94	-0.97	-0.92
Capacity constrained production	-0.01	-0.07	-0.20	-0.38	-0.58	-0.96
Labour constrained production	-0.02	-0.15	-0.29	-0.41	-0.52	-0.67
Labour cost rate	-0.18	-0.35	-0.45	-0.52	-0.57	-0.67
Unit labour costs	-0.04	-0.08	-0.09	-0.06	-0.06	-0.14

5. Productivities

	1989	1990	1991	1992	1993	1995
Technical labour productivity	-0.03	-0.15	-0.27	-0.36	-0.44	-0.55
Apparent labour productivity	-0.14	-0.27	-0.36	-0.45	-0.51	-0.53
Technical capital productivity	-0.01	-0.04	-0.06	-0.06	-0.06	-0.06
Apparent capital productivity	-0.26	-0.45	-0.46	-0.41	-0.30	0.03

Sensitivity analysis : ratios and variations (absolute deviations from baseline)

Significant ratios

1. Share in GNP of :

	1989	1990	1991	1992	1993	1995
Public sector deficit	-0.90	-0.85	-0.87	-0.87	-0.88	-0.94
Interests of the public debt	-0.02	-0.10	-0.16	-0.20	-0.24	-0.30
Total public debt	-0.46	-1.03	-1.74	-2.44	-3.16	-4.66
Net exports	0.44	0.78	0.89	0.98	1.04	1.11
Wages and self employed incomes	0.07	0.06	0.04	0.02	-0.02	-0.15
2. Saving ratio	-0.50	-0.25	-0.24	-0.22	-0.21	-0.18
3. Unemployment rate	0.06	0.13	0.16	0.19	0.22	0.25

4. Degrees of capacity utilisation

	1989	1990	1991	1992	1993	1995
Total capacity	-0.22	-0.38	-0.37	-0.32	-0.22	0.08
Equipments constrained capacity	-0.24	-0.38	-0.37	-0.32	-0.22	0.08
Labour constrained capacity	-0.22	-0.31	-0.29	-0.30	-0.29	-0.19
5. Demand pressure (QDF/QAFFT)	-0.23	-0.29	-0.26	-0.21	-0.16	-0.05

6. Proportion of enterprises

	1989	1990	1991	1992	1993	1995
Demand constrained	2.60	3.58	3.27	2.87	2.23	0.68
Capacity constrained	-1.52	-1.95	-1.55	-1.12	-0.69	0.30
Labour supply constrained	-1.08	-1.64	-1.72	-1.75	-1.53	-0.98

Absolute variations

	1989	1990	1991	1992	1993	1995
Unemployment	2.59	5.40	6.85	8.21	9.50	10.95
Total full time equiv. employment	-3.26	-6.07	-6.96	-8.08	-9.21	-10.23
Net exports	24.87	47.02	57.03	66.67	74.81	91.43
Public sector deficit	-53.97	-55.17	-59.93	-63.63	-68.08	-82.73

Variant 5

	1989	1990	1991	1992	1993	1995

Sensitivity analysis : multipliers (percentage deviations from baseline)

	1989	1990	1991	1992	1993	1995
1. Labour Market (June 30)						
Total employment	-0.04	-0.10	-0.13	-0.16	-0.19	-0.23
Enterprises sector	-0.05	-0.12	-0.16	-0.20	-0.24	-0.29
State sector	0.00	0.00	0.00	0.00	0.00	0.00
Active population	0.00	0.00	0.00	0.00	0.00	0.00
Unemployment	0.32	0.90	1.37	1.92	2.44	3.20
2. Demand and output						
Private consumption	-0.59	-0.97	-1.12	-1.28	-1.40	-1.58
Public consumption	0.00	0.00	0.00	0.00	0.00	0.00
Gross capital formation	-0.12	-1.12	-1.64	-2.14	-2.42	-2.22
- GFCF enterprises	-0.19	-0.61	-1.22	-1.77	-2.14	-1.87
- GFCF state	0.00	0.00	0.00	0.00	0.00	0.00
- GFCF residential sector	0.00	-3.56	-4.10	-4.50	-4.48	-4.05
Exports of goods and services	0.02	0.05	0.07	0.07	0.06	0.00
Imports of goods and services	-0.36	-0.67	-0.75	-0.84	-0.88	-0.88
Gross domestic product	-0.12	-0.27	-0.36	-0.47	-0.56	-0.64
Gross national product	-0.11	-0.23	-0.29	-0.35	-0.40	-0.39
3. Prices, wages and incomes						
Private consumption deflator	-0.05	-0.11	-0.14	-0.15	-0.14	-0.13
Terms of trade (goods and serv.)	-0.02	-0.02	-0.01	-0.02	-0.01	0.03
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00
Wage cost rate	-0.08	-0.20	-0.30	-0.38	-0.45	-0.56
Interest rate	-0.29	-1.61	-0.86	-0.70	-0.55	-0.19
Households disposable income	-1.55	-1.75	-1.87	-1.97	-2.04	-2.12
Enterprises gross profits	0.02	0.03	-0.05	-0.10	0.19	2.04
4. Endogeneous sector						
Value added (constant prices)	-0.15	-0.34	-0.45	-0.57	-0.67	-0.75
Value added deflator	-0.08	-0.11	-0.14	-0.15	-0.14	-0.08
Total output	-0.28	-0.56	-0.67	-0.78	-0.85	-0.84
Demand constrained production	-0.28	-0.54	-0.65	-0.76	-0.82	-0.82
Capacity constrained production	0.00	-0.05	-0.13	-0.26	-0.42	-0.76
Labour constrained production	-0.01	-0.09	-0.20	-0.30	-0.39	-0.55
Labour cost rate	-0.11	-0.24	-0.33	-0.40	-0.46	-0.56
Unit labour costs	-0.03	-0.05	-0.07	-0.05	-0.04	-0.11
5. Productivities						
Technical labour productivity	-0.02	-0.09	-0.18	-0.27	-0.34	-0.46
Apparent labour productivity	-0.08	-0.19	-0.26	-0.35	-0.41	-0.46
Technical capital productivity	0.00	-0.02	-0.04	-0.05	-0.05	-0.05
Apparent capital productivity	-0.15	-0.31	-0.36	-0.36	-0.30	-0.04

Sensitivity analysis : ratios and variations (absolute deviations from baseline)

Significant ratios

	1989	1990	1991	1992	1993	1995
1. Share in GNP of :						
Public sector deficit	-0.93	-0.89	-0.91	-0.90	-0.90	-0.93
Interests of the public debt	-0.03	-0.11	-0.18	-0.23	-0.27	-0.33
Total public debt	-0.68	-1.30	-2.02	-2.71	-3.41	-4.82
Net exports	0.25	0.54	0.67	0.78	0.85	0.95
Wages and self employed incomes	0.04	0.05	0.04	0.03	0.00	-0.10
2. Saving ratio	-0.80	-0.60	-0.54	-0.48	-0.44	-0.36
3. Unemployment rate	0.04	0.09	0.12	0.15	0.18	0.22
4. Degrees of capacity utilisation						
Total capacity	-0.13	-0.27	-0.29	-0.29	-0.23	0.01
Equipments constrained capacity	-0.14	-0.27	-0.29	-0.29	-0.23	0.01
Labour constrained capacity	-0.13	-0.23	-0.23	-0.26	-0.26	-0.19
5. Demand pressure (QDF/QAFFT)	-0.13	-0.21	-0.21	-0.19	-0.15	-0.07
6. Proportion of enterprises						
Demand constrained	1.50	2.60	2.60	2.51	2.13	0.94
Capacity constrained	-0.88	-1.40	-1.23	-1.00	-0.73	0.03
Labour supply constrained	-0.62	-1.21	-1.38	-1.51	-1.39	-0.97
Absolute variations						
Unemployment	1.48	3.73	5.10	6.46	7.75	9.29
Total full time equiv. employment	-1.86	-4.28	-5.29	-6.48	-7.61	-8.75
Net exports	14.41	32.71	42.85	52.90	61.49	78.69
Public sector deficit	-55.21	-57.15	-62.01	-65.65	-69.57	-81.71

Maribel II

Variant 6	1989	1990	1991	1992	1993	1995

Sensitivity analysis : multipliers (percentage deviations from baseline)

1. Labour Market (June 30)

	1989	1990	1991	1992	1993	1995
Total employment	-0.25	-0.51	-0.66	-0.70	-0.68	-0.57
Enterprises sector	-0.32	-0.64	-0.82	-0.88	-0.85	-0.71
State sector	0.00	0.00	0.00	0.00	0.00	0.00
Active population	0.00	0.00	0.00	0.00	0.00	0.00
Unemployment	2.12	4.78	6.96	8.30	8.57	7.87

2. Demand and output

	1989	1990	1991	1992	1993	1995
Private consumption	-0.59	-0.70	-0.70	-0.69	-0.68	-0.70
Public consumption	0.00	0.00	0.00	0.00	0.00	0.01
Gross capital formation	-0.03	0.08	0.27	0.22	0.38	-0.15
- GFCF enterprises	-0.05	-0.35	-0.15	-0.10	0.27	0.68
- GFCF state	0.00	0.00	0.00	0.00	0.00	0.00
- GFCF residential sector	0.00	1.60	1.85	1.27	0.86	-2.07
Exports of goods and services	-0.47	-0.26	-0.04	0.09	0.16	0.21
Imports of goods and services	-0.74	-0.54	-0.39	-0.30	-0.22	-0.26
Gross domestic product	-0.19	-0.22	-0.13	-0.09	-0.06	-0.07
Gross national product	-0.12	-0.17	-0.07	0.00	0.05	0.08

3. Prices, wages and incomes

	1989	1990	1991	1992	1993	1995
Private consumption deflator	2.19	2.24	2.05	1.80	1.60	1.38
Terms of trade (goods and serv.)	-0.04	0.02	0.05	0.07	0.08	0.06
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00
Wage cost rate	2.08	1.85	1.32	0.79	0.40	0.03
Interest rate	2.08	1.85	1.56	0.68	0.12	-0.34
Households disposable income	1.79	1.61	1.27	0.94	0.70	0.46
Enterprises gross profits	-6.90	-4.33	-1.34	0.84	2.22	2.04

4. Endogeneous sector

	1989	1990	1991	1992	1993	1995
Value added (constant prices)	-0.13	-0.09	0.00	0.03	0.05	0.02
Value added deflator	0.42	0.34	0.13	-0.09	-0.25	-0.44
Total output	-0.47	-0.37	-0.23	-0.16	-0.09	-0.14
Demand constrained production	-0.47	-0.45	-0.30	-0.19	-0.07	-0.06
Capacity constrained production	0.07	0.07	-0.02	-0.07	-0.11	-0.02
Labour constrained production	0.57	0.79	0.78	0.67	0.53	0.29
Labour cost rate	2.00	1.78	1.26	0.76	0.39	0.01
Unit labour costs	1.68	1.07	0.33	-0.20	-0.51	-0.68

5. Productivities

	1989	1990	1991	1992	1993	1995
Technical labour productivity	0.54	0.79	0.88	0.87	0.81	0.66
Apparent labour productivity	0.31	0.70	0.93	0.96	0.90	0.70
Technical capital productivity	0.07	0.07	0.03	-0.02	-0.05	-0.05
Apparent capital productivity	-0.13	-0.08	0.05	0.09	0.11	-0.02

Sensitivity analysis : ratios and variations (absolute deviations from baseline)

Significant ratios

1. Share in GNP of :

	1989	1990	1991	1992	1993	1995
Public sector deficit	-0.50	-0.35	-0.38	-0.41	-0.47	-0.52
Interests of the public debt	-0.10	-0.05	-0.10	-0.14	-0.18	-0.23
Total public debt	-2.49	-2.67	-2.78	-2.86	-3.03	-3.46
Net exports	0.12	0.17	0.26	0.35	0.38	0.49
Wages and self employed incomes	-0.04	-0.32	-0.62	-0.82	-0.93	-0.94
2. Saving ratio	0.17	0.08	-0.05	-0.13	-0.18	-0.18
3. Unemployment rate	0.23	0.46	0.60	0.65	0.63	0.53

4. Degrees of capacity utilisation

	1989	1990	1991	1992	1993	1995
Total capacity	-0.64	-0.74	0.02	0.10	0.15	0.03
Equipments constrained capacity	-0.18	-0.14	0.02	0.10	0.15	0.03
Labour constrained capacity	-0.64	-0.81	-0.72	-0.60	-0.44	-0.25
5. Demand pressure (QDF/QAFFT)	-0.36	-0.38	-0.31	-0.22	-0.13	-0.08

