NOTES D'ÉTUDES

ET DE RECHERCHE

MASCOTTE: MODEL FOR ANALYSING AND FORECASTING SHORT TERM DEVELOPMENTS

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MASCOTTE
Model for AnalySing and foreCasting shOrT TErm developments[1]

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Résumé :

Cette note présente MASCOTTE, la nouvelle version du modèle macro-économétrique de prévision de la Banque de France. A l'occasion du changement de base des comptes nationaux (base 1995), la version précédente de ce modèle a été simplifiée, re-spécifiée et ré-estimée. Ce modèle est utilisé à titre principal pour effectuer les projections macro-économiques sur un horizon de deux à trois ans, ce qui impose un cadre comptable utilisant des définitions de variables au plus proche de celles de la comptabilité nationale française. Les principaux agents sont : les entreprises, les ménages, les administrations publiques et le reste du monde. Cette nouvelle version du modèle comporte désormais un bloc d'offre spécifié sur un comportement d'optimisation explicite d'entreprises utilisant une technologie Cobb-Douglas en concurrence imparfaite et une équation de salaire de type Wage-Setting (WS) ré-estimée. L'homogénéité complète du système de prix assure l'indépendance entre l'équilibre de la sphère nominale et la sphère réelle, cette dernière étant seulement déterminée, à long terme, par le niveau des prix relatifs. Par ailleurs, une attention particulière a été portée dans la spécification des équations à l'impact des variations de taux d'intérêt.

Classification JEL : E17,E27, E37.

Mots-clés : Modèle Macro-economique, Econometrie appliquée, Prévision, France.

Asbtract:

MASCOTTE is the new version of the Banque de France's macro-econometric forecasting model. Following the last rebasing of National Accounts (currently at 1995 price), the previous version of the model was simplified, re-specified and re-estimated. The model is essentially used for making macroeconomic projections of the French economy over a two-to-three year horizon, which requires an accounting framework as close as possible to the French National Accounts. The main agents are companies, households, general government and the rest of the world. The new version now includes a supply block derived from the explicit optimisation behaviour of companies using a Cobb-Douglas technology under imperfect competition, and a new Wage Setting schedule. Full homogeneity of the nominal side of the model ensures the independence between the nominal equilibrium and the real equilibrium, the latter being only determined in the long run by relative prices. Furthermore, as regards the specification of equations, special attention was paid to the consequences of changes in short-term interest rates.

JEL Classification: E17, E27, E37.

Keywords : Macro-economic model, Applied econometrics, Forecasting, France.

Résumé non technique :

Le modèle MASCOTTE (Modèle d'Analyse et de préviSion de la COnjoncTure TrimestriellE) est la nouvelle version du modèle économétrique de la Banque de France qui sert de cadre de cohérence pour les prévisions à court terme sur l'économie française. C'est le modèle utilisé à titre principal pour assurer la contribution de la France à la projection zone euro réalisée de façon semestrielle par le Système Européen des Banques Centrales. Mascotte est un modèle de petite taille qui comprend une soixantaine d'équations économétriques, ne retenant que quatre types d'agents (entreprises, ménages, administrations publiques et reste du monde) et un seul bien (sauf pour le commerce extérieur qui distingue les biens hors énergie, les services et l'énergie à l'importation, les biens et les services à l'exportation). L'accent est mis sur l'adéquation des comportements spécifiés par la théorie économique aux données statistiques disponibles sur la période récente. De fait, si la dynamique de long terme est cohérente avec la théorie néo-classique, les évolutions de court terme correspondent davantage à une logique néo-keynésienne.

Un effort particulier a été apporté à la détermination de l'équilibre de long terme du bloc d'offre, fondé sur un comportement d'optimisation des entreprises en situation de concurrence imparfaite. Toutefois, une spécification de l'équation de prix de valeur ajoutée sous forme de frontière des prix des facteurs s'est avérée peu robuste et une formulation en termes de marge par rapport à un lissage sur les coûts unitaires du travail a été finalement retenue. La cible de long terme de l'équation de salaire est définie en écart entre le salaire réel, net des cotisations sociales et de la productivité du travail, écart qui fluctue avec le taux de chômage. Le coin social est ici analysé comme un prélèvement pur. Compte tenu de l'homogénéité dynamique des équations de prix et de salaire, la confrontation de ces deux équations conduit à un taux de chômage d'équilibre qui ne dépend pas explicitement du taux d'inflation et s'interprète donc comme un NAIRU. S'agissant du bloc de demande, les taux d'intérêt interviennent désormais dans plusieurs équations : la consommation des ménages (via leur impact sur les crédits de l'économie), l'investissement-logement et les variations de stocks.

Un cahier complet de variantes « analytiques » est fourni. Elles illustrent les bonnes propriétés du modèle de simulation. Des variantes « contre-factuelles », plus illustratives des développements économiques récents ont été publiées dans le numéro d'octobre 2003 du Bulletin de la Banque de France. Conformément à la théorie économique, seule la structure des prix relatifs a un impact sur l'activité réelle. La première variante illustre ainsi l'effet d'un choc homogène de 10 % sur tous les prix étrangers. En l'absence de fonction de réaction des taux d'intérêt et des taux de change nominaux, l'ancrage nominal est assuré par les prix étrangers et toutes les grandeurs nominales augmentent à terme de 10 % et les grandeurs réelles reviennent à leur valeur de référence. Les autres variantes présentent les effets d'une hausse du taux de change, du prix du pétrole, de la demande mondiale mais aussi des dépenses publiques, des salaires, de la fiscalité, de la population active et des taux d'intérêt. Au total, on observe, suite à un choc, une relative persistance des écarts par rapport au compte central et les développements futurs du modèle devraient porter sur la dynamique des ajustements aux relations de long terme. La construction d'un bloc financier plus complet est aussi envisagée.

Non-technical summary:

MASCOTTE (the French acronym for "Model for Analysing and Forecasting Quarterly Short Term Developments") is the new version of the Banque de France's econometric model designed to ensure the consistency of short-term forecasts for the French economy. This is the principal tool used to produce France's contribution to the European System of Central Banks' semi-annual forecasting exercise. Mascotte is a small-scale model, made up of roughly 60 econometric equations. It comprises only four agents (companies, households, general government and the rest of the world) and one product (with the exception of external trade, which provides a breakdown between imports of

nonenergy goods, services and energy, and exports of goods and services). Emphasis is placed on the adequacy between behaviour patterns derived from economic theory and data available in recent years. Consequently, if the long-term relationships are consistent with neo-classical theory, short-term dynamics are more in the New-Keynesian tradition.

A special effort is made to determine the long-term equilibrium of the supply side, based on the optimisation behaviour of companies under imperfect competition. However, it turns out that specifying the value added price equation in the form of a factor price frontier is not robust enough and a mark-up on (smoothed) unit wage costs is finally preferred. The long-term target for the wage equation is defined as the real wage, net of social security contributions and labour productivity, and it varies according to the unemployment rate. The social security wedge is viewed as a pure tax. Given the dynamic homogeneity of price and wage equations, a comparison of these equations defines an equilibrium unemployment rate that does not explicitly depend on the inflation rate and can therefore be viewed as a NAIRU. Regarding the demand side, interest rates now enter several equations : household consumption (through their impact on consumption credit), housing investment and inventories.

The article also discusses a full set of "analytical" variant scenarios, designed to shed light on the good simulation properties of the model. "Counter-factual" variant scenarios, that illustrate the more recent economic developments, were published in the October 2003 issue of the Banque de France Monthly Bulletin (an English version appeared in the Banque de France Digest in April 2004). In accordance with economic theory, only relative prices have an impact on real activity. The first variant scenario illustrates the effect of a 10% homogeneous increase in all foreign prices. In the absence of a reaction function of interest rates and nominal exchange rates, foreign prices provide a nominal anchor and all nominal variables increase by 10 % in the long run, while real variables return to their baseline. The other variant scenarios study the effects of a rise in the exchange rate, oil prices, world demand, public expenditure, wages, taxes, the labour force and interest rates. Overall, in all variants, deviations from the baseline level are relatively persistent after a shock. Future developments of the model should therefore focus on the equilibrium correction mechanisms and the convergence towards the long-term relationships. It is also planned to further develop the financial block.