6. Proportion of enterprises

	1989	1990	1991	1992	1993	1995
Demand constrained	4.19	4.75	3.99	3.02	1.82	1.15
Capacity constrained	-1.18	-0.75	0.07	0.36	0.48	0.12
Labour supply constrained	-3.01	-4.00	-4.07	-3.38	-2.30	-1.27

Absolute variations

	1989	1990	1991	1992	1993	1995
Unemployment	9.71	19.85	25.89	27.99	27.27	22.87
Total full time equiv. employment	-12.20	-22.26	-26.50	-26.79	-24.81	-19.88
Net exports	10.11	13.96	21.14	28.49	32.44	45.82
Public sector deficit	-22.32	-15.07	-18.67	-23.43	-29.57	-39.17

Maribel II

Variant 7	1989	1990	1991	1992	1993	1995

Sensitivity analysis : multipliers (percentage deviations from baseline)

1. Labour Market (June 30)

	1989	1990	1991	1992	1993	1995
Total employment	-0.41	-0.83	-1.06	-1.08	-0.97	-0.62
Enterprises sector	-0.51	-1.04	-1.32	-1.34	-1.21	-0.78
State sector	0.00	0.00	0.00	0.00	0.00	0.00
Active population	0.00	0.00	0.00	0.00	0.00	0.00
Unemployment	3.42	7.79	11.18	12.73	12.22	8.63

2. Demand and output

Private consumption	-0.19	-0.42	-0.55	-0.67	-0.75	-0.90
Public consumption	0.00	0.00	0.00	0.00	0.00	0.01
Gross capital formation	-0.43	-0.97	-0.87	-0.52	0.02	0.00
- GFCF enterprises	-0.64	-1.37	-1.08	-0.11	1.09	1.83
- GFCF state	0.00	0.00	0.00	0.00	0.00	0.00
- GFCF residential sector	0.00	-0.22	-0.71	-2.01	-2.77	-4.04
Exports of goods and services	-0.85	-0.44	-0.08	0.13	0.22	0.25
Imports of goods and services	-0.99	-0.82	-0.60	-0.45	-0.33	-0.36
Gross domestic product	-0.11	-0.17	-0.10	-0.05	-0.02	-0.05
Gross national product	-0.08	-0.15	-0.06	0.02	0.09	0.13

3. Prices, wages and Incomes

Private consumption deflator	0.74	0.75	0.38	-0.05	-0.39	-0.68
Terms of trade (goods and serv.)	-0.09	-0.01	0.06	0.10	0.12	0.05
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00
Wage cost rate	3.73	2.95	1.80	0.76	0.02	-0.57
Interest rate	0.73	-0.20	0.13	-0.48	-0.89	-0.92
Households disposable income	0.55	-0.02	-0.69	-1.30	-1.73	-2.04
Enterprises gross profits	-11.58	-5.26	0.78	5.33	7.84	5.98

4. Endogenous sector

Value added (constant prices)	-0.10	-0.16	-0.09	-0.06	-0.04	-0.08
Value added deflator	0.75	0.67	0.29	-0.07	-0.35	-0.60
Total output	-0.59	-0.54	-0.37	-0.23	-0.12	-0.19
Demand constrained production	-0.59	-0.70	-0.51	-0.29	-0.11	-0.08
Capacity constrained production	0.14	0.04	-0.21	-0.42	-0.46	-0.13
Labour constrained production	1.02	1.29	1.12	0.80	0.45	-0.05
Labour cost rate	3.60	2.82	1.71	0.71	0.00	-0.58
Unit labour costs	2.97	1.67	0.31	-0.62	-1.13	-1.17

5. Productivities

Technical labour productivity	0.97	1.29	1.28	1.13	0.92	0.50
Apparent labour productivity	0.61	1.13	1.40	1.35	1.14	0.60
Technical capital productivity	0.14	0.11	0.01	-0.10	-0.17	-0.17
Apparent capital productivity	-0.10	-0.09	0.13	0.26	0.26	-0.12

Sensitivity analysis : ratios and variations (absolute deviations from baseline)

Significant ratios

1. Share in GNP of :

	1989	1990	1991	1992	1993	1995
Public sector deficit	-0.85	-0.64	-0.63	-0.68	-0.76	-0.90
Interests of the public debt	-0.07	-0.10	-0.15	-0.19	-0.23	-0.29
Total public debt	-1.59	-2.02	-2.19	-2.38	-2.73	-3.79
Net exports	0.00	0.24	0.44	0.58	0.63	0.71
Wages and self employed incomes	1.18	0.55	0.03	-0.30	-0.46	-0.37
2. Saving ratio	0.00	-0.29	-0.45	-0.51	-0.52	-0.40
3. Unemployment rate	0.36	0.75	0.97	1.00	0.90	0.58

4. Degrees of capacity utilisation

Total capacity	-1.03	-1.27	0.11	0.33	0.39	0.04
Equipments constrained capacity	-0.22	-0.19	0.11	0.33	0.39	0.04
Labour constrained capacity	-1.03	-1.34	-1.13	-0.80	-0.45	-0.03
5. Demand pressure (QDF/QAFFT)	-0.51	-0.56	-0.43	-0.24	-0.07	0.00

6. Proportion of enterprises

Demand constrained	6.04	7.18	5.56	3.19	1.04	-0.02
Capacity constrained	-1.42	-0.97	0.50	1.23	1.32	0.17
Labour supply constrained	-4.62	-6.21	-6.06	-4.42	-2.37	-0.15

Absolute variations

Unemployment	15.64	32.36	41.56	42.92	38.87	25.08
Total full time equiv. employment	-19.65	-36.34	-42.40	-40.44	-34.20	-19.82
Net exports	1.24	15.95	29.77	40.44	45.71	58.03
Public sector deficit	-47.46	-38.08	-40.56	-47.88	-58.10	-78.67

Variant 8	1989	1990	1991	1992	1993	1995

Sensitivity analysis : multipliers (percentage deviations from baseline)

	1989	1990	1991	1992	1993	1995
1. Labour Market (June 30)						
Total employment	-0.23	-0.44	-0.56	-0.60	-0.57	-0.42
Enterprises sector	-0.29	-0.55	-0.70	-0.75	-0.71	-0.53
State sector	0.00	0.00	0.00	0.00	0.00	0.00
Active population	0.00	0.00	0.00	0.00	0.00	0.00
Unemployment	1.93	4.10	5.97	7.08	7.14	5.87
2. Demand and output						
Private consumption	-0.40	-0.47	-0.45	-0.44	-0.43	-0.42
Public consumption	0.00	0.00	0.00	0.00	0.00	0.06
Gross capital formation	-0.10	-0.44	-0.35	-0.27	0.08	0.10
- GFCF enterprises	-0.15	-0.93	-0.82	-0.47	0.28	1.32
- GFCF state	0.00	0.00	0.00	0.00	0.00	0.00
- GFCF residential sector	0.00	0.96	0.95	0.13	-0.46	-2.60
Exports of goods and services	-0.23	0.02	0.23	0.37	0.44	0.52
Imports of goods and services	-0.57	-0.63	-0.53	-0.48	-0.41	-0.38
Gross domestic product	-0.02	0.12	0.25	0.35	0.43	0.53
Gross national product	0.03	0.16	0.32	0.46	0.59	0.77
3. Prices, wages and incomes						
Private consumption deflator	1.39	1.22	0.87	0.50	0.20	-0.18
Terms of trade (goods and serv.)	-0.11	-0.05	-0.03	0.00	0.03	0.00
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00
Wage cost rate	1.26	0.84	0.19	-0.42	-0.88	-1.32
Interest rate	1.37	0.86	0.82	0.18	-0.22	-0.44
Households disposable income	1.05	0.67	0.20	-0.24	-0.58	-0.92
Enterprises gross profits	-8.97	-5.61	-2.44	0.25	2.23	2.59
4. Endogeneous sector						
Value added (constant prices)	0.06	0.27	0.41	0.51	0.60	0.70
Value added deflator	-0.71	-0.94	-1.29	-1.61	-1.87	-2.20
Total output	-0.27	-0.17	-0.01	0.11	0.22	0.28
Demand constrained production	-0.27	-0.02	0.19	0.38	0.57	0.73
Capacity constrained production	0.24	0.35	0.29	0.24	0.24	0.49
Labour constrained production	0.69	0.98	1.05	1.00	0.91	0.78
Labour cost rate	1.18	0.77	0.14	-0.45	-0.90	-1.34
Unit labour costs	0.72	-0.16	-1.06	-1.73	-2.18	-2.50
5. Productivities						
Technical labour productivity	0.66	0.99	1.13	1.18	1.16	1.09
Apparent labour productivity	0.45	0.94	1.21	1.30	1.31	1.19
Technical capital productivity	0.24	0.36	0.41	0.44	0.46	0.55
Apparent capital productivity	0.06	0.28	0.53	0.71	0.83	0.76

Sensitivity analysis : ratios and variations (absolute deviations from baseline)

	1989	1990	1991	1992	1993	1995
Significant ratios						
1. Share in GNP of :						
Public sector deficit	-0.69	-0.65	-0.71	-0.79	-0.88	-1.03
Interests of the public debt	-0.07	-0.07	-0.13	-0.18	-0.24	-0.32
Total public debt	-1.94	-2.43	-2.78	-3.18	-3.71	-5.01
Net exports	0.15	0.41	0.56	0.70	0.78	0.92
Wages and self employed incomes	-0.12	-0.46	-0.78	-1.01	-1.15	-1.20
2. Saving ratio	0.06	-0.06	-0.18	-0.26	-0.30	-0.27
3. Unemployment rate	0.21	0.40	0.52	0.55	0.53	0.40
4. Degrees of capacity utilisation						
Total capacity	-0.59	-0.59	0.11	0.25	0.33	0.20
Equipments constrained capacity	-0.18	-0.07	0.11	0.25	0.33	0.20
Labour constrained capacity	-0.59	-0.66	-0.59	-0.46	-0.29	-0.07
5. Demand pressure (QDF/QAFFT)	-0.34	-0.30	-0.23	-0.13	-0.03	0.03
6. Proportion of enterprises						
Demand constrained	3.89	3.71	2.90	1.72	0.42	-0.39
Capacity constrained	-1.13	-0.39	0.48	0.91	1.11	0.78
Labour supply constrained	-2.76	-3.32	-3.38	-2.63	-1.53	-0.38
Absolute variations						
Unemployment	8.83	17.01	22.21	23.87	22.73	17.05
Total full time equiv. employment	-11.09	-18.94	-22.71	-22.79	-20.49	-14.28
Net exports	10.46	27.97	39.44	51.34	59.72	79.58
Public sector deficit	-36.59	-36.81	-43.89	-53.12	-64.18	-86.88

Maribel II

Variant 8

	1989	1990	1991	1992	1993	1995

Sensitivity analysis : multipliers (percentage deviations from baseline)

1. Labour Market (June 30)

	1989	1990	1991	1992	1993	1995
Total employment	0.35	1.06	1.88	2.62	3.25	4.04
Enterprises sector	0.44	1.33	2.35	3.26	4.04	5.03
State sector	0.00	0.00	0.00	0.00	0.00	0.00
Active population	0.00	0.00	0.00	0.00	0.00	0.00
Unemployment	-2.91	-9.93	-19.91	-30.90	-40.82	-55.99

2. Demand and output

	1989	1990	1991	1992	1993	1995
Private consumption	-0.24	-0.57	-0.96	-1.38	-1.81	-2.58
Public consumption	0.00	0.00	0.00	0.00	0.00	-0.36
Gross capital formation	0.23	0.02	-1.12	-3.29	-5.97	-9.16
- GFCF enterprises	0.34	0.64	-0.43	-3.35	-7.44	-13.21
- GFCF state	0.00	0.00	0.00	0.00	0.00	0.00
- GFCF residential sector	0.00	-2.12	-4.10	-5.01	-5.33	-4.58
Exports of goods and services	0.74	1.05	1.07	1.00	0.90	0.46
Imports of goods and services	0.67	0.96	1.02	0.83	0.44	-0.19
Gross domestic product	-0.05	-0.26	-0.74	-1.30	-1.80	-2.73
Gross national product	-0.06	-0.27	-0.75	-1.31	-1.81	-2.73