Introduction

Econometric modelling has undergone a great deal of change at the Banque de France in recent years[2]. As in many other institutions, it became obvious that the quantitative approach to economic developments could no longer rely on a single model. A model is by nature a stylised version of the real situation and the level of detail provided for each area of the economy varies according to the subject that the model is supposed to address. It would be unrealistic to attempt to build a model that can provide equally accurate answers to all questions about future developments in the prices of goods and services, the labour market structure, exchange rate dynamics, the role that expectations play and optimal economic policy. Therefore, the decision was taken to develop a set of models, with each one being designed for a specific purpose, even though the areas of application sometimes overlap.

Under these circumstances, the macroeconomic model is more specifically intended for making medium-term macroeconomic forecasts that factor in the interactions between macroeconomic variables. The projections are made twice a year over a two-to-three-year horizon within the context of the European System of Central Banks, using a set of underlying assumptions shared by all of the National Central Banks (ECB 2001). The assumptions underlying the forecasts include constant nominal exchange rates and no change in economic policy. This explains why the version of the model presented here does not include a monetary or fiscal impulse response function and why the nominal interest rates and exchange rates are exogenous variables.

The Banque de France uses several models to make its macroeconomic projections. Short-term projections up to three quarters ahead are in line with forecasts made using other models that are more appropriate for this purpose. These models are based on calibrations of business conditions surveys and they use high-frequency economic data (ISMA, 2000; Irac and Sédillot, 2002). A special forecasting model is used for inflation of consumption prices (HICP). It produces forecasts that are detailed and consistent with general macroeconomic forecasts (Jondeau *et alii*, 1999). The macroeconomic projections are also conditioned on and consistent with public finance forecasts (Adenot *et alii*, 2001; Bouthevillain, in progress). But the macro-econometric model is still the main check on the plausibility of forecasts in this modelling system.

The rebasing of the National Accounts provided an opportunity for a respecification and re-estimation of the previous version of the model, which was presented in *Economie et Prévision* (1998).[3] The changes to the specifications were made to simplify the model and define its long-run properties more precisely.

The specification of each model relies more or less exactly on the formulations of a number of equations derived from economic theory. MASCOTTE, like many other projection models, is what is commonly called a New-Keynesian model. Its Keynesian aspect stems from the fact that prices and wages are somewhat rigid in the short run and the level of activity is determined primarily by demand. Prices and wages are not fixed, but their short-run variations are too small to have any significant influence on the macroeconomic equilibrium. In the longer run, the Keynesian aspect fades and corresponds to key equations derived from neo-classical theory. If the short-run equilibrium is not sustainable, prices and wages have to adjust gradually. Price and wage trends affect France's competitiveness with regard to the rest of the world, which affects both the level of exports and the relative shares of aggregate supply coming from domestic output and imports. Price and wage variations also affect the division of value added between wages and profits, which has an impact on the financial situation of businesses, investment and, therefore, capital formation. Ultimately, it affects the level of activity and the process lasts until a sustainable equilibrium is reached. More specifically, the sustainability of the equilibrium is characterised by the stability of the unemployment rate in the long run.

[2] The previous version of the model was published in *Economie et Prévision* (1998). Later on, the re-estimated investment equation (base 1990) was presented on its own in Irac and Jacquinot (1999).

[3] The preliminary work for the re-estimation was carried out by Véronique Brunhes-Lesage and Franck Sédillot.

The development of such models has not kept pace with the most recent advances in macroeconomics. In particular, despite the effort made in this direction with the new version of the supply block, or consumption and investment behaviours, the model does not rely systematically on specifications derived from agents' optimisation programmes ("micro-foundations"), nor does it deal explicitly with expectations. It still relies on block-by-block specification rather than a general equilibrium approach.[4] These shortcomings stem mainly from the fact that using models for forecasting requires a degree of consistency between the simulated results produced with the model and real economic data, as well as stable equations. This requirement often conflicts with the use of equation specifications derived directly from economic theory. Such conflicts are all the more likely to arise because macroeconomic projections have to cover all macroeconomic areas simultaneously and consistently, even though no truly unified and operational theory has yet emerged that simultaneously covers all of the following areas: supply behaviour, consumption, capital formation, foreign trade, the labour market, price formation and transfers between agents.

The main characteristics of the model

The model has 280 equations, including 60 econometric equations; the others are defining equations or accounting identities.

The accounting framework for projections adheres very closely to the definitions in France's system of national accounts. The main agents are : corporations, households, government and the rest of the world. Unincoporated corporations are aggregated with other corporations for their productive activity and with households for their other transactions. Financial corporations are also aggregated with all corporations for their productive activity, given that the production of financial services is no different from the production of other services at the macroeconomic level. On the other hand, they are treated separately in their role as financial intermediaries for income transactions, such as interest payment flows. Non-profit institutions serving households (NPISHs) are primarily treated exogenously.

The real equilibrium is consistent with an explicit Cobb-Douglas production function. It is ensured by the static homogeneity of the nominal variables. Wage formation follows a model of the behaviour of the agents taking part in wage bargaining (wage-setting, WS[5]). The nominal anchor is provided by foreign prices, since the model does not have an impulse response function and the nominal exchange rates are exogenous variables. Nominal variables and real variables alike adjust sluggishly to shocks. Adjustment speeds have been estimated and are in line with the apparent average behaviour observed over the last twenty years.

The first part of this paper presents the supply block, wage formation and the employment-unemployment relationship, demand price and foreign trade equations, final demand components and foreign trade. The second part presents the variants for analysing the properties of the model.

[4] See, for example, Jacquinot and Mihoubi (2000, (2003) about this type of macroeconomic modelling for France.

[5] This work is in line with that of Layard and Nickell (1991).

OVERVIEW OF THE MODEL

The overall structure of the model is as follows:

Goods and services equilibrium

$Y = C + IL + FBCF + \Delta S + X - M$

Supply block

$K = K(Y, Ck / W)$ determination of capital stock (investment can be derived from the equation)

$FBCF = K - (1 - \delta)K_{-1}$). To simplify the presentation, we assimilate total value added with GDP here.

$L = L(Y, Ck / W, Eff)$ labour demand

$P = P(Y, Ck / W, Eff)$ value-added price, which depends on capacity utilisation rates in the short run

$Eff = hp(Y / L \times dht)$, where *hp* is a filtering operator

with:

Y : value added (or GDP, by assimilation)

Ck : cost of capital

W : private sector wage

Eff : exogenous trend in per-capita labour productivity

K : capital stock

L : wage earners and self-employed in full-time equivalent

δ : obsolescence rate

Wages

$W = W(Pc, Eff, U, CS)$ private sector wage equation

where:

U : unemployment rate

CS : tax-contribution wedge

Pc: consumption prices

Employment, unemployment

$U = (L^S - L) / L^S$ unemployment rate (accounting identity)

$L^S = L^S(Y, L, POPAG)$ labour supply, which depends on the population and the participation rate

where:

$POPAG$: working-age population

L^S : labour force

The combined dynamics of the supply block and the wage equation ("price-wage system") determine the equilibrium unemployment rate: disequilibrium in the division of value added between wages and profits (lower profit margin) leads to an increase in the unemployment rate.

Prices and deflators[6]

$Ck = CK(TL, \delta, \Delta p_k)$ cost of capital

$Pq = f(P, Pci)$ output prices, used in foreign trade price equations[7]

$Px = \omega \ln Pq + (1-\omega)\ln P_{et}e$: export prices

$Pm = \alpha Pp + (1-\alpha)P_{et}e$: import prices

$\ln Pc = \lambda_c \ln P + (1-\lambda_c)\ln Pm$: consumption prices (ex. tax)

$\ln Pi = \lambda_k \ln P + (1-\lambda_k)\ln Pm$: investment prices (ex. tax)

where:

TL : long-term interest rate

TC : short-term interest rate

P_k : price of the capital stock

e : nominal effective exchange rate

Demand block

$C = C(RDB, Pc, \Delta Tres, TC)$: household consumption

$X = X(Mond, Px, eP_{et})$: exports of goods and services

$M = M(Dem, Pm, P_{et})$: imports (energy/goods and services excluding energy)

$IL = IL(RDB, TL, Pc, Pi)$: Household residential investment

$\Delta s = S(Y, TC)$ changes in inventories

where:

$\Delta Tres$: changes in cash credit in real terms

RDB : real disposable income

Mond: real world demand

Dem: weighted domestic demand

[6] The GDP price is determined in several stages (see the accounting framework for the model):

- Real GDP = C+FBCF+IL+ΔS +X-M in real terms
- Real VA = real GDP – real VAT – real customs duties
- Nominal VA = real VA x p (value-added price)
- Nominal GDP = nominal VA + nominal TVA + nominal customs duties
- GDP price = nominal GDP/real GDP
- Nominal GDP components = Real components x demand price including taxes, with the tax-inclusive demand price being defined on the basis of the demand price before tax, for example: $p_{c,ttc} = p_c(1+\tau_c)$, since the τ_i for each of the demand components are exogenous.
- ΔStock price by the balance (nominal ΔStock = nominal GDP – other nominal GDP components)

[7] A new variable for the production price of goods has to be included because France's foreign trade is highly specialised in exports of goods and the value-added price includes the prices of both goods and services. Otherwise, France would be qualified as a "price taker", in the sense that the price of exports would depend solely on competitors' prices, with no variation in price mark-ups.

Agents' accounts

$RDB = WL - CSS + PREST - T + INT$: households' disposable income

Public finances

$T = T(Y, \tau)$ taxes and social security contributions

$G = G(Y, L, Pc)$ public expenditures

Financial sub-block[8]

$\Delta Tres = CDm(RDB, TC, Pc)$ **:** cash credit to households

Long-run equilibrium growth path

Employment growth on the equilibrium growth path depends on the population (L^S), taking into account the equilibrium unemployment rate, which, in turn, depends on the trend growth rate of apparent labour productivity. The nominal variables depend on the exchange rate, which is considered to be an exogenous variable, and they grow at the same rate as foreign prices (p_{et})

Notations for the variables in the model (logarithms of variables are denoted in small letters)

C : households' real consumption

C_k : total cost of capital

C_{kmat} : cost of capital for equipment

C_{kbat} : cost of capital for buildings

CRT : outstanding cash credit to households

CS : social security wedge

CUT : unit labour cost in business sector

DHS : total demand excluding inventories

Durée **:** weekly hours of work

E : technological progress (TFP)

$EMPTOT$: total employment

G : government housing benefits

Il : households' real housing GFCF

K : total capital stock of business sector (K_i capital stock of firm i)

$Kmat$: capital stock in equipment

$Kbat$: capital stock in buildings

L : business sector employees (full-time equivalent)

[8] Future versions of the model will attempt to include a more comprehensive financial block based on preliminary work by De Bandt, de Belleville and Vazeille (2001), de Belleville and Fonteny (2001), and De Bandt and de Belleville (2002). The model also includes an analysis of the various sectors' net interest flows.

(Notations for the variables in the model, continued)

P : value-added price of business sector

P_{ci} : price of inputs

P_{cim} : price of imported inputs

P_{mat} : price of imported commodities

$P_{brent€}$: oil price (Brent) in euros

Pc : price of household consumption

Pi : price of business sector equipment and buildings investment

Pil : price of housing investment

Pm : price of imports (Pm_i : price of imports of product *i*)

Px : price of exports (Px_i : price of exports of product *i*)

Pm^* : price of competitors for imports (on the domestic market)

Px^* : price of competitors for exports (on export markets)

Pq : domestic output price (Pq_i : domestic output price of product *i*)

Pt : price of total business sector investment

PDH : demand price excluding VAT (consumption or investment)

PIB : real gross domestic product

$PRODT$: actual apparent labour productivity

$POPBIT$: ILO labour force

$POP2564$: working-age population, 25 to 64 years old

R : real gross disposable income of households (adjusted by the consumption deflator)

$\Delta Stocks$: real variations in stocks and objects of value

TC : three-month interbank interest rate

$Texo$: rate of exemptions from social security contributions on unskilled labour

TL : ten-year bond yield

TLR : real bond yield (adjusted for the year-on-year change in the household consumption deflator)

TUC : capacity utilisation rate

W : total per capita wage cost (gross/gross terms)

Y : business sector value added (Y_i : value-added price of firm *i*)

α : elasticity of import prices to output prices ($1-\alpha$: elasticity to export prices of competitors on the domestic market).

α' : elasticity of export prices to output price ($1-\alpha'$: elasticity to export prices of competitors on foreign markets).

λ : elasticity of final demand prices to the value-added price ($1-\lambda$: elasticity to import price).

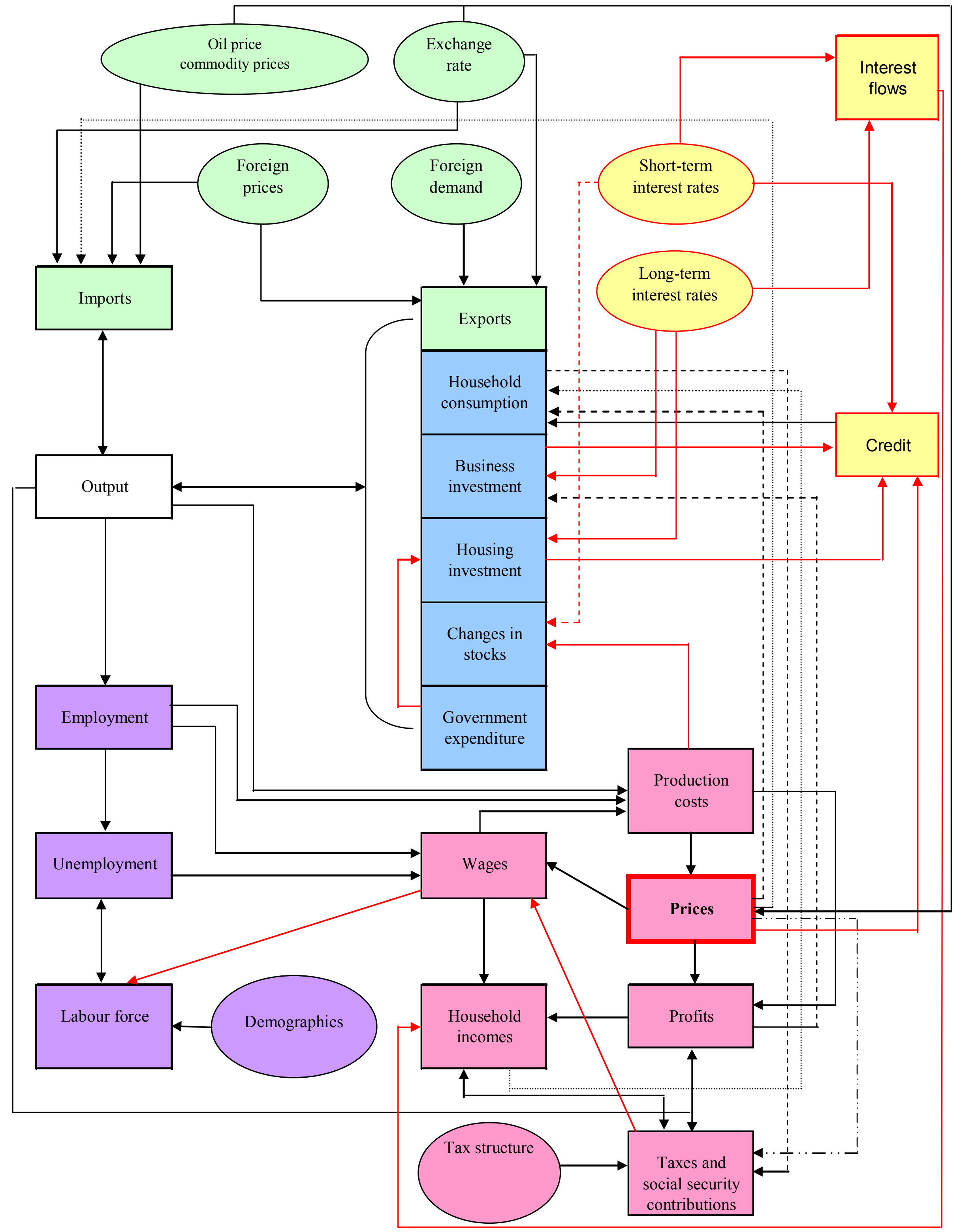
ξ : elasticity of output price to the value-added price.

β : capital share in business sector value added

η : elasticity of demand to prices in the market for goods

μ : Price mark-up in the market for goods ($\mu = (1-1/\eta)^{-1}$)

General Structure of the Macro-economic Model



1 Part one: the main equations of the model

1.1 Supply block

The Mascotte model has a supply block in which a production function is specified. This specification makes it possible to formulate explicit long-run theoretical targets for factor demands. It also makes it possible to formulate a long-run equation for setting producer prices (PS) to anchor the determination of the price-wage system. Combined with a wage-setting equation (WS), the price-setting equation determines the rate of structural unemployment and then uses Okun's law to derive the output gap. The specification of a production function increases the consistency with which the model is written.