3. Prices, wages and incomes

	1989	1990	1991	1992	1993	1995
Private consumption deflator	-0.63	-1.16	-1.27	-1.05	-0.67	0.31
Terms of trade (goods and serv.)	0.06	0.03	-0.08	-0.26	-0.40	-0.39
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00
Wage cost rate	-3.21	-5.61	-7.02	-7.75	-8.11	-8.41
Interest rate	-0.86	-1.82	-2.71	-2.96	-2.69	-1.50
Households disposable income	-1.46	-2.44	-2.90	-3.03	-2.96	-2.58
Enterprises gross profits	9.45	13.04	11.03	6.43	1.31	-3.58

4. Endogeneous sector

	1989	1990	1991	1992	1993	1995
Value added (constant prices)	-0.09	-0.40	-1.02	-1.71	-2.30	-3.36
Value added deflator	-0.65	-1.11	-1.18	-1.05	-0.81	0.12
Total output	0.31	0.29	-0.07	-0.63	-1.24	-2.07
Demand constrained production	0.31	0.43	0.17	-0.38	-1.02	-1.99
Capacity constrained production	-0.11	-0.15	-0.06	0.01	-0.20	-1.67
Labour constrained production	-0.91	-2.09	-3.22	-4.24	-5.10	-6.31
Labour cost rate	-3.12	-5.43	-6.78	-7.49	-7.85	-8.12
Unit labour costs	-2.45	-3.44	-3.18	-2.40	-1.52	0.06

5. Productivities

	1989	1990	1991	1992	1993	1995
Technical labour productivity	-0.87	-2.05	-3.32	-4.61	-5.81	-7.71
Apparent labour productivity	-0.68	-2.06	-3.71	-5.21	-6.43	-8.17
Technical capital productivity	-0.11	-0.19	-0.16	-0.04	0.11	0.35
Apparent capital productivity	-0.09	-0.44	-1.12	-1.76	-2.00	-1.38

Sensitivity analysis : ratios and variations (absolute deviations from baseline)

Significant ratios

1. Share in GNP of :

	1989	1990	1991	1992	1993	1995
Public sector deficit	0.14	0.13	0.17	0.29	0.43	0.72
Interests of the public debt	0.04	0.04	0.04	0.05	0.08	0.18
Total public debt	0.97	1.89	2.62	3.26	3.78	4.57
Net exports	0.12	0.17	0.09	0.05	0.14	0.27
Wages and self employed incomes	-0.96	-1.28	-1.15	-0.83	-0.50	-0.15
2. Saving ratio	-0.52	-0.64	-0.61	-0.55	-0.45	-0.26
3. Unemployment rate	-0.31	-0.96	-1.72	-2.42	-3.01	-3.77

4. Degrees of capacity utilisation

	1989	1990	1991	1992	1993	1995
Total capacity	0.78	-0.23	-0.89	-1.57	-1.92	-1.58
Equipments constrained capacity	0.02	-0.23	-0.89	-1.57	-1.92	-1.58
Labour constrained capacity	0.78	1.62	2.14	2.49	2.77	2.94
5. Demand pressure (QDF/QAFFT)	0.42	0.85	1.23	1.38	1.34	1.44

6. Proportion of enterprises

	1989	1990	1991	1992	1993	1995
Demand constrained	-4.42	-9.35	-13.25	-15.47	-16.11	-16.73
Capacity constrained	0.15	-1.18	-3.48	-4.72	-5.00	-5.15
Labour supply constrained	4.27	10.53	16.73	20.19	21.11	21.88

Absolute variations

	1989	1990	1991	1992	1993	1995
Unemployment	-13.34	-41.25	-74.04	-104.21	-129.83	-162.68
Total full time equiv. employment	16.76	48.15	80.87	107.99	129.62	154.50
Net exports	6.11	7.93	1.24	-2.80	3.40	14.31
Public sector deficit	5.36	1.83	2.43	9.63	20.07	47.11

Maribel II

Variant 10	1989	1990	1991	1992	1993	1995

Sensitivity analysis : multipliers (percentage deviations from baseline)

1. Labour Market (June 30)

Total employment	0.17	0.32	0.39	0.45	0.51	0.58
Enterprises sector	0.21	0.40	0.48	0.56	0.63	0.72
State sector	0.00	0.00	0.00	0.00	0.00	0.00
Active population	0.00	0.00	0.00	0.00	0.00	0.00
Unemployment	-1.41	-2.98	-4.11	-5.30	-6.40	-7.99

2. Demand and output

Private consumption	0.01	0.04	0.10	0.20	0.31	0.48
Public consumption	0.00	0.00	0.00	0.00	0.00	0.07
Gross capital formation	0.48	1.49	2.57	3.23	3.46	2.64
- GFCF enterprises	0.71	2.25	3.79	4.76	5.07	3.69
- GFCF state	0.00	0.00	0.00	0.00	0.00	0.00
- GFCF residential sector	0.00	-0.23	0.06	0.55	1.06	1.50
Exports of goods and services	2.04	2.83	2.75	2.76	2.81	2.94
Imports of goods and services	1.63	2.35	2.39	2.40	2.38	2.33
Gross domestic product	0.44	0.72	0.87	1.05	1.21	1.36
Gross national product	0.47	0.77	0.96	1.17	1.36	1.57

3. Prices, wages and incomes

Private consumption deflator	0.26	0.53	0.67	0.72	0.70	0.68
Terms of trade (goods and serv.)	0.16	0.12	0.10	0.11	0.10	0.04
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00
Wage cost rate	0.41	0.89	1.24	1.46	1.61	1.86
Interest rate	1.24	1.91	2.11	1.97	1.64	0.91
Households disposable income	0.47	0.91	1.15	1.28	1.35	1.41
Enterprises gross profits	3.36	4.39	4.73	5.33	5.17	2.64

4. Endogeneous sector

Value added (constant prices)	0.57	0.94	1.14	1.38	1.58	1.74
Value added deflator	0.56	0.82	0.90	0.92	0.86	0.74
Total output	1.19	1.81	1.95	2.06	2.12	2.07
Demand constrained production	1.19	1.69	1.77	1.87	1.93	1.89
Capacity constrained production	-0.01	0.10	0.37	0.74	1.14	1.81
Labour constrained production	0.00	0.22	0.50	0.74	0.95	1.28
Labour cost rate	0.54	1.01	1.30	1.49	1.62	1.86
Unit labour costs	0.26	0.56	0.69	0.71	0.71	0.86

5. Productivities

Technical labour productivity	0.02	0.22	0.43	0.62	0.78	1.02
Apparent labour productivity	0.28	0.45	0.61	0.78	0.90	1.00
Technical capital productivity	-0.01	0.02	0.04	0.03	0.01	-0.02
Apparent capital productivity	0.57	0.86	0.81	0.67	0.44	-0.09

Sensitivity analysis : ratios and variations (absolute deviations from baseline)

Significant ratios

1. Share in GNP of :

Public sector deficit	-0.30	-0.45	-0.55	-0.68	-0.80	-0.96
Interests of the public debt	-0.04	-0.04	-0.07	-0.12	-0.17	-0.29
Total public debt	-1.36	-2.36	-3.09	-3.86	-4.60	-5.97
Net exports	0.46	0.52	0.45	0.48	0.55	0.71
Wages and self employed incomes	-0.12	-0.08	-0.07	-0.08	-0.06	0.03
2. Saving ratio	0.17	0.30	0.32	0.30	0.28	0.21
3. Unemployment rate	-0.15	-0.29	-0.36	-0.41	-0.47	-0.54

4. Degrees of capacity utilisation

Total capacity	0.53	0.74	0.72	0.58	0.39	-0.06
Equipments constrained capacity	0.54	0.78	0.72	0.58	0.39	-0.06
Labour constrained capacity	0.53	0.67	0.61	0.60	0.58	0.42
5. Demand pressure (QDF/QAFFT)	0.64	0.76	0.64	0.49	0.35	0.15

6. Proportion of enterprises

Demand constrained	-6.64	-8.44	-7.31	-6.11	-4.73	-2.07
Capacity constrained	3.81	4.54	3.36	2.24	1.33	-0.25
Labour supply constrained	2.82	3.90	3.95	3.87	3.40	2.31

Absolute variations

Unemployment	-6.45	-12.39	-15.29	-17.86	-20.35	-23.21
Total full time equiv. employment	8.11	13.78	15.42	17.43	19.60	21.61
Net exports	28.84	35.93	34.66	39.70	47.35	69.00
Public sector deficit	-14.01	-22.43	-29.61	-40.39	-52.01	-72.58

Variant 11	1989	1990	1991	1992	1993	1995

Sensitivity analysis : multipliers (percentage deviations from baseline)

1. Labour Market (June 30)

	1989	1990	1991	1992	1993	1995
Total employment	0.00	-0.02	-0.03	-0.03	-0.02	0.01
Enterprises sector	0.00	-0.02	-0.04	-0.04	-0.03	0.01
State sector	0.00	0.00	0.00	0.00	0.00	0.00
Active population	0.00	0.00	0.00	0.00	0.00	0.00
Unemployment	-0.01	0.15	0.32	0.38	0.30	-0.08

2. Demand and output

	1989	1990	1991	1992	1993	1995
Private consumption	0.06	0.07	0.17	0.30	0.44	0.67
Public consumption	0.00	0.00	0.00	0.00	0.00	0.03
Gross capital formation	-0.15	-0.88	-1.35	-1.44	-1.22	-0.40
- GFCF enterprises	-0.22	-0.49	-0.68	-0.68	-0.41	0.59
- GFCF state	0.00	0.00	0.00	0.00	0.00	0.00
- GFCF residential sector	0.00	-2.79	-4.39	-4.54	-4.00	-2.76
Exports of goods and services	0.00	0.01	0.01	0.01	-0.01	-0.03
Imports of goods and services	0.02	-0.09	-0.08	-0.02	0.07	0.27
Gross domestic product	0.00	-0.05	-0.06	-0.04	0.00	0.10
Gross national product	-0.10	-0.24	-0.25	-0.22	-0.17	-0.08

3. Prices, wages and incomes

	1989	1990	1991	1992	1993	1995
Private consumption deflator	0.00	-0.02	-0.03	-0.03	-0.04	-0.04
Terms of trade (goods and serv.)	0.00	0.00	0.01	0.02	0.03	0.05
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00
Wage cost rate	0.00	-0.03	-0.06	-0.08	-0.09	-0.07
Interest rate	4.91	7.18	8.23	8.76	9.36	9.97
Households disposable income	0.16	0.31	0.40	0.50	0.59	0.76
Enterprises gross profits	-0.50	-0.93	-1.03	-0.84	-0.42	0.27

4. Endogeneous sector

	1989	1990	1991	1992	1993	1995
Value added (constant prices)	0.01	-0.04	-0.05	-0.03	0.03	0.15
Value added deflator	-0.02	-0.04	-0.04	-0.03	-0.02	0.01
Total output	0.02	-0.07	-0.07	-0.01	0.09	0.29
Demand constrained production	0.02	-0.06	-0.06	0.00	0.10	0.29
Capacity constrained production	0.00	-0.02	-0.08	-0.14	-0.20	-0.19
Labour constrained production	0.01	0.01	-0.01	-0.03	-0.03	0.02
Labour cost rate	0.00	-0.04	-0.07	-0.08	-0.08	-0.05
Unit labour costs	-0.01	-0.03	-0.06	-0.09	-0.13	-0.18

5. Productivities

	1989	1990	1991	1992	1993	1995
Technical labour productivity	0.01	0.00	-0.01	-0.02	-0.02	0.03
Apparent labour productivity	0.01	-0.01	-0.01	0.01	0.05	0.13
Technical capital productivity	0.00	0.01	0.00	0.00	0.00	0.00
Apparent capital productivity	0.01	-0.01	0.03	0.11	0.23	0.34

Sensitivity analysis : ratios and variations (absolute deviations from baseline)

Significant ratios

1. Share in GNP of :

	1989	1990	1991	1992	1993	1995
Public sector deficit	0.18	0.44	0.51	0.56	0.58	0.60
Interests of the public debt	0.22	0.48	0.58	0.67	0.74	0.84
Total public debt	0.29	0.89	1.36	1.80	2.20	2.93
Net exports	-0.11	-0.12	-0.10	-0.13	-0.20	-0.37
Wages and self employed incomes	0.06	0.13	0.10	0.08	0.04	0.00
2. Saving ratio	0.08	0.22	0.22	0.20	0.16	0.11
3. Unemployment rate	0.00	0.02	0.03	0.03	0.02	-0.01