The general approach is inspired by the "new Keynesian approach" proposed by Blanchard and Fisher (1989) for dealing with nominal rigidities and by the "micro-macro" models that propose micro-foundations for cycles in the short run while specifying a long-run equilibrium inspired by neo-classical economics. For this purpose, firms have price-setting power under monopolistic competition. The economy has n goods ($i = 1,...,n$). Each good is produced by one monopolistic producer, but can still be substituted for the other goods. If we take a representative consumer with a CES utility function, the maximisation of the consumer's utility, subject to an income constraint, means that, if there are a large number of goods, the demand function for each good is iso-elastic. In the short run, and since n is fixed, profit maximisation by each firm leads to an identical equilibrium price for each product, assuming products are made using the same technology, with a given cost of labour and a given cost of capital (Benassy, 1991). Under symmetrical equilibrium, each firm i produces the same quantity of the good and makes the same profit. This means that the degree of competition is measured by the price mark-up that firms apply to their production costs.

The characteristics of the production function depend on the assumptions with regard to returns to scale, integration of technological progress, the number of factors of production and their substitutability. Technological progress is assumed to be Harrod-neutral, meaning that it increases labour efficiency only. This enables us to ensure that the production function is consistent with a steady-state long-run growth regime. In order to limit the apparently unlimited choice of functions that could be tested, we imposed constant returns to scale on the economy. We justify this assumption by considering that it should be possible to replicate identical production units under optimum circumstances.[9] This assumption alone restricts the production functions that can be used to functions that are homogenous of degree one. To keep the model relatively simple in terms of its specification and use, particularly for forecasting, we have limited the number of factors of production to three: employment and capital stocks in equipment and buildings. Some quite recent work has once again shown the value of distinguishing between capital stock in equipment and capital stock in buildings when modelling investment.[10] The two types of capital stock may be assumed to be complementary, as investment in building often precedes investment in equipment. Finally, after re-examining the value of the elasticity of substitution between capital and labour, which plays a critical role in the long-run specification of the model, we have put it at one.[11]

[9] See *Economie et Prévision* (1998).

[10] See Irac and Jacquinot (1999). This distinction was already made in the OFCE Mosaïque model and previous versions of the Banque de France model. See Cette (1992) in particular.

[11] De Bandt and Rousseaux (2002) also opted for this choice, as did Baghli, Cette and Sylvain (2003) implicitly. Elasticity of substitution measures the long-run effects of a rise in interest rates on capital productivity, or of a fall in the cost of labour on employment. It also determines the direct long-run effect of technological progress on employment by being different from 1 or not.

1.1.1 The choice of production function: the elasticity of substitution between capital and labour

Most macro-econometric models use a Cobb-Douglas production function that assumes that the elasticity of substitution between factors, which is usually written $\sigma = \Delta \log (K / L) / \Delta \log (w / ck)$, is equal to one. Turner *et alii* (1996) propose using a Cobb-Douglas specification for all G7 countries except Japan, but without providing any empirical justification for this choice. The measurement error relating to the users' cost of capital makes it difficult to determine the elasticity of substitution between capital and employment (Dormont, 1997). Therefore, some authors (Bolt *et alii*, 2000) use the employment equation to determine the elasticity of substitution and then impose this elasticity in the capital demand equation. In many cases, it can also be calculated on a case-by-case basis using panel data (Allard-Prigent *et alii*, 2001).

The following table supplements the survey in Gautier (1997) by showing the most recent results for France, along with the results reviewed by Maermesh (1993). The table shows the uncertainty surrounding the measurement of elasticity of substitution between capital and labour, which ranges from 0 to 1.1, depending on the authors.

Study/model	Type of data	Elasticity of substitution
Hamermesch (1993)	International literature survey	Around 1
Dormont (1997)	Aggregated data (manu. sector)	Between 0.5 and 0.8
	Sector data (manu. sector)	1
	Individual data (manu. sector firms)	1.1
Legendre and Le Maître (1997)	Individual data (firms)	Near 0
Crepon and Giannella (2001)	Individual data (firms)	Between 0.4 and 0.6
Bolt and Van Els (2000)	Aggregated data	0.7
Mésange model (2000)	Aggregated data	0.4
OFCE model (2002)	Aggregated data	0
ECB multi-country model (1998)	Aggregated data	1

In order to determine the value of this elasticity of substitution, we solved the firms' optimisation programme using a translog production function, which is a Taylor expansion of any production function that incorporates the assumptions of constant returns to scale and Harrod-neutral technological progress.

There are several errors in the measurement of the users' cost of capital that influence the supply block production function parameters, and more specifically, the elasticity of substitution.[12] The absolute level elasticity of substitution therefore depends on the choice of interest rate or the way investment price expectations are formulated. Nonetheless, our estimations provide an order of magnitude for the elasticity of substitution between capital and labour, which is seems reasonable to put at 1.

The series used in this section relate to the whole business sector (financial, non-financial and unincorporated corporations). The production of financial services is hence considered like the production of any other services. The only exception is the profit measure used below, which is restricted to non-financial and unincorporated corporations, since the role of interest payments for financial corporations, cannot be treated like those of the other sectors.

After preliminary considerations, the elasticity of substitution has been assumed to be unitary. The production function is hence Cobb-Douglas, with usual notations:

$$Y = AK^{\beta} (EL)^{1-\beta} \qquad (1.1.1)$$

[12] See Appendix 1 for the determination of the elasticity of substitution between capital and labour.

The solution of the firms' optimisation programme leads to:

$$K = \frac{\beta PY}{\mu Ck}$$

$$L = \frac{(1-\beta)PY}{\mu W} \qquad (1.1.2)$$

$$P = \frac{\mu}{A}\left(\frac{C_k}{\beta}\right)^{\beta}\left(\frac{W}{(1-\beta)E}\right)^{1-\beta}$$

with $\mu = (1-\frac{1}{\eta})^{-1}$ being the price mark-up and η the price elasticity of demand.

In logarithmic form:

$$\begin{cases} k = y - (c_k - p) + \ln(\beta) - \ln(\mu) \\ l = y - (w - p) + \ln(1-\beta) - \ln(\mu) \\ p = (1-\beta)(w-e) + \beta c_k - \beta\ln(\beta) - (1-\beta)\ln(1-\beta) + \ln(\mu) - a \end{cases} \qquad (1.1.3)$$

Since building investment is seen as a complement to equipment investment, the users' cost of capital will be defined for equipment only as:

$$C_{kmat} = P_{t,imat}\left(\frac{TL}{4} + \delta_{mat} - \frac{1}{4}\left(\frac{P_{t,imat} - P_{t-4,imat}}{P_{t-4,imat}}\right)\right) \qquad (1.1.4)$$

Using the Cobb-Douglas specification, it is easy to express the coefficients as functions of structural parameters. If S_K denotes the capital share and S_L the labour share, then:

$$S_K = \frac{\beta}{\mu},\ S_L = \frac{1-\beta}{\mu} \qquad (1.1.5)$$

hence: $\mu = \frac{1}{S_K + S_L},\ \beta = \frac{S_K}{S_K + S_L}$

The average values of μ and β over 1978Q1-2001Q4 (1.28 and 0.26 respectively) computed in this way are very close to the ones obtained from the FIML estimations of the system (1.1.3) (1.28 and 0.27 respectively). μ and β can then be fixed to these values with some confidence. Labour-augmenting technical progress (e) is measured on the basis of apparent labour productivity, taken from a moving average over the preceding 2 years. With respect to an exogenous time trend, this formulation allows for possible productivity shocks, and it is especially tractable as regards the implementation of the 35-hour week.

These values are used to determine the long-run relationships, which are then used as the basis for estimating the short-run dynamics.

1.1.2 Employment equation

For the sake of simplicity and to make the model easier to use for forecasting, the employment variable that we use is the number of business sector employees. We do not break the variable down by sector, for example into manufacturing and non-manufacturing sectors. Self-employment is considered to be an exogenous variable. The labour factor can be measured in two ways: hours worked or number of employees. Modelling labour in hours worked implies that the elasticity of per capita productivity to hours of work is equal to one. On the other hand, if we consider headcount only, we assume that the weekly hours of work have influence on productivity. The weekly hours of work do not appear to be significant when added to the non-calibrated parameters of the employment equation in the long-run target. Therefore, we merely add a contemporaneous variation of weekly hours of work to the short-run dynamics of the employment equation. This variation is significant, but it could successfully be replaced by two dummy variables in 1982Q1 and 2000Q1, which would correspond roughly to the reductions in the statutory workweek. With the exception of these two brief periods, the variations in hours worked and number of employees are very similar.

Quarterly variations in employment and hours worked

In the long run, the equality between the marginal labour cost and marginal revenue means that real wages depend on labour productivity, in accordance with the firm's optimisation programme (1.1.3.b).

$$l = y - (\omega - p) + \ln(1-\beta) - \ln(\mu)$$

Short-run dynamic is:

$$B(L)\Delta l = b_0 + B_2(L)\Delta y + B_3\Delta tuc + B_4\Delta durée + \rho \cdot (l_{-1} - y_{-1} + w_{-1} - p_{-1}) \qquad (1.1.6)$$

Employment equation estimation results

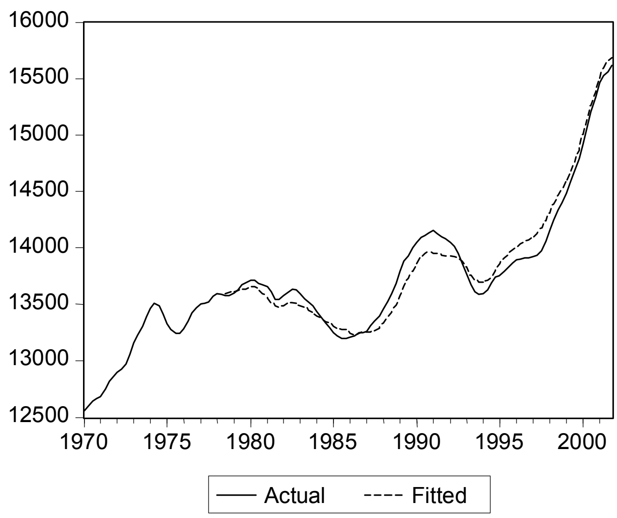
Δl	1978q3-1996q4		1978q3-2001q4	
	Coefficients	t-stat	Coefficients	t-stat
Δl_{-1}	0.960	7.50	0.916	8.19
Δl_{-2}	-0.470	-2.74	-0.449	-3.05
Δl_{-3}	0.226	2.02	0.241	2.50
Δy	0.091	3.61	0.090	4.03
Δy_{-1}	0.051	1.89	0.057	2.33
Δtuc_{-1}	0.026	1.18	0.032	1.68
$\Delta durée$	-0.160	-1.93	-0.144	-2.20
ρ	-0.012	-2.12	-0.011	-2.29
$Dum_{93T3-01T4}$	0.001	1.66	0.001	2.74
b_0	-0.007	-2.35	-0.007	-2.55
Ser	0.12%		0.11%	
DW	1.98		1.97	
R2	0.87		0.91	

The gradual adjustment of employment to activity tracks the productivity cycle. A temporary increase in value added leads to a 0.9% increase in productivity in the short run, but the effect is cancelled out in the longer run as employment gradually adjusts.

Capacity utilisation rates without new hires can capture a substitution effect between labour and capital: tighter capital leads to an increase in employment.

Cost variables, such as real wages and the social-security-and-tax wedge, do not have a significant influence on employment in the short run. Nevertheless, the inclusion of a dummy variable from 1993Q3 can be seen as a very rough modelling of employment policies implemented since that period.[13] The dummy variable is equivalent to a lasting effect on the level of employment and a temporary effect on its rate of growth. The rate of employment growth is determined by the steady-state growth rate of the labour force.

Dynamic simulation of business sector employment levels



[13] The date of 1993Q3 is determined econometrically with a break test.

Business sector employment elasticities[14]

After…	1 quarter	1 year	2 years	5 years	Long run
Value added	0.09	0.40	0.58	0.79	1.00
Cost of labour	0.00	-0.06	-0.18	-0.50	-1.00

1.1.3 Equipment investment equation

KMAT: changes in stocks
Y: Gross domestic product
$CKRL = \frac{1}{8}\sum_{i=0}^{7}\left(\frac{C_{kmat}}{P}\right)_{-i}$: real users' cost of capital – moving average
$p_{t,imat}$: equipment investment deflator.

P: value added deflator
PROFIT: (gross operating surplus – taxes) / value of the capital stock
TUC: capacity utilisation rate

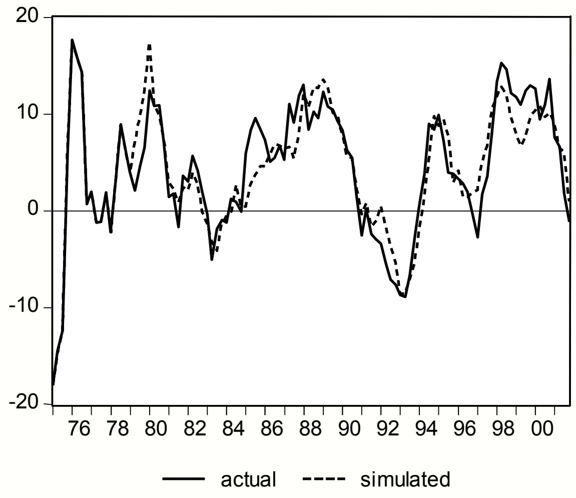
The long-run target is written like equation (1.1.3 a) applied to capital stock in equipment:

$$kmat = y - (c_k - p) + \ln(\beta) - \ln(\mu)$$

The obsolescence rate is assumed to be constant. Under these circumstances, the accumulation rate in level is written the same way as variation in capital stock. The noteworthy changes from the former model specification are (i) the fact that the obsolescence rate is an exogenous variable, whereas capital stock had previously been calculated by depreciation with sudden death, (ii) the inclusion of the users' real cost of capital in the short-run dynamics and long-run target, and (iii) writing the accumulation rate as a level and not a variation, which makes it possible to consider an accelerator effect.

[14] All of the dynamic elasticities presented in this way are calculated by simulating the shocks in 1980Q1.

Dynamic simulation of business sector investment in equipment (quarter on quarter change in %)



With the introduction of a smoothing of the logarithm of *Ck* over 2 years deflated by *p*, meaning the variable *ckrl*, the dynamic equation is:

Equipment capital stock, business sector: estimation results

$$B(L)\Delta kmat = b_0 + B_1(L)\Delta y + B_2(L)\Delta(ckrl) + B_3(L)\Delta \Pr ofit + B_4(L)\Delta TUC$$
$$+ \rho(kmat_{-1} - y_{-1} - ckrl_{-1})$$

$\Delta kmat$	1981q1-1996q4		1981q1-2001q4	
	Coefficients	t-stat	Coefficients	t-stat
$\Delta kmat_{-1}$	0.6435	5.38	0.7260	6.81
$\Delta kmat_{-2}$	0.1711	1.66	0.1117	1.18
Δy	0.0557	5.22	0.0528	5.16
$\Delta(ck_{-1} - p_{-1})$	-0.0012	-1.58	-0.0011	-1.48
$\Delta Profit_{-4}$	0.0010	0.77	0.0021	1.59
ΔTUC	0.0129	3.52	0.0112	3.49
ρ	-0.0014	-2.50	-0.0014	-3.00
b_0	-0.0011	-2.29	-0.0011	-2.08
Dum_{92T3}	0.0018	2.26	0.0013	1.82
Ser	0.05%		0.05%	
DW	1.88		2.03	
R2	0.97		0.97	

The profit variable is hardly significant, but we consider it as poorly estimated rather than non-significant. This might be because the share of firms facing financial constraints changes over time. The profit rate actually increases with the accumulation rate during the eighties, but does not contribute to the fall in the accumulation rate in the early nineties, which is explained by the fall in activity instead. At the end of the sample, the profit rate regains some explanatory power with regard to investment developments.