4. Degrees of capacity utilisation

	1989	1990	1991	1992	1993	1995
Total capacity	0.01	-0.02	0.02	0.10	0.21	0.31
Equipments constrained capacity	0.01	-0.02	0.02	0.10	0.21	0.31
Labour constrained capacity	0.01	-0.04	-0.04	0.00	0.05	0.12
5. Demand pressure (QDF/QAFFT)	0.01	-0.03	-0.01	0.03	0.07	0.14

6. Proportion of enterprises

	1989	1990	1991	1992	1993	1995
Demand constrained	-0.07	0.31	0.12	-0.37	-0.97	-1.91
Capacity constrained	0.05	-0.09	0.10	0.38	0.69	1.26
Labour supply constrained	0.03	-0.22	-0.22	-0.01	0.28	0.64

Absolute variations

	1989	1990	1991	1992	1993	1995
Unemployment	-0.05	0.64	1.17	1.28	0.94	-0.23
Total full time equiv. employment	0.06	-0.82	-1.31	-1.26	-0.76	0.46
Net exports	-6.38	-7.93	-7.14	-10.03	-15.37	-31.59
Public sector deficit	10.22	26.04	32.52	38.32	42.51	50.64

Variant 12	1989	1990	1991	1992	1993	1995

Sensitivity analysis : multipliers (percentage deviations from baseline)

	1989	1990	1991	1992	1993	1995
1. Labour Market (June 30)						
Total employment	-0.16	-0.32	-0.48	-0.63	-0.73	-0.80
Enterprises sector	-0.20	-0.39	-0.60	-0.78	-0.91	-1.00
State sector	0.00	0.00	0.00	0.00	0.00	0.00
Active population	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00
Unemployment	-8.07	-7.41	-6.51	-5.38	-4.34	-3.70
2. Demand and output						
Private consumption	-0.19	-0.25	-0.26	-0.27	-0.26	-0.21
Public consumption	0.00	0.00	0.00	0.00	0.00	0.05
Gross capital formation	-0.32	-1.04	-1.52	-1.56	-1.11	0.33
- GFCF enterprises	-0.47	-1.51	-2.33	-2.46	-1.81	0.80
- GFCF state	0.00	0.00	0.00	0.00	0.00	0.00
- GFCF residential sector	0.00	-0.09	0.19	0.21	0.12	-0.50
Exports of goods and services	-0.21	-0.26	-0.24	-0.20	-0.18	-0.14
Imports of goods and services	-0.07	-0.24	-0.29	-0.26	-0.17	0.05
Gross domestic product	-0.28	-0.36	-0.41	-0.41	-0.36	-0.23
Gross national product	-0.28	-0.36	-0.41	-0.41	-0.36	-0.23
3. Prices, wages and incomes						
Private consumption deflator	0.29	0.48	0.58	0.58	0.51	0.28
Terms of trade (goods and serv.)	-0.02	-0.09	-0.07	-0.03	0.02	0.08
Exchange rate	0.00	0.00	0.00	0.00	0.00	0.00
Wage cost rate	0.77	1.21	1.39	1.36	1.19	0.82
Interest rate	-0.08	-0.13	0.10	0.13	0.11	0.01
Households disposable income	0.15	0.32	0.39	0.34	0.24	0.02
Enterprises gross profits	-3.31	-4.92	-4.77	-3.50	-1.17	2.77
4. Endogeneous sector						
Value added (constant prices)	-0.35	-0.44	-0.48	-0.49	-0.44	-0.29
Value added deflator	0.33	0.42	0.50	0.51	0.47	0.34
Total output	-0.25	-0.41	-0.46	-0.42	-0.30	-0.02
Demand constrained production	-0.25	-0.48	-0.55	-0.53	-0.41	-0.11
Capacity constrained production	0.05	0.04	-0.12	-0.37	-0.62	-0.78
Labour constrained production	-1.05	-0.75	-0.56	-0.45	-0.40	-0.41
Labour cost rate	0.78	1.18	1.35	1.31	1.16	0.79
Unit labour costs	0.86	1.13	1.13	0.92	0.61	0.06
5. Productivities						
Technical labour productivity	0.27	0.33	0.41	0.47	0.53	0.59
Apparent labour productivity	-0.08	0.05	0.21	0.39	0.55	0.73
Technical capital productivity	0.05	0.09	0.10	0.08	0.04	-0.02
Apparent capital productivity	-0.35	-0.38	-0.26	-0.04	0.22	0.46

Sensitivity analysis : ratios and variations (absolute deviations from baseline)

	1989	1990	1991	1992	1993	1995
Significant ratios						
1. Share in GNP of :						
Public sector deficit	-0.06	0.02	0.08	0.12	0.13	0.10
Interests of the public debt	-0.01	-0.02	-0.02	-0.01	0.01	0.03
Total public debt	-0.11	-0.13	-0.11	0.00	0.13	0.36
Net exports	-0.12	-0.09	-0.03	0.00	0.00	-0.09
Wages and self employed incomes	0.27	0.37	0.33	0.21	0.06	-0.15
2. Saving ratio	0.04	0.08	0.06	0.02	-0.01	-0.04
3. Unemployment rate	-0.76	-0.62	-0.48	-0.35	-0.25	-0.18
4. Degrees of capacity utilisation						
Total capacity	0.66	-0.44	-0.33	-0.10	0.17	0.45
Equipments constrained capacity	-0.38	-0.44	-0.33	-0.10	0.17	0.45
Labour constrained capacity	0.66	0.30	0.08	-0.04	-0.03	0.11
5. Demand pressure (QDF/QAFFT)	0.11	-0.05	-0.07	-0.04	0.03	0.18
6. Proportion of enterprises						
Demand constrained	-1.17	0.57	0.92	0.57	-0.36	-2.43
Capacity constrained	-2.40	-2.23	-1.38	-0.37	0.55	1.85
Labour supply constrained	3.57	1.66	0.46	-0.21	-0.19	0.58
Absolute variations						
Unemployment	-36.97	-30.76	-24.21	-18.15	-13.80	-10.75
Total full time equiv. employment	-7.52	-13.75	-19.97	-25.35	-28.71	-29.95
Net exports	-6.72	-5.13	-1.50	0.34	0.26	-7.27
Public sector deficit	-3.50	1.53	5.59	9.04	10.25	8.77

Bibliography

Bogaert, H.: *Taux d'intérêt et dette publique dans le modèle MARIBEL*, Planning Bureau, Document DG-3973, Brussels, 3d May 1987.

Bogaert, H.J., and de Biolley, T.J.: *Employment and Quantity of Labour Data for the Aggregate Enterprises' sector.* Planning Bureau, Document DG/HJB-TdB/4037, Brussels, October 13, 1986.

Bossier, F., Strumelle, P., Standaert, S.: *Un outil d'analyse macrosectorielle - le Modèle HERMES.*, Planning Bureau, Document DG-4082, December 1987.

Cuddington, J.T., Johansson, P.O., Loëfgren, K.G.: *Disequilibrium Macroeconomics in Open Economies*, Basil Blackwell, Cambridge, 1984.

Lambert, J.P. : *Disequilibrium Macroeconomic Models. Theory and Estimation of Rationing Models Using Business Survey Data.*, Cambridge University Press, 1988.

McDonald, I. and Solow, R.: Wage bargaining and employment, *American Economic Review*, 1981, vol. 71 n.5,p.896-908.

Planning Bureau: *MARIBEL:. Model for Analysis and Rapid Investigation of the Belgian Economy*, Brussels, 1984, 326 p.

Picard, P.: *Théorie du Déséquilibre et Politique Economique*, Economica, Paris, 1985.

Sneessens, H., Drèze, J.: Discussion of Belgian Unemployment Combining Traditional Concepts and Disequilibrium Econometrics, *Economica*, vol. 53, supplement, p.89-120.

Sneessens, H. and Maillard, B.: Investment, Sales Constraints and Profitability in France, 1957-1985., *Recherches Economiques de Louvain*, vol.54 (2), 1988.

Wyplosz, C.: La France en 1986: bilan et perspectives macro-économiques, *Revue Economique*, volume 38, n.3, mai 1987, p. 677-702.

LIST OF VARIABLES OF THE MODEL

a. Endogenous variables

ABCT	:	Short-term public debt not elsewhere denoted
ABLT	:	Long-term public debt (not elsewhere denoted)
AC	:	Central Government total public debt
ACCT	:	Short-term public debt
ACLT	:	Consolidated public debt in BEF
ACLTAC	:	Miscellaneous cumulated debts
APC	:	Average value added cost
AQC	:	Average value added cost (computed with apparent productivities)
AWC	:	Public debt in foreign currency
BF	:	Undistributed corporate profits(adjusted)
BF0	:	Undistributed corporate profits (unadjusted)
BG	:	Current saving of the State sector
BH	:	Households savings (adjusted)
BH0	:	Unadjusted households saving
BKW	:	Net lending abroad
BKW1	:	Net lending abroad
BOP	:	Change in foreign assets of the BNB (Balance of payments)
BQY0	:	Net factor incomes from abroad
BVBS	:	Net export of goods and services
BVE	:	Net exports of energy
BVYE	:	Net exports of factors incomes: labour
BVYK	:	Net factor incomes: property incomes
BVY0	:	Net factor incomes from abroad
BV0	:	Net exports
C	:	Fiduciary money
CCL	:	Expenditure linked with the rents
CF	:	Net inflow of private capital transfers from abroad
DUC	:	Global degree of capacity utilisation
DUK	:	Degree of utilisation of the capacity (equipment)
DUL	:	Degree of utilisation of the labour supply
EDF	:	Keynesian employment
EF	:	Wage paid employment on June 30
EFB	:	Net outflow of border workers
EFP	:	Wage paid employment in equivalent full time
EPF	:	Classical employment
ESF	:	Supply of labour for the endogenous sector
EOF	:	Total employment on June 30
EOFP	:	Total employment in equivalent full time
EOFPT	:	Effective employment excluding labour hoarding
F	:	Net foreign borrowings of the private sector
FB	:	Current balance and exogenous capital movements
FD	:	Total output of the endogeneous sector (at factor cost)
GMF	:	Monetary financing of the Treasury
I	:	Central Bank interventions on the foreign exchange market

KNF	:	Net capital stock of the enterprises' sector
KNG	:	Net capital stock of the state sector
KN5	:	Net capital stock of residential buildings
MB	:	Base money
M1	:	Fiduciary money and assets of the households in the OCP
NFA	:	Reserves of the National Bank of Belgium
NRRK	:	Real after tax net rate of return of the capital stock
PA	:	Deflator of adjusted GNP at market prices
PAD0	:	Price of GDP at market price (non adjust., production side)
PAFF	:	Price of the gross value added at factor cost: enterprises sector
PAG	:	Price of gross value added at factor cost of the State sector
PA0	:	GNP deflator, non adjusted
PA5	:	Price of gross value added at factor cost of the residential sector
PA9	:	Price of gross value added at factor cost of the domestic servants
PC	:	Private consumption deflator (adjusted)
PC0	:	Deflator of non adjusted private consumption
PFB	:	Exchange movements associated with changes in the public debt
PFI	:	Price of domestic final demand
PG0AM	:	Deflator of the public consumption of goods and services
PIF	:	Deflator of the gross fixed capital formation of the enterprises
PIG	:	Deflator of investments of the State sector
PI5	:	Deflator of residential investments
PKF3	:	Capital user's cost
PMABS	:	Price deflator of imports of goods and services excluding energy
PMBS	:	Deflator of imports of goods and services
PME	:	Deflator of energy imports
PMYE	:	Deflator of labour's incomes paid abroad
PMYK	:	Deflator of property incomes paid abroad
PRE	:	Relative of imported energy to domestic final demand
PSBR	:	Public sector borrowing requirements
PWXW	:	World prices weighted at constant exchange rate
PXABS	:	Price deflator of exports of goods and services excluding energy
PXBS	:	Deflator of total exports of goods and services
PXE	:	Price deflator of energy exports
PXYE	:	Deflator of labour's income received from abroad
PXYK	:	Deflator of property incomes received from abroad
PYHG	:	Price index of the public consumption of wages
QA	:	Gross national product at market price, adjusted
QAD	:	GDP at market price, adjusted
QADP	:	GDP at factor cost adjusted (production side)
QADP0	:	GDP at factor cost, non adjusted (production side)
QAD0	:	Gross domestic product at market price (non adj.) (production side)
QAFEFP	:	Labour productivity of the equivalent full time employment
QAFF	:	Value added of the productive sector
QAFFT	:	Value added of the endogenous sector (computed)
QAG	:	Gross value added at factor cost of the State sector
QA0	:	Gross National Product, non adjusted, at market price
QA5	:	Gross value added at factor cost of the residential sector
QA9	:	Gross value added at factor cost of the domestic servants