Elasticities of equipment investment

After …	1 quarter	1 year	2 years	5 years	Long run
Value added	1.05	1.73	1.70	1.2	1
Real user's cost	0.00	-0.032	-0.07	-0.15	-1
Profit	0.00	0.05	0.03	0.016	0

1.1.4 Building investment

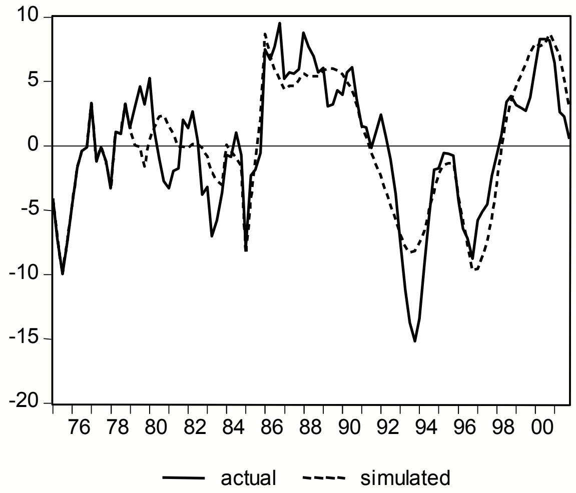
Building investment is treated as a complement to equipment investment, but the ratio of equipment capital stock to building capital stock has followed a downward trend for 30 years. The specification takes these features into account:

Building capital stock, business sector: estimation results

$$B(L)\Delta kbat = b_0 + B_1(L)\Delta kmat + b_1 t + b_2 \cdot \left(kbat_{-1} - kmat_{-1}\right)$$

$\Delta kbat$	1972q1-1996q4		1972q1-2001q4	
	Coefficients	t-stat	Coefficients	t-stat
$\Delta kbat_{-1}$	0.7735	25.12	0.8060	32.37
$\Delta kmat$	0.0542	8.02	0.0455	10.59
b_0	0.0063	3.49	0.0036	2.84
b_1	$-3.2\ 10^{-5}$	-3.89	$-1.9\ 10^{-5}$	-3.35
b_2	-0.0042	-3.16	-0.0022	-2.37
Dum_{84T1}	0.0003	2.71	0.0003	2.79
Dum_{85T1}	-0.0005	-4.11	-0.0005	-4.51
$Dum_{85T1-95T4}$	0.0002	4.36	0.0002	6.35
Ser	0.01%		0.01%	
DW	1.86		1.83	
R2	0.98		0.99	

Dynamic simulation of business sector investment in buildings (quarter on quarter change in %)



1.1.5 Capacity utilisation rate equation

The investment and employment equations imply that the capacity utilization rate (TUC) is an endogenous variable. We considered two long-run targets. The first represents a deviation from the long-run capital productivity trend, adjusted by the ratio of investment prices to value-added prices. This adjustment is due to the downward trend in real capital productivity over the 1978Q1-2001Q4 period, whereas nominal capital productivity was more stable. Investment primarily represents investments in manufactured goods, which account for around 70% in real terms. The prices of such goods showed a much smaller increase than the prices of other goods. This long-run target did not seem to be significant.

The second long-run target stems from rewriting the production function and adjusting the capital stock for the capacity utilisation rate. This target seemed to be significant, but it had the wrong sign. Furthermore, it did not make any appreciable difference to forecasts compared to a simpler equation that regressed the capacity utilisation rate on lags of itself and the lagged values of variations in value added. Therefore, we chose this formulation and wrote it in the form of:

$$B(L)tuc = b_0 + B_2(L)\Delta y \qquad (1.1.7\text{ a})$$

The presence of a constant in this equation enables us to interpret it as a deviation from the respective averages of each of the variables, or:

$$B(L)(tuc - \overline{tuc}) = B_2(L)(\Delta y - \overline{\Delta y}) \qquad (1.1.7\text{ b})$$

The capacity utilisation rate dips below its average, signalling tightness on the goods market, when effective growth (Δy) dips below its average ($\overline{\Delta y}$) too.[15]

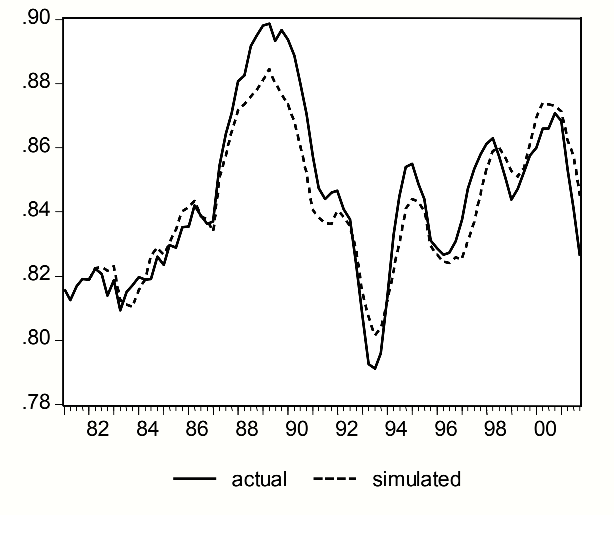
[15] This means that the simulation of a structural shock to the growth potential of the economy in this model requires the simulation of a shock to the constant b_0 in this equation as well, in order to leave the long-run value of the capacity utilisation rate unchanged.

Capacity utilisation rate equation
(Manufacturing sector, Banque de France)

$$B(L)tuc = b_0 + B_2(L)\Delta y$$

Tuc	1979q1-1995q4		1981q3-2001q4	
	Coefficients	t-stat	Coefficients	t-stat
tuc_{-1}	1.2691	12.19	1.324	13.68
tuc_{-2}	-0.1998	-1.23	-0.244	-1.56
tuc_{-3}	-0.4668	-2.81	-0.435	-2.69
tuc_{-4}	0.3012	3.03	0.264	2.82
Δy	0.5046	4.66	0.525	5.48
Δy_{-1}	0.4860	3.93	0.354	3.20
Δy_{-2}	-0.0122	-0.10	-0.119	-1.11
Δy_{-3}	0.1618	1.27	0.083	0.73
Δy_{-4}	-0.3274	-2.73	-0.264	-2.54
Constant	-0.019	-3.16	-0.018	-3.21
Dum_{82T1}	-0.010	-2.13	-0.009	-1.85
Dum_{83T2}	-0.010	-2.07	-0.011	-2.24
Dum_{86T3}	-0.013	-2.67	-0.013	-2.68
Dum_{87T2}	0.019	3.60	0.018	3.63
Ser	0.6%		0.5%	
DW	1.93		2.16	
R2	0.93		0.977	

Dynamic simulation of the capacity utilisation rate



When we consider the capacity utilisation rate as an endogenous variable and look at the building investment equation, we find a maximum accelerator effect of 1.9 after one year:

Elasticities of total business sector investment

After…	1 quarter	1 year	2 years	5 years	Long run
Value added	1.1	0.89	0.80	0.61	1
Real user's cost	-0.025	-0.05	-0.11	-0.26	-1
Profit rate	0.00	0.04	0.03	0.015	0

1.1.6 Value-added price equation

The theoretical specification of the supply block could also lead us to adopt a long-run target for the value-added price equation in the form of a factor price frontier[16] according to equation (1.1.3 c). However, for forecasting purposes, we prefer to use an equation specification where the long-run elasticity of the value-added price to unit wage costs is equal to one.

$$B(L)\Delta p = b_0 + B_1(L)\Delta csul + B_2(L)tuc + \rho(p_{-1} - csul_{-1}) \quad (1.1.8)$$

The long-run target of the equation can be seen as another way of writing the long-run employment equation, or else the result of the optimisation programme in which the firm or the entrepreneur considers that the stock of capital is fixed in the short run. This equation provides greater stability for the price-wage system. Compared to a total factor cost equation, it limits the effect of interactions between investment prices and value-added prices, which are linked by the way the users' cost of capital is written.

In the short run, changes in the value-added price depend on its inertia, wages adjusted for productivity smoothed over two years (csul, or $w_t + l_t - \frac{1}{8}\sum_{j=1}^{8}(y_{t-j} - l_{t-j})$), and the capacity utilisation rate (*tuc*).

Thus, the value-added price adjusts in different ways to unit wage cost components: adjusting rapidly to wage increases, but more gradually to productivity increases, since they are smoothed over two years. The capacity utilisation rate shows the more rapid increase in businesses' price mark-up in a high-growth regime subject to supply constraints. Tightness on the labour market has only an indirect influence on price-setting, though its effect on wage-setting.