QC	:	Private consumption (adjusted)
QC0	:	Private consumption non adjusted
QDF	:	Demand constrained production
QG	:	Public consumption
QG0AM	:	Public consumption of goods and services
QHI	:	Net indirect taxes at legislation of 1980
QIF	:	Gross fixed capital formation of the enterprises
QIG	:	Gross fixed capital formation of the State sector
QIV	:	Gross total capital formation (adjusted)
QIV0	:	Gross capital formation (unadjusted)
QI0	:	Gross fixed capital formation (unadjusted)
QI5	:	Residential investments
QK	:	Technical capital productivity
QL	:	Technical labour productivity
QMBS	:	Imports of goods and services.
QME	:	Energy imports
QMYE	:	Labour incomes paid abroad
QMYK	:	Incomes of factors other than labour paid abroad
QNFKF	:	Capital productivity
QPF	:	Capacity constraint due to the availability of profitable capital
QSF	:	Capacity constrained by the supply of labour
QVF	:	Changes in inventories
QXABS	:	Exports of non energetic goods and services
QXBS	:	Total exports of goods and services
QXE	:	Exports of energy
QXYE	:	Labour incomes received from abroad
QXYK	:	Incomes of factors other than labour received from abroad
QYHG	:	Public consumption of wages
RLBE	:	Long-term interest rate in Belgium
RRS	:	Three months interest rate on treasury certificates (Belgium)
SAQIV	:	Statistical adjustment of the capital formation
SAVA	:	Statistical adjustment of the G.D.P. (production side)
SAVIV	:	Statistical adjustment of the capital formation
SAWIF	:	Statistical adjustment of the self employeds' remuneration
SEDF	:	Proportion of enterprises in the keynesian regime
SEPF	:	Proportion of enterprises in the classical regime
SESF	:	Proportion of enterprises constrained by the supply of labour
SQDF	:	Proportion of enterprises in the keynesian regime
SQPF	:	Proportion of enterprises in the classical regime
SQSF	:	Proportion of enterprises constrained by the supply of labour
TCW	:	Transfers from the rest of the world to the State
TFG	:	Subsidies
TGF	:	Direct corporate taxes (general government)
TGH	:	Direct taxes on households (central and local governments)
THG	:	Total current transfers from the State to the households
THSS3	:	Social security transfers to the unemployed
THSS3R	:	Real unit unemployment allocation
THS0A	:	Social security transfers other than unemployment transfers
THS00	:	Total social security transfers

TICF2	:	Central Government indirect taxes: excises duties
TICF2E	:	Excises duties on energetic products: total
TICF2N	:	Excises duties on non energetic private consumption products
TICF3	:	Value added tax: total
TICF4	:	Central government indirect taxes: stamps and real estate taxes
TIF2EA	:	Excises duties on energetic products of the intermediate consumption
TIF2EC	:	Excises duties on the energetic products of the private consumption
TIGF	:	Total indirect taxes
TIPC0R	:	Total indirect tax rate, net of subsidies, on private consumption
TKAFC	:	Capital transfers from the central government to the enterprises
TPMOB	:	Fiscal receipts from capital withholding tax paid by the households
TSFD0	:	Social security contribution of the employers (endogeneous sector)
TSHD0	:	Personnal social security contributions of the wage paid workers
TSHI0	:	Social security contributions of the self-employed
TS000	:	Total social security contributions
UL	:	Unemployment on June 30
ULLD	:	People unemployed for two years and more
ULPM	:	Partial unemployment
VA	:	Gross national product at market price, adjusted
VAD0	:	Gross domestic product at market price (non adjust., production side)
VAFF	:	Gross fixed value added of the enterprises sector
VAG	:	Gross value added at factor cost of the State sector
VA0	:	Gross National Product non adjusted, at market prices
VA5	:	Gross value added at factor cost of the residential sector
VA9	:	Gross value added at factor cost of the domestic servants
VC	:	Private consumption (adjusted)
VC0	:	Value of non adjusted private consumption
VFI	:	Domestic final demand
VG	:	Public consumption
VIF	:	Gross fixed capital formation of the enterprises sector.
VIV	:	Gross total capital formation (adjusted)
VIV0	:	Total unadjusted gross capital formation
VI0	:	Total fixed capital formation
VI5	:	Residential investments
VKF	:	Amortizations of the enterprises
VKG	:	Amortizations of the State sector
VK0	:	Total amortizations
VK5	:	Amortizations of the households
VMBS	:	Imports of goods and services
VMYE	:	Labour incomes paid abroad
VVF	:	Changes in inventories
VXBS	:	Total exports of goods and services
VXYE	:	Labour incomes received from abroad
VXYK	:	Incomes of factors other than labour received from abroad
VYHG	:	Public consumption of wages
W	:	Total wage bill (adjusted)
WCR1	:	Wage cost rate
WCR4	:	Macroeconomic cost of labour per full time equivalent worker
WEALTH	:	Financial wealth of the households

Maribel II

WF	:	Total wage bill
WG	:	Wage bill of the central and local Governments
WHO	:	Financial wealth of the households
WIF	:	Income of self-employed (adjusted).
WIFO	:	Remuneration of the self-employed workers
WPG	:	Wages of the public sector: pensions
WSH1	:	Wage share (excluding the self employed)
WSH4	:	Labour cost share in the value added
WWG	:	Wages of the public sector (excluding the central gov.pensions)
WO	:	Total unadjusted wage bill
W9	:	Remuneration of the domestic servants
Y	:	Net National Income at factor cost (adjusted)
YACCT	:	Interest burden on the short and medium term public debt in BEF
YACFB	:	Interest burden of the public debt in Belgian francs
YACLT	:	Interest burden of the consolidated public debt in Belgian francs
YALN	:	Net rents
YAPFG	:	Interests of public bonds held by the enterprises
YAPGO	:	Property income of the government.
YAPHF1	:	Enterprise incomes (excluding dividends) of the households
YAPHF2	:	Dividends received by the households
YAPHG	:	Interests of public bonds held by the households
YAPHW	:	Property income of the households, coming from abroad
YAWC	:	Interest burden on the public debt in foreign currency
YAOC	:	Interest payments (central government)
YAOG	:	Public debt interests
YAOL	:	Interest payments (local government debt)
YCF	:	Gross National Income at factor cost (adjusted)
YDH	:	Disposable income of the households. Adjusted.
YDHO	:	Disposable income of households. Non adjusted.
YF	:	Gross corporate profits (adjusted)
YFO	:	Gross corporate profits (non adjusted)
YHK	:	Households' property incomes
YHO	:	Gross primary income of households
YWHW	:	Incomes of border and season workers
YO	:	Net National Income at factor cost (unadjusted)
ZKF	:	National Bank's degree of capacity utilization

b. Exogenous variables

ABLTAR	:	Implicit amortization rate of the consolidated public debt in BEF
ACCP	:	Assets of the households in the OCP
ACLTAJ	:	Accounting variations of the (consolidated) public debt
ADJG	:	Statistical adjustment of the public sector borrowing requirements
AFMI	:	Short–term public debt in BEF, hold by the FMI
AWCADJ	:	Public debt in foreign currency: yearly exchange variations
AOL	:	Public debt of the local government
AOLTAR	:	Implicit amortization rate of the local authorities public debt
BEAF	:	Exchange rate BEF per USD. Market rate.
BOPERR	:	Unidentified items in the balance of payments
DC	:	Net assets of the BNB on national sectors other than the State
EER	:	Index of Belgium's effective exchange rate
EFM	:	Border workers coming from abroad
EFX	:	Border workers working abroad
EGO	:	Total employment in the State sector
EIF	:	Self employed workers
E9	:	Employment of domestic servants
GCCT	:	Direct and ind. loans 1 year and more loans of the BNB to the State
GCLT	:	Loans of the BNB to the State (longer than 1 year)
MTRES	:	Notes and coins of the Treasury
NA	:	Active population on June 30
NFAADJ	:	Variations of exchange reserves due to accounting adjustments
PFBEP	:	Public enterprises operations with the rest of the world
PMOB	:	Rate of withholding capital tax
PMWE	:	Price index of world import of energy in DUS.
PRTP	:	Proportion of part–time workers
PVF	:	Deflator of changes in inventories
PWM	:	World import price index in USD
PWX	:	Export price index in USD of Belgium's competitors
QWX	:	Volume of Belgium's potential export markets. Index in constant DUS
RLGY	:	Long–term interest rate: Germany
RLUS	:	Long–term interest rate USA
RSEUD	:	Eurodollar interest rate in London
RTCF	:	Legal rate af corporate income tax
SAQA	:	Statistical adjustment of the G.D.P. (production side)
SAQC	:	Statistical adjustment of the private consumption
SAVC	:	Statistical adjustment of the private consumption
SAW	:	Stastical adjustment of the wage paid incomes
TEMPS	:	Time (2 digits: 53,....)
TFGR	:	Subsidiation rate
TGKNF	:	Implicit Tax Rate on Fixed Capital
THC	:	Transfers of central government to the households
THL	:	Transfers of local authorities to the households
THWB	:	Households' net transfers from abroad
TIAPCR	:	Rate of indirect taxation (other than VAT) on private consumption
TICG1R	:	Indirect tax rate affecting immediately the public cons. price
TICP1R	:	Rate of indirect taxes affecting immediately the consumption price

TIIF1R	:	Indirect tax rate affecting immediately the business inv. price
TIIG1R	:	Indirect tax rate affecting immediately the State investment price
TII51R	:	Indirect tax rate affecting immediately the residential inv. price
TIX	:	Ind.tax rate affecting the final demand price through interm. demand
TI3CR	:	inside rate of the value added tax on the private consumption
TI3GR	:	inside rate of value added tax on public consumption
TI3IGR	:	Inside rate of value added tax on public investments
TI3I5R	:	Inside rate of value added tax on residential investments
TKWB	:	Net transfers of capital received from the rest of the world
TSFD0R	:	Rate of employers' social security contributions
TSHD0R	:	Rate of social security contribution of wage paid workers(pers.share)
TSHI0R	:	Rate of social security contribution of the self-employed
TWC	:	Government transfers to the rest of the world
VAGADJ	:	Adjustment of the value added of the state
VG0AM	:	Public consumption of goods and services
VIG	:	Gross fixed capital formation of public administrations
VKFF	:	Rate of depreciation of the enterprises net capital stock
VKFG	:	Depreciation rate of the State's capital stock
VKF5	:	Depreciation rate of the net capital stock of residential buildings
VMYK	:	Incomes of factors other than labour paid abroad
WRMIN	:	Unemployment allowance
WSS	:	Wages of the social security sector
WWGR	:	Wage rate in the public sector (excluding the central gov.pensions)
YACNDA	:	Interest burden of the public debt: other items
YALB	:	Gross rents
YAPFW	:	Property incomes paid by rest of the world to Belgian enterprises
YAPGF	:	Enterprise incomes of the State
YAPGG	:	Imputed rent of the State sector

LIST OF THE MODEL'S EQUATIONS

Note :
In the writing af equations the following operators are used :

$\Delta X = X_t - X_{t-1}$

$n\Delta X = X_t - X_{t-n}$

$\%X = X_t / X_{t-1}$

$n\%X = X_t / X_{t-n}$

$Y**X = Y^X$

$>, \geq, <, \leq$ are boolean operators giving a value 0 when the conditions is fallse and a value one when the condition is true.