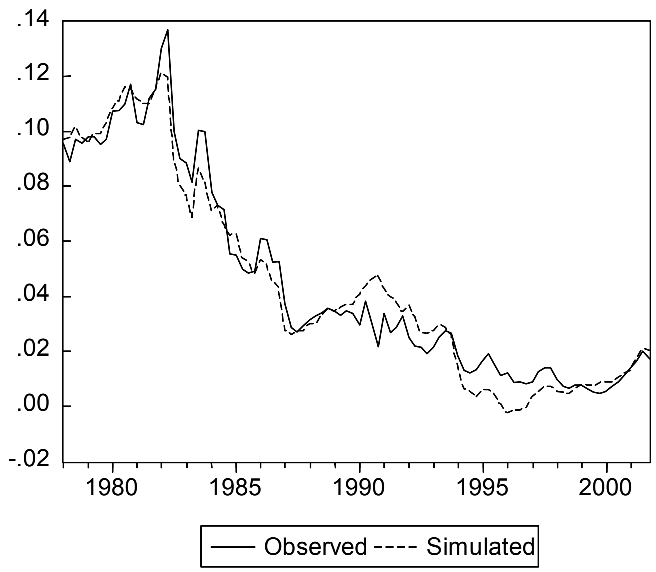
Furthermore, we have imposed dynamic homogeneity of prices to unit wage costs so that the equilibrium unemployment rate is not dependent on the level of inflation.

[16] See Appendix 2 for such a specification.

Results of the estimation of the value-added price equation (base 95)
Long-run target: unit wage costs

Δp	1972q2-1996q4		1972q2-2001q4	
	Coefficients	t-stat	Coefficient s	t-stat
Δp_{-2}	-0.136	-1.60	-0.134	-1.75
Δp_{-3}	0.269	constrained	0.269	constrained
Δp_{-5}	0.287	4.23	0.290	4.72
$\Delta csul$	0.303	3.79	0.295	4.28
$\Delta csul_{-1}$	0.277	3.28	0.281	3.86
tuc_{-1}	0.070	3.62	0.070	4.07
ρ	-0.032	-2.04	-0.031	-2.24
b_0	0.029	2.65	0.028	2.94
Dum823	-0.017	-3.53	-0.018	-3.90
Dum861	0.015	3.09	0.015	3.38
Dum93	0.007	2.74	0.007	3.00
Ser	0.5%		0.4%	
DW	1.96		1.95	
R2	0.83		0.86	

Dynamic simulation of value-added price (year on year change in %)



Elasticities of the value-added price to

After…	1 quarter	1 year	2 years	5 years	Long run
per capita compensation	0.29	0.62	0.90	1.10	1.00
utilisation rate (*)	0.00	0.23	0.61	1.69	2.63

(*) semi-elasticity

1.2 Determining wages

The price-wage system is a critical component of any macro-econometric model and has a preponderant influence on the long-run equilibrium of the model. The usual structure consists of a wage equation that expresses workers' pay aspirations and a system of price equations that summarises the price mark-up that firms apply to output costs (factor costs, input costs and taxes). Generally speaking, empirical price models and wage models both rely on an error-correction specification where the target is similar to a mark-up applied to the unit output cost for prices and similar to a long-run share of value added for wages.

The implied challenge in determining the wage equation properly is to compare the equations making up the price-wage spiral to define an equilibrium unemployment rate that corresponds to a reference situation where inflation is stable and optimum use is made of productive resources. This structural unemployment rate (non-accelerating inflation rate of unemployment or NAIRU) is an indicator of labour market conditions and, thereby of potential inflationary pressures. It is a key piece of information for any central bank in its conduct of monetary policy. For example, a situation where the unemployment rate falls below its steady-state value in most of the euro area countries would eventually lead to inflationary pressures and a loss of competitiveness. This could trigger intervention by the European Central Bank.

In addition to its repercussions for economic policy, the formulation of a wage curve in the Mascotte model enables us to explain specific issues, such as whether accounting for past wage disequilibria can introduce a mean-reverting process, the respective roles of terms of trade and productivity gains, and, more specifically, how taxes on labour affect compensation levels and thereby employment levels. Tax on the labour factor is considered to be one of the major causes of high unemployment. In Europe, and in France in particular, governments have introduced a series of measures aimed at reducing the relative cost of unskilled labour through exemptions from social security contributions on low-wage jobs.

The first subsection (1.2.1.) starts by presenting the results of estimations of the wage aspiration curve used in the model. Subsection 1.2.2. then presents the evaluations of the NAIRU and the output gap that results from this equation, taking into consideration the price equation estimated in section 1.1.

1.2.1 Estimation of the wage aspiration curve

This section summarises more detailed work on re-estimation of the wage equation in the Banque de France macroeconomic forecasting model (see Baghli, 2003).[17] On the basis of a macroeconomic

[17] This work provides as clear a picture as possible of the role that the social security wedge plays in wage formation by estimating two alternative specifications for the wage equation that can be used for running variant simulations. The first alternative model does not distinguish the social security wedge from net compensation in the long run (wage bargaining focusing on gross/gross wages). The second

specification that reconciles the Phillips curve approach (equation where all of the variables, except the unemployment rate, are growth rates) and the WS-PS model (level equation based on more elaborate micro-foundations), we estimate wage dynamics over the 1972Q3-2001Q4 period (expressed as per capita wage cost deflated by the value-added price) using an error correction model that includes the terms of trade (measured as the ratio between consumption prices and value-added prices), apparent labour productivity (per employment unit) and the unemployment rate as the long-run determinants of real wages. In short, this re-estimation is based on the following econometric equation (expressed as per capita wage cost deflated by the value-added price):

$$\begin{aligned} B(L)\Delta(w-p_{-1}) &= b_1 + \mathrm{B}_1(L)\Delta(pc-p) + \mathrm{B}_2(L)\Delta prodt + \mathrm{B}_3(L)\Delta cs \\ &+ \mathrm{B}_4(L)\Delta U_{-1} + \mathrm{B}_5(L)\Delta^2 p + \rho\left(w_{-1} - pc_{-1} - b_2 prodt_{-1} - b_3 cs_{-1} + b_4 U_{-2}\right) + \varepsilon \end{aligned} \qquad (1.2.1)$$

where ε is assumed to be an independent and identically distributed error term.

The social security wedge, denoted CS, corresponds to all of the social security contributions that explain the difference between the cost of labour paid by the employer and the net wage of the employee:

$$CS = \frac{\text{Gross/gross wage}}{\text{Net wage}} = \frac{1+tcse}{(1-tcss)(1-tcsgrds)} \approx \frac{1+tcse}{1-tcss-tcsgrds} \qquad (1.2.2)$$

where tcse is the rate of employer's social security contributions, tcss is the rate of employee's social security contributions and tcsgcrds is a composite rate that is the sum of the "adjusted" rates of the social security surcharge (CSG) and the social security debt reimbursement levy (CRDS).

Including the social security wedge enables us to see to what extent workers consider these contributions as pure taxation or else as deferred income (in the form of retirement pension contributions), health and unemployment insurance premiums and/or a contribution towards financing a future supply of public goods.[18] Since $\log(W) = w \approx w^n + cs$ represents the logarithm of the nominal labour cost, then if $b_3 = 0$ it means that workers consider net wages and deferred benefits (pensions) or potential benefits (health and unemployment insurance) to be perfect substitutes, see Cotis and Loufir (1990), Collard and Hénin (1994), and Bonnet and Mahfouz, (1996). On the other hand, if the coefficient is equal to one, it means that workers consider the social security wedge to be pure taxation, which means that they bargain in terms of net wages and not total labour cost (Cotis, Méary and Sobczak, 1996; L'Horty and Sobczak, 1996 and 1997; L'Horty and Thibault, 1997; *Mésange* macroeconomic forecasting model of the Ministry of Finance Forecasting Directorate, 2001) [19].

We tested the constraints $b_2 = b_3 = 1$ in order to define an economically consistent econometric long run. The specification of the wage equation enables us to determine the target value of the real net wage, with regard to labour productivity and pressures on the labour market. The mean-reverting process towards this long-run target stabilises the division of value added in the long run in the explicit

alternative equation incorporates a social security contribution exemption rate, which means that it accounts for the impact that successive cuts in social security contributions on low-wage jobs have had on per capita wage costs and, thus, on employment.

[18] In order to identify wage-earners' different resistance behaviours to different pay deductions (especially different social security contributions), several attempts were made to estimate equations including a disaggregated social security wedge in the long-run target. Every single attempt, however, failed to produce statistically acceptable or economically coherent results.

[19] This work actually refers to the tax and social security wedge, which includes income tax (and thus, incorrectly, some direct taxes on income other than wages), whereas our definition refers solely to employers' and employees' social security contributions, the social security surcharge (CSG) and the social security debt reimbursement levy (CRDS). See Appendix 3 for the calculation of the social security wedge.

form of a norm for wage earners' purchasing power, which means that pay bargaining focuses solely on net wages. When we use nonlinear least squares to estimate the constrained wage aspiration curve, we get the results shown in the table below.