$\ln$ = Neperian logarithm

These operators can be combined : e.g. : $3\Delta \ln X$ means $\ln X_t - \ln X_{t-3}$

Short–term public debt

(1) $\Delta ABCT = PSBR - GMF - \Delta ABLT$

Long term public debt

(2) $\Delta ABLT/ABLT[t-1] = 1.15 \ (PSBR - PFB)/ABLT[t-1] + 0.233 + (-0.0456) \ RLBE$
      $+ ACLTAJ/ABLT[t-1] + 0.0117 \ RRS$

Total public debt

(3) $\Delta AC = PSBR + AWCADJ + \Delta AFMI + ACLTAJ$

Public debt in BEF

(4) $ACCT = ABCT + (ACCP + GCCT + MTRES + AFMI)$

Long–term public debt

(5) $ABLT = ACLT - GCLT - ACLTAC$

Miscellaneous debts of the central government

(6) $\Delta ACLTAC = ACLTAJ$

Average value added cost

(7) $APC = WCR4/QL + PKF3/QK$

Average value added cost

(8) $AQC = WCR4/QAFEFP + PKF3/QNFKF$

Public debt in foreign currency

(9) $AWC = AWC[t-1] + PFB + AWCADJ$

Undistributed corporate profits (adjusted)

(10) $BF = YF - TGF - YAPHF2$

Undistributed corporate profits (unadjusted)

(11) $BF0 = YF0 - TGF - YAPHF2$

Current saving of the State sector

(12) $BG = YAPG0 + TIGF + TGH + TGF + TS000 + TCW - (VYHG + PG0AM \cdot QG0AM + YA0G + TFG + THG + TWC)$

Households' current saving (adjusted)

(13) $BH = YDH - VC$

Households' current saving (unjusted)

(14) $BH0 = YDH0 - PC0 \cdot QC0$

Net lending abroad (computed from the external account)

(15) $BKW = BV0 + THWB + TCW + TKWB - TWC$

Net lending abroad (computed from the capital account)

(16) $BKW1 = BF0 + BH0 + BG + VK0 + TKWB - (QIG \cdot PIG + QIF \cdot PIF + QI5 \cdot PI5 + QVF \cdot PVF)$

Balance of payments

(17) $BOP = CF + BKW + PFB + PFBEP + BOPERR$

Net factor incomes: total

(18) $BQY0 = QXYE + QXYK - QMYE - QMYK$

Net exports of goods and services

(19) $BVBS = QXBS \cdot PXBS - QMBS \cdot PMBS$

Net exports of energy

(20) $BVE = QXE \cdot PXE - QME \cdot PME$

Net factor incomes: labour

(21) $BVYE = VXYE - VMYE$

Net factor incomes: property incomes

(22) $BVYK = VXYK - VMYK$

Net factor incomes: total

(23) $BVY0 = BVYE + BVYK$

Net exports including factor incomes

(24) $BV0 = BVBS + BVY0$

Monnaie fiduciaire

(25) $DC = NFA + GCCT + GCLT - (C - MTRES)$

Expenses linked with the renting of a residential building

(26) $CCL = .51\ YALB$

Net capital inflow

(27) $CF = WEALTH[t-1]\ (0.00335\ RLBE - 0.00335\ RLUS + (-0.224)\ (\Delta \log BEAF) + (-0.00792))$

Degree of utilisation of the global capacity

(28) $DUC = DUL \cdot (DUL < DUK) + DUK \cdot (DUK \leq DUL)$

Degree of utilisation of the productive capacity (capital)

(29) $DUK = QAFFT/QPF$

Degree of utilisation of the productive capacity (labour)

(30) $DUL = QAFFT/QSF$

Keynesian employment

(31) $EDF = QDF/QL$

Wage paid employment in endogenous sector on June 30

(32) $EF = (EFP + ULPM)/(1 - .5 \, PRTP)$

Net outflow of border workers

(33) $EFB = EFX - EFM$

Full time equivalent wage paid employment in endogenous sector

(34) $EFP = E0FP - EIF$

Classical employment

(35) $EPF = (1/QL) \, QPF$

Supply of labour for the endogenous sector

(36) $ESF = NA - (EG0 + E9 + EFB) - ULLD - (PRTP/2) \, EF$

Total employment of productive sector on June 30

(37) $E0F = EF + EIF$

Apparent labour productivity

(38) $QAFEFP = QAFF/E0FP$

Effective full time equivalent employment (excluding labour hoarding)

(39) $E0FPT = (1/.0004) \, ((EPF \cdot .0004)^{**}(- (54.4 \, (TEMPS \leq 74) + 22.4 \, (TEMPS > 74)))$
$\quad + (ESF \cdot .0004)^{**}(- (54.4 \, (TEMPS \leq 74) + 22.4 \, (TEMPS > 74))) + (EDF \cdot .0004)^{**} \, (- (54.4$
$\quad (TEMPS \leq 74) + 22.4 \, (TEMPS > 74))))^{**}(- 1/(54.4 \, (TEMPS \leq 74) + 22.4 \, (TEMPS > 74)))$

Net capital flows from abroad

(40) $\Delta F = CF + F[t-1] \, (EER[t-1] - EER)/EER$

Exogenous components of the balance of payments

(41) $FB = BKW + PFBEP + BOPERR$

Output at factor cost of the productive sector

(42) $FD = QC0 + SAQC + QG0AM + QYHG + QIF + QIG + QI5 + QVF + SAQIV + QXBS - QA5$
$\quad - QAG - QA9 - SAQA - QHI - QXE$

Maribel II

Monetary financing of the State sector

(43) $[t-] + GMF)/MB[t-1] = 0.00176 \; RRS + (- 0.835) \; \log (MB)[t-1] + 1.84 + 1.09 \; \Delta\log VA0$
$+ 0.000797 \; RRS[t-1] + 0.38 \; \log VA0[t-1]$

Monetary authorities interventions

(44) $I = FB + CF$

Gross capital stock

(45) $\Delta\log KNF = 0.112 \; (\log QNFKF - (- 0.0232) \; \log (PMWE/PWX)[t-1]$
$- \log (PKF3/PAFF)[t-1]) + 0.154 \; \log DUK[t-1] + (- 0.16) + 0.433 \; \Delta\log KNF[t-1]$
$+ 0.0886 \; NRRK + 0.0532 \; \log DUK[t-2]$

Net capital stock of the State sector

(46) $KNG = (1 - VKFG) \; KNG[t-1] + QIG$

Net capital stock of residential buildings

(47) $KN5 = (1 - VKF5) \; KN5[t-1] + QI5$

Base money (supply)

(48) $\Delta MB = I + GMF + NFAADJ$

Monetary stock M1

(49) $M1 = C + ACCP$

Variations of exchange reserves

(50) $\Delta NFA = NFAADJ + BOP$

Net after tax real rate of return of the capital stock

(51) $NRRK = (VAFF - WIF0 - WF - VKF - TGF)/(KNF[t-1] \; PIF)$
$- (.01 \; RLBE \cdot (1 - .2 \; (TEMPS < 84) - .25 \; (TEMPS > 83)) - ((\%PC0 + \%PC0[t-1]$
$+ \%PC0[t-2])/3 - 1))$

GNP price

(52) $PA = VA/QA$

Deflator of GDP at market price non adjusted

(53) $PAD0 = VAD0/QAD0$

Deflator of the enterprises' value added

(54) $PAFF = VAFF/QAFF$

Deflator of the State value added

(55) $PAG = VAG/QAG$

Deflator of non adjusted GNP

(56) $PA0 = VA0/QA0$

Deflator of the value added of the residential sector

(57) $\Delta\log PA5 = (- 0.0108) + 0.473 \; \Delta((1 + .01 \; RLBE)/\%PC0) + 1.18 \; \Delta\log PC0$

Maribel II

Value added price of the domestic servants

(58) $\Delta \log PA9 = 0.0095 + 0.495 \, \Delta \log (W9/E9) + 0.303 \, \Delta \log PA9[t-1] + 0.078 \, (TEMPS = 66)$

Private consumption price

(59) $PC = VC/QC$

Private consumption deflator

(60) $\Delta(\Delta \log (PC0 \cdot (1 - TIPC0R))) = 0.451 \, \Delta(0.667 \, (\Delta \log WCR4 - \Delta \log QAFEFP) + 0.608$
$\Delta \log (QDF/QAFFT) + (1 - 0.667) \, \Delta \log PMBS) + 0.451 \, (0.667 \, (\Delta \log WCR4 - \Delta \log QAFEFP)$
$+ 0.608 \, \Delta \log (QDF/QAFFT) + (1 - 0.667) \, \Delta \log PMBS - (\Delta \log (PC0 \cdot (1 - TIPC0R))))[t-1]$

Public sector borrowings from the rest of the world

(61) $PFB = GMF - \Delta(GCCT + GCLT + ACCP + MTRES)$

Price of domestic final demand

(62) $PFI = VFI/(QC0 + QG0AM + QIF + QIG + QI5 + QVF)$

Public consumption deflator

(63) $\Delta \log (PG0AM/((1 - TI3GR - TIX))) = 0.884 \, \Delta \log (PC0/(1 - TIPC0R)) + (1 - 0.884)$
$\Delta \log PMBS + 0.00301 + 0.0544 \, \log DUC[t-1]$

Private investment deflator

(64) $\Delta(\Delta \log PIF) = 0.828 \, \Delta(0.642 \, (\Delta \log WCR4 - \Delta \log QAFEFP) + 0.758 \, \Delta \log (QDF/QAFFT)$
$+ (1 - 0.642 - 0) \, \Delta \log PMABS + 0 \, \Delta \log (1 + TIX) + 0.0471 \, (TEMPS = 70)) + 0.828 \, (0.642$
$(\Delta \log WCR4 - \Delta \log QAFEFP) + 0.758 \, \Delta \log (QDF/QAFFT) + (1 - 0.642 - 0) \, \Delta \log PMABS$
$+ 0 \, \Delta \log (1 + TIX) + 0.0471 \, (TEMPS = 70) - (\Delta \log PIF))[t-1]$

Public investment deflator

(65) $\Delta(\Delta \log (PIG \cdot (1 - TI3IGR))) = 0.806 \, \Delta(0.679 \, (\Delta \log WCR4 - \Delta \log QAFEFP) + 2.1$
$\Delta \log (QDF/QAFFT) + (1 - 0.679 - 0) \, \Delta \log PMBS + 0 \, \Delta \log (1 + TIX)) + 0.44 \, (0.679$
$(\Delta \log WCR4 - \Delta \log QAFEFP) + 2.1 \, \Delta \log (QDF/QAFFT) + (1 - 0.679 - 0) \, \Delta \log PMBS + 0$
$\Delta \log (1 + TIX) - (\Delta \log (PIG \cdot (1 - TI3IGR))))[t-1]$

Residential investments deflator

(66) $\Delta(\Delta \log (PI5 \cdot (1 - TI3I5R))) = 0.859 \, \Delta(0.867 \, (\Delta \log WCR4 - \Delta \log QAFEFP) + 1.38$
$\Delta \log (QDF/QAFFT) + (1 - 0.867 - 0) \, \Delta \log PMBS + 0 \, \Delta \log (1 + TIX)) + 0.547 \, (0.867$
$(\Delta \log WCR4 - \Delta \log QAFEFP) + 1.38 \, \Delta \log (QDF/QAFFT) + (1 - 0.867 - 0) \, \Delta \log PMBS + 0$
$\Delta \log (1 + TIX) - (\Delta \log (PI5 \cdot (1 - TI3I5R))))[t-1]$

Capital user's cost

(67) $PKF3 = PIF \cdot (.035 + TGKNF + VKFF)$

Price of non energetic exports of goods and services

(68) $\Delta \log PMABS = \Delta \log (PWM \cdot BEAF)$

Import price of goods and services

(69) $PMBS = ((QMBS - QME) \, PMABS + QME \cdot PME)/QMBS$

Import price of energy

(70) $\Delta \log PME = 0.854 \, \Delta(0.956 \, \log (PMWE \cdot BEAF)) + 0.359 \, (0.956 \, \log (PMWE \cdot BEAF)$
$+ (-3.13) - \log PME)[t-1]$

Deflator of labour's incomes paid abroad

(71) $\log PMYE = 0.158 + 0.335 \log WCR1 + 0.418 \log PMYE[t-1]$

Deflator of property incomes paid abroad

(72) $\log PMYK = 0.00406 + 0.898 \log PAD0 + (-0.507) \log PAD0[t-1] + 0.592 \log PMYK[t-1]$

Relative price of energy

(73) $PRE = (PME \cdot (1 + TICF2E/(QME \cdot PME)))/(PFI \cdot (1 - (TICF2N + TICF3)/VFI))$

Total borrowing requirements

(74) $PSBR = -ADJG - \Delta A0L - BG - VKG + VIG + TKAFC$

World export price at constant exchange rate

(75) $PWXW = \exp(\log PWX + \log EER + \log (BEAF/29.242))$

Price of non energetic exports of goods and services

(76) $\Delta \log PXABS = 0.00791 + 0.931 \log PMABS + 0.206 \Delta \log (QDF/QAFFT)$
$- 0.966 \log (PXABS)[t-1]$

Export price of goods and services

(77) $PXBS = (QXABS \cdot PXABS + QXE \cdot PXE)/QXBS$

Export price of energy

(78) $\Delta \log PXE = 0.785 \Delta (0.96 \log PME) + 0.503 (0.96 \log PME + (-0.0405) - \log PXE)[t-1]$

Deflator of labour's incomes received from abroad

(79) $\log PXYE = 0.135 + 0.263 \log WCR1 + 0.54 \log PXYE[t-1]$

Deflator of property incomes received from abroad

(80) $\log PXYK = 0.00663 + 0.85 \log PAD0 + (-0.346) \log PAD0[t-1] + 0.473 \log PXYK[t-1]$

Deflator of the public consumption of wages and pensions

(81) $\%PYHG = \%PC0$

GNP at market price, adjusted

(82) $QA = QA0 + SAQC + SAQIV$

GDP at market price, adjusted

(83) $QAD = QAD0 + SAQC + SAQIV$

GDP at factor cost, adjusted

(84) $QADP = QADP0 + SAQA$

GDP at factor cost, non adjusted (production side)

(85) $QADP0 = QAFF + QA9 + QA5 + QAG$

GDP at market price non adjusted

(86) $QAD0 = QC0 + QG + QIV0 + QXBS - QMBS$

Estimator of labour technical coefficient

(87) log $QAFEFP$ = $((ESF/EOFP)**5.45 - 1)\cdot1$ Δlog $EOFP$ + 0.373 (0.383 + log $(WCR4/PAFF)$)
   + (1 − 0.373) log $QAFEFP[t-1]$ − (1 − 0.373) $((ESF/EOFP)**5.45 - 1)\cdot1$ Δlog $EOFP[t-1]$
   + 0.138 log (ZKF)

Value added of the endogeneous sector

(88) $QAFF = QAFFT$

Effective value added of endogeneous sector (computed)

(89) $QAFFT$ = (1/.0004) $((QPF\cdot.0004)**(- (54.4$ $(TEMPS\leq74)$ + 22.4 $(TEMPS > 74)))$
   + $(QSF\cdot.0004)**(- (54.4$ $(TEMPS\leq74)$ + 22.4 $(TEMPS > 74)))$ + (.0004 exp(0.266
   + (− 0.212) log $(PAFF/PMABS)[t-1]$ + 1 log FD + (− 0.0103) $TEMPS))**(- (54.4$
   $(TEMPS\leq74)$ + 22.4 $(TEMPS > 74))))**(- 1/(54.4$ $(TEMPS\leq74)$ + 22.4 $(TEMPS > 74)))$

Value added of the State

(90) $QAG = QYHG + (YAPGG + VKG + VAGADJ)/PC0$

GNP at market prices, non adjusted

(91) $QA0 = QAD0 + BQY0$

Value added of the residential sector

(92) $QA5 = VA5/PA5$

Value added of the domestic servants

(93) log $QA9$ = (− 0.272) + 0.144 log $E9$ + 0.892 log $QA9[t-1]$ + (− 0.148) $(TEMPS = 66)$
   + (− 0.0551) $(TEMPS = 74)$

Private consumption, adjusted

(94) $QC = QC0 + SAQC$

Private consumption

(95) $\Delta QC0$ = 0.79 Δ(486 + (0.454 + 0.324 $THG/YDH0$) $YDH0/PC0$) + 0.937 (486 + (0.454
   + 0.324 $THG/YDH0$) $YDH0/PC0 - QC0)[t-1]$ + 0.186 $(WH0[t-1]/PC0)$ + (− 834)$\cdot$.01
   $RLBE[t-1]$ (1 − $PMOB)[t-1]$

Structural demand adressed to the endogeneous sector (computed)

(96) log QDF = 0.266 + (− 0.212) log $(PAFF/PMABS)[t-1]$ + 1 log FD + (− 0.0103) $TEMPS$

Public consumption

(97) $QG = QYHG + QG0AM$

Public consumption of goods and services

(98) $QG0AM = VG0AM/PG0AM$

Indirect taxes at 1980 prices and reglementation

(99) $QHI = QAD\cdot(1 - 3164.048/3525.67)$

Gross fixed capital formation in endogenous sector

(100) $QIF = KNF - (1 - VKFF)$ $KNF[t-1]$

State investments

(101) $QIG = VIG/PIG$

Gross capital formation adjusted

(102) $QIV = QIV0 + SAQIV$

Gross capital formation

(103) $QIV0 = QI0 + QVF$

Gross fixed capital formation

(104) $QI0 = QIF + QI5 + QIG$

Investments in housing

(105) $QI5 = 0.323\ QI5[t-1] + (-0.0617)\ KN5[t-1] + 0.1298\ (YDH0/PC0)[t-1] + (-1262.9)$
$(PI5/PC0)[t-1]\ (.01\ RLBE - (5\Delta\log PC0/5))[t-1] + 67.57$

Capital technical coefficient

(106) $\log (QK) = -0.477\ \log ZKF[t-1] + (-0.0232)\ \Delta\log (PMWE/PWX) + 0.273$
$\log (PKF3/PAFF) + (1 - 0.273)\ \log QNFKF[t-1] + 0.273\ (0.477\ \log ZKF + (-0.0232)$
$\log (PMWE/PWX))[t-1] + 0.486 + 0.477\ \log (.86284)$

Labour technical coefficient

(107) $\log QL = 0.373\ (0.383 + \log (WCR4/PAFF)) + (1 - 0.373)\ \log QAFEFP[t-1] - (1 - 0.373)$
$((ESF/E0FP)**5.45 - 1)\cdot 1\ \Delta\log E0FP[t-1] + 0.138\ \log (.86284)$

Imports of goods and services

(108) $QMBS = FD + QXE - QAFF$

Import price of energy

(109) $\Delta\log QME = 0.427\ \Delta((-3.22) + 1.09\ \log FD + (-0.504)\ \log PRE) + 0.376\ ((-3.22)$
$+ 1.09\ \log FD + (-0.504)\ \log PRE - \log QME)[t-1]$

Labour's incomes paid abroad

(110) $\log (QMYE/EFM) = 0.338 + 0.526\ \log QL[t-1] + 0.527\ \log (QMYE/EFM)[t-1]$

Property incomes paid abroad

(111) $QMYK = VMYK/PMYK$

Apparent capital productivity

(112) $QNFKF = QAFF/KNF[t-1]$

Capacity constraint due to the availability of profitable capital

(113) $QPF = QK\cdot KNF[t-1]$

Capacity constrained by the supply of labour

(114) $QSF = QL\cdot ESF$

Variations in inventories

(115) $QVF = .005\ QAFF[t-1]$

Exports of non energetic goods and services

(116) $\log QXABS = 7.56 + 1 \log QWX + 0.349 \ (\log PXABS - \log AQC) + (-0.31) \ \Delta\log QWX$

Exports of goods and services

(117) $QXBS = QXABS + QXE$

Exports of energy

(118) $\log QXE = (-0.433) + 0.545 \log QME + (-2.74) \log DUK + 0.431 \log QXE[t-1]$

Labour's incomes received from abroad

(119) $\log (QXYE/EFX) = 0.101 + 0.621 \log QL[t-1] + 0.657 \log (QXYE/EFX)[t-1] + (-0.152)$
$(TEMPS = 70) + 0.16 \ (TEMPS = 63)$

Property incomes received from abroad

(120) $QXYK = VXYK/PXYK$

Public consumption (wages and pensions)

(121) $QYHG = VYHG/PYHG$

Long-term interest rate

(122) $\Delta RLBE = 2.25 + 0.269 \ RRS + (-0.803) \ RLBE + 0.106 \ RRS[t-1] + 0.23 \ RLUS + 8.97$
$\Delta(PSBR/VA0)[t-1]$

Short-term interest rate

(123) $RRS = (-44.4) \ FB/VA0[t-1] + 0.742 \ \Delta RSEUD + (-7.42) \ (\Delta\log PWX - \Delta\log PC0) + 30.5$
$\Delta\log PA0 + 0.436 \ RSEUD[t-1] + (1 - 0.436) \ RRS[t-1] + (-3.48) + 51.3 \ \Delta\log QA0$

Statistical adjustment of the capital formation

(124) $SAQIV = SAQC \cdot QIV0/QC0$

Statistical adjustment of the production side

(125) $SAVA + SAVIV + SAVC + SAW + SAWIF = 0$

Statistical adjustment of the capital formation in current prices

(126) $SAVIV = SAVC \cdot VIV0/VC0$

Statistical adjustment of the self-employed's remuneration

(127) $SAWIF = SAW \cdot WIF0/W0$

Share of keynesian employment

(128) $SEDF = (EDF/E0FPT)^{**}(-(54.4 \ (TEMPS \leq 74) + 22.4 \ (TEMPS > 74)))$

Share of classical employment

(129) $SEPF = (EPF/E0FPT)^{**}(-(54.4 \ (TEMPS \leq 74) + 22.4 \ (TEMPS > 74)))$

Proportion of enterprises constrained by the supply of labour

(130) $SESF = (ESF/E0FPT)^{**}(-(54.4 \ (TEMPS \leq 74) + 22.4 \ (TEMPS > 74)))$

Proportion of demand constrained enterprises

(131) $SQDF = (QDF/QAFFT)^{**}(- (54.4 \; (TEMPS \leq 74) + 22.4 \; (TEMPS > 74)))$

Proportion of enterprises constrained by the availibility of capital

(132) $SQPF = (QPF/QAFFT)^{**}(- (54.4 \; (TEMPS \leq 74) + 22.4 \; (TEMPS > 74)))$

Proportion of enterprises constrained by the supply of labour

(133) $SQSF = (QSF/QAFFT)^{**}(- (54.4 \; (TEMPS \leq 74) + 22.4 \; (TEMPS > 74)))$

Foreign transfers to the government

(134) $TCW = TCW[t{-}1] \; \%PC0$

Subsidies to the enterprises

(135) $TFG = - VC0{\cdot}TFGR$

Corporations tax (total)

(136) $\ln (TGF / VAFF) = -0.865 + 0.699 \ln RTCF + 0.725 \ln (YF / VAFF) + .861 \ln (TGF / YF)[t{-}1] - 0.702 \ln RTCF[t{-}1]$

Personal income tax (total)

(137) $\log TGH = (\log TGH[t{-}1] + 1.22 \; \Delta\log ((W0 + WIF0 + YHK - (TS000 - THSS3))) + (1 - 1.22) \; \Delta\log PC0.(TEMPS > 87))$

Total transfers from the State to the households

(138) $THG = THS00 + THC + THL$

Social security transfers to the unemployed

(139) $THSS3 = THSS3R{\cdot}PC0{\cdot}(UL + ULPM)$

Individual social security allowance in real prices

(140) $THSS3R = THSS3R[t{-}1] \; (1 + GR)$

Social security transfers other than unemployment allowances

(141) $THS0A = (THS0A[t{-}1] \; \%PC0{\cdot}(1 + GR + .01))$

Total social security transfers

(142) $THS00 = THSS3 + THS0A$

Excise duties

(143) $TICF2 = TICF2N + TICF2E$

Excise duties on energetic products

(144) $TICF2E = TIF2EC + TIF2EA$

Excise duties on non energetic products

(145) $TICF2N = TIAPCR{\cdot}VC0{\cdot}0.529$

Value added tax

(146) $TICF3 = (0.735 \; TICP1R{\cdot}VC0 + TICG1R{\cdot}VG0AM + TIIG1R{\cdot}VIG + TIIF1R{\cdot}VIF + TII51R{\cdot}VI5) \; (TEMPS > 70)$

Maribel II

Stamps and real estate duties
(147) $TICF4 = TICF4[t-1] \, \%PC0$

Excise duties on energetic products of the intermediary consumption
(148) $TIF2EA = TIX \cdot (VC0 + VG0AM + VIF + VIG + VI5 + VVF + VXBS) \, (0.107 \, (TEMPS \leq 71)$
$+ \, 0.423 \, (TEMPS > 70))$

Excise duties on energetic products of the private consumption
(149) $TIF2EC = 0.294 \, TIAPCR \cdot VC0$

Total indirect taxes
(150) $TIGF = (TIPCOR + TIX) \, PC0 \cdot QC0 + (TI3GR + TIX) \, PG0AM \cdot QG0AM + (TIX) \, PIF \cdot QIF$
$+ \, (TI3IGR + TIX) \, PIG \cdot QIG + (TI3I5R + TIX) \, QI5 \cdot PI5 + TIX \cdot (PVF \cdot QVF + PXBS \cdot QXBS)$
$+ \, TICF4 + TFG + (- 34) \, (TEMPS < 71) + 7.08 \, (TEMPS > 70)$

Ind.tax rate net of subsidies, on private consumption
(151) $TIPCOR = TI3CR + TIAPCR + TIX + TFGR$

Capital transfers from the government to the enterprises
(152) $TKAFC = TKAFC[t-1] \, \%PC0 \cdot (1 + GR)$

Capital withholding tax paid by the households
(153) $\log TPMOB = (- 0.661) + 0.224 \log PMOB + 0.27 \log (YAPHF2) + 0.823 \log (YAPHG)$

Employers' social security contributions
(154) $TSFD0 = TSFD0R \cdot WF$

Wage paid workers' social security contributions
(155) $TSHD0 = TSHD0R \cdot WF$

Self employed' social security contributions
(156) $TSHI0 = TSHI0R \cdot WIF0$

Total social security contributions
(157) $TS000 = TSFD0 + TSHD0 + TSHI0$

Complete unemployment on June 30
(158) $UL = NA - EFB - E0F - EG0 - E9$
(159) $\Delta(ULLD/NA) = (- 0.00174) + 0.2 \, (UL/NA) + (- 0.2) \, \Delta(UL/NA) + (- 0.339)$
$(ULLD/NA)[t-1]$

Partial unemployment
(160) $ULPM = 32.2 + (- 0.277) \, \Delta EFP + 0.426 \, ULPM[t-1]$

GNP adjusted
(161) $VA = VAFF + BVY0 + TIGF - TFG + SAVA + VA5 + VA9 + VAG$

G.D.P. at market price, non adjusted (expenditure side)
(162) $VAD0 = VA0 - BVY0$

Maribel II

Value added at factor cost of the enterprises' sector

(163) $VAFF = QC0 \cdot PC0 + SAVC + QG0AM \cdot PG0AM + QYHG \cdot PYHG + QIF \cdot PIF + QIG \cdot PIG + QI5 \cdot PI5$
$+ QVF \cdot PVF + SAVIV + BVBS - QA5 \cdot PA5 - QAG \cdot PAG - QA9 \cdot PA9 - SAVA - (TIGF - TFG)$

Value added of the State

(164) $VAG = VYHG + YAPGG + VKG + VAGADJ$

GNP at market price, non adjusted (expenditure side)

(165) $VA0 = VA - SAVC - SAVIV$

Value added of the residential sector

(166) $VA5 = (- 4.56) + 0.303 (.5 (VKF5 \cdot KN5[t-1] PI5 + YALN) + .5 (VKF5 \cdot KN5[t-1] PI5$
$+ YALN)[t-1]) + 0.821 VA5[t-1]$

Value added of the domestic servants

(167) $VA9 = QA9 \cdot PA9$

Private consumption (adjusted)

(168) $VC = VC0 + SAVC$

Private consumption

(169) $VC0 = PC0 \cdot QC0$

Domestic final demand

(170) $VFI = QC0 \cdot PC0 + QG0AM \cdot PG0AM + QIF \cdot PIF + QIG \cdot PIG + QI5 \cdot PI5 + QVF \cdot PVF$

Public consumption

(171) $VG = VG0AM + VYHG$

Enterprises' investments

(172) $VIF = PIF \cdot QIF$

Gross capital formation adjusted

(173) $VIV = VIV0 + SAVIV$

Gross capital formation

(174) $VIV0 = VI0 + VVF$

Gross fixed capital formation

(175) $VI0 = VIF + VI5 + VIG$

Residential investments

(176) $VI5 = PI5 \cdot QI5$

Amortizations of the enterprises

(177) $VKF/PIF = 5.52 + 0.198 (VKFF \cdot KNF[t-1]) + 0.804 (VKF/PIF)[t-1]$

Amortizations of the state's capital stock

(178) $VKG/(VKFG \cdot KNG[t-1] PIG) = 0.0402 + 0.744 (VKG/(VKFG \cdot KNG[t-1] PIG))[t-1] + 0.0126$
$\Delta\Delta\log QIG$

Maribel II

Total amortizations

(179) $VK0 = VKF + VKG + VK5$

Amortizations of the residential buildings

(180) $VK5 = (-0.402) + 0.0688 \, (VKF5 \cdot KN5[t-1] \, PI5) + 0.981 \, VK5[t-1] + 11.5 \, \Delta\log PI5$

Imports of goods and services

(181) $VMBS = QMBS \cdot PMBS$

Labour's incomes paid abroad

(182) $VMYE = QMYE \cdot PMYE$

Variations in inventories

(183) $VVF = QVF \cdot PVF$

Exports of goods and services

(184) $VXBS = QXBS \cdot PXBS$

Labour's incomes received from abroad

(185) $VXYE = QXYE \cdot PXYE$

Property incomes received from abroad

(186) $VXYK = YAPFW + YAPHW$

Wages and pensions of the State sector

(187) $VYHG = WWG + WPG$

Total wage bill(adjusted)

(188) $W = W0 + SAW$

Wage cost rate in the productive sector

(189) $\Delta\log (WCR1 \cdot (1 - TSFD0R)) = 0.1 + 0.97 \, \Delta\log PC0 + (1 - 0.97) \, \Delta\log PC0[t-1] + 0.44$
$\log (E0FP/ESF) + 0.0744 \log (WRMIN/(WCR1)[t-1])$

Macroeconomic labour cost rate

(190) $WCR4 = (WF + WIF0)/E0FP$

Financial wealth of the households

(191) $WEALTH = MB + ABLT + ABCT - F$

Total wage bill (wage cost)

(192) $WF = EFP \cdot WCR1$

Wage bill of the State sector excluding the SS sector

(193) $WG = VYHG - WSS$

Financial wealth of the households

(194) $\Delta WH0 = BH0 - QI5 \cdot PI5$

Maribel II

Self employed remumeration (adjusted)

(195) $WIF = WIF0 + SAWIF$

Self employed's real rate of remuneration

(196) $\Delta(\log (WIF0/EIF) - \log WCR1) = (-0.398) \Delta\log PMBS + 0.946 \Delta\log (QDF/QAFFT) + 0.321$
$((-0.503) \log PMBS + 0 \log (QDF/QAFFT) + (-0.0622) - (\log (WIF0/EIF)$
$- \log WCR1))[t{-}1]$

Pensions of the public sector

(197) $WPG = WPG[t{-}1]{\cdot}1.02\ \%PC0$

Share of wage costs in value added

(198) $WSH1 = WF/(VAFF - WIF0)$

Share of labour costs in value added

(199) $WSH4 = (WCR1{\cdot}EFP + WIF0)/VAFF$

Wages of the State sector (excluding pensions)

(200) $WWG = EG0{\cdot}WWGR$

Total income from employment (unadjusted)

(201) $W0 = WF + WG + YWHW + W9$

Wages of the domestic servants

(202) $\log (W9/E9) = (-0.158) + 0.293 \log WCR1 + 0.682 \log (W9/E9)[t{-}1]$

Net National Income, adjusted

(203) $Y = Y0 + SAVC + SAVIV$

Interest burden of the floating debt in BEF

(204) $YACCT = .5{\cdot}.01\ (RRS + RRS[t{-}1]){\cdot}.5\ (ABCT + GCCT + ABCT[t{-}1] + GCCT[t{-}1])$

Interest of the central government public debt in BEF

(205) $YACFB = YACLT + YACCT$

Interest burden on the consolidated debt in BEF

(206) $YACLT = ((.5\ (.01\ RLBE{\cdot}ACLT + (.01\ RLBE{\cdot}(ABLTAR - 1) + .01\ RLBE[t{-}1])\ (ACLT[t{-}1])$
$- (1 - ABLTAR){\cdot}.01\ RLBE[t{-}1]\ ACLT[t{-}2]) + (1 - ABLTAR/2)\ (YACLT)[t{-}1] - (ABLTAR/2)$
$(YACLT)[t{-}2]))$

Net rents

(207) $YALN = YALB - CCL$

Interests of public bonds held by the enterprises

(208) $YAPFG = YA0G - YAPHG$

Property income of the State sector

(209) $YAPG0 = YAPGG + YAPGF$

Maribel II

Enterprises incomes (excluding dividends) of the households

(210) $\Delta YAPHF1 = (1 - (-0.0337))\ (.01\ RLBE{\cdot}\Delta WH0 + .01\ \Delta RLBE{\cdot}0.107\ WH0[t{-}1]) + 0.432$
$+ (-0.0337)\ YAPHF1[t{-}1]$

Dividends received by the households

(211) $YAPHF2/VAFF = 0.00109 + 0.08\ ((YF - TGF)/VAFF)[t{-}1] + 0.75\ (YAPHF2/VAFF)[t{-}1]$
$+ (-0.0342)\ \Delta WSH1[t{-}1]$

Interests on public bonds held by the households

(212) $YAPHG = .42\ YA0G$

Foreign property incomes of the households

(213) $YAPHW = YAPHW[t{-}1]\ \%PC0$

Charges d'intérêts sur les emprunts en devises

(214) $YAWC = (.3{\cdot}.01\ (RLGY + RLGY[t{-}1]) + .2{\cdot}.01\ (RSEUD + RSEUD[t{-}1])){\cdot}.5\ (AWC + AWC[t{-}1])$

Interest of the public debt of the central government

(215) $YA0C = YACCT + YACLT + YAWC + YACNDA$

Interest of the public debt

(216) $YA0G = YA0C + YA0L$

Interest on the debt of the local authorities

(217) $YA0L = ((.5\ (.01\ RLBE{\cdot}A0L + (.01\ RLBE{\cdot}(A0LTAR - 1) + .01\ RLBE[t{-}1])\ (A0L[t{-}1])$
$- (1 - A0LTAR){\cdot}.01\ RLBE[t{-}1]\ A0L[t{-}2]) + (1 - A0LTAR/2)\ (YA0L)[t{-}1] - (A0LTAR/2)$
$(YA0L)[t{-}2]))$

Gross National Income at factor costs (adjusted)

(218) $YCF = VA - TIGF + TFG$

Households' disposable income (adjusted)

(219) $YDH = W + WIF + YHK - TS000 - TGH + THG + THWB$

Households' disposable income (unadjusted)

(220) $YDH0 = YH0 - TS000 - TGH + THG + THWB$

Gross corporate profits, adjusted

(221) $YF = VC - VK5 + VG0AM - VKG - YAPGG + VIV + BVBS + YAPFG + YAPFW + TFG - W$
$+ VYHG + BVYE - WIF - YAPHF1 - YALN - YAPGF - VMYK - TIGF - VKF$

Gross corporate profits, unadjusted

(222) $YF0 = VC0 - VK5 + VG0AM - VKG - YAPGG + VIV0 + BVBS + YAPFG + YAPFW + TFG$
$- W0 + VYHG + BVYE - WIF0 - YAPHF1 - YALN - YAPGF - VMYK - TIGF - VKF$

Property income of the households

(223) $YHK = YAPHF1 + YAPHF2 + YALN + YAPHG + YAPHW$

Primary households' income

(224) $YH0 = W0 + WIF0 + YHK$

Maribel II

Incomes of border workers

(225) log *YWHW* = 1.23 + 0.235 log *EFX* + 0.514 log *WCRI* + 0.299 log *YWHW*[t−1] + 0.896
Δlog *QAFF*[t−1]

Net national income at factor cost (non adjusted)

(226) *Y0* = *YCF* − *SAVC* − *SAVIV* − *VK0*

Degree of capacity utilization of the NBB

(227) log *DUK* = 0 + 1.05·.477 log (*ZKF*/.86284)