NLS estimations of the constrained wage equation ($b_2 = b_3 = 1$)

$\Delta(w - p_{-1})$	1972Q3-1996Q4		1972Q3-2001Q4	
	Coef.	t-Student	Coef.	t-Student
b_1	-0.02	-2.4	-0.03	-3.5
$\Delta^2 p$	0.66	8.7	0.65	9.2
$\Delta(pc - p)$	0.31	4.0	0.29	4.0
$\Delta(pc - p)_{-1}$	0.21	2.5	0.21	2.7
$\Delta tcse$	1	-	1	-
$\Delta^2 U_{-1}$	-0.91	-4.0	-0.77	-3.9
ρ	-0.04	-3.7	-0.05	-4.9
U_{-2}	-4.5	-4.2	-3.9	-5.6
$DU83Q2$	-0.004	-1.2	-0.005	-1.3.
$DU99q2-99q4$	-	-	-0.004	-1.8
$DU83Q3-01Q4$	-0.003	-2.4	-0.004	-2.0
SER	0.37%		0.35%	
DW	1.51		1.42	
R^2	0.85		0.80	

$DU83Q2$ and $DU99q2-99q4$ are dummy variables equal to one in the second quarter of 1983 and the second and third quarters of 1999 respectively, and equal to zero at other dates. These dummy variables are intended to account for the periods when wage indexation was temporarily eliminated. On the other hand, the dummy variable $DU83Q3-01Q4$, which is equal to one starting in the third quarter of 1983 and equal to zero before that, reflects a break in the level of wage growth.[20]

The statistical significance of the mean-reverting process means that the null hypothesis of no cointegration is rejected. Thus, the level term in the model with the social security wedge clearly illustrates a long-run target that is expressed in terms of the real net wage, with regard to labour productivity and tightness on the labour market. The long-run semi-elasticity of wages to the unemployment rate (expressed in percentage points) is estimated at 3.9%. This means that an increase of 1 percentage point in the unemployment rate leads to a 3.9% decrease in wages in the long run. This order of magnitude is close to the 4% result obtained with the Mésange macroeconomic model of the Forecasting Directorate, but it seems to be less in line with the econometric conclusions of Cotis, Méary and Sobczak (1996) or L'Horty and Sobczak (1997), even though the latter were also derived in a WS-PS framework that imposed the assumption that the social wedge is linked to the cost of labour ($b_3 = 1$) or to be derived from the econometric estimation ($\hat{b}_3 \approx 1$), and which led the authors to consider that pay bargaining focuses on the real net wage.

[20] The disinflation policy instituted in 1982 and its gradually increasing impact through the nineteen-eighties and early nineteen-nineties provides one explanation for this break in the level of compensation, but it would seem that this dummy variable really represents a change in the behaviour of the parties involved in wage bargaining, with a decrease in the bargaining power of workers and/or a greater preference for promoting employment. This explanation has been borne out by recent studies of wage developments in France (Blanchard, 1997 and 2000; Estevao and Nargis, 2002).

In the short run, the lagged difference of the unemployment rate is intended to capture the effects of labour market rigidities that account for a degree of persistence of unemployment (hysteresis). In addition, the introduction of the second difference, rather than the first difference, is aimed at accounting for the impact that periods of exceptionally fast rises or falls in unemployment have on wage bargaining.

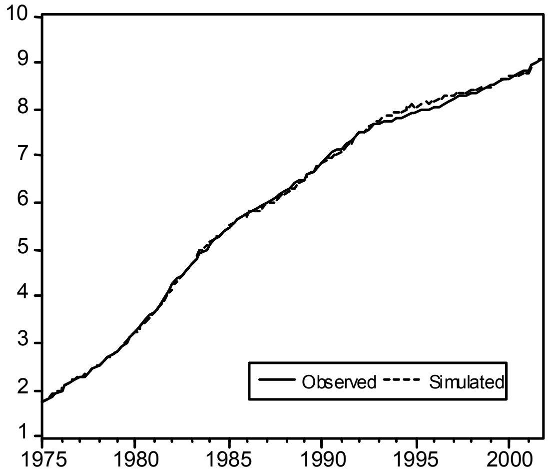
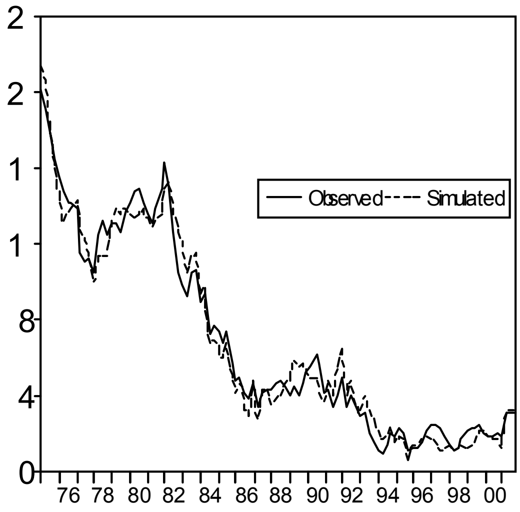
Labour productivity gains are not included because they are not statistically significant. This is in line with all of the applied econometrics work done on wage formation in France (Collard and Hénin, 1994; Bonnet and Mahfouz, 1996; Cotis, Méary and Sobczak, 1996; L'Horty and Sobczak, 1996 and 1997; L'Horty and Thibault, 1997; *Mésange* model of the Forecasting Directorate, 2001) as well as the work on the primary distribution of income (Cotis and Rignols, 1998; Prigent, 1999, Mihoubi, 1999; Baghli, Cette and Sylvain, 2003).

In addition, when we introduce the term $\Delta tcse$ (employers' contributions), it means that, in the short run, wage earners bargain in terms of their gross compensation, rather than in terms of their gross/gross compensation (meaning compensation including the employees' but not the employers' social security contributions) but, in the longer term, wage earners base their pay bargaining on a compensation norm expressed in terms of net wages (meaning after employers' and employees' social security contributions). The equation includes a domestic terms of trade indicator, defined as the ratio of the consumption price to the value-added price, to account for disparities between consumption price inflation and changes in value-added prices stemming from the distinct content of imported goods. The difference in points of view between wage earners, who naturally value their purchasing power in terms of consumption prices (which are more directly sensitive to import prices), and employers, who reason in terms of the value-added price, can give rise to pressures during wage bargaining in the short to medium run. More specifically, during a major oil shock, the linking of wages to consumption prices, which were driven up by higher energy prices, caused an increase in the share of wage costs in value added during these two subperiods. As Cotis and Rignols (1998), Prigent, (1999), Mihoubi (1999) and Baghli, Cette and Sylvain (2003) asserted in the case of France, Germany and Japan, this wage resistance is the expression of a conflict about the distribution of the fruits of growth ("mark-up war", Bean, 1994). It is often cited in empirical work as one explanation for the persistence of the effects of terms of trade shocks on the wage share and thereby on the NAIRU (see following section).

Elasticities of the nominal labour cost

After…	1 quarter	1 year	2 years	5 years	Long run
Consumption prices (+1%)	0.30	0.58	0.65	0.80	1.0
Labour productivity (+1%)	0.0	0.13	0.28	0.60	1.0
Social security wedge (+1%)	0.00	0.13	0.29	0.60	1.0
Unemployment (+1 point)	0.00	-0.32	-0.94	-2.23	-3.9

Dynamic simulation of the wage aspiration curve with the social security wedge included in the long-run target

Level	Year-on-year change (%)
	

As the chart above shows, the equation tracks gross/gross wage changes correctly both in terms of level and in terms of year-on-year change.

1.2.2 NAIRU

A comparison of the wage aspiration curve and the value-added price equation set out in Section 3.1., where the long-run target is written as a mark-up on wage costs $pva_t = pva_t = \alpha_0 + csul_t$ defines a single equilibrium unemployment rate:

$U^* = f\,(pc - p, prodt - prodtl, cs, \Delta cs)$

This equilibrium unemployment rate is not dependent on the inflation rate. It can therefore be seen as an unemployment rate that is compatible with stable long-term inflation, or NAIRU (non-accelerating-inflation rate of unemployment). The persistence of the NAIRU can partly be explained by the cost of the social security system. The social security contribution *cs* influences both the NAIRU level and trend, since its growth rate ˜(cs) was not stable over the period under study.

The NAIRU is positively correlated with domestic terms of trade, energy shocks, indirect taxes and, to a lesser extent, the deviation of apparent labour productivity growth from its trend rate.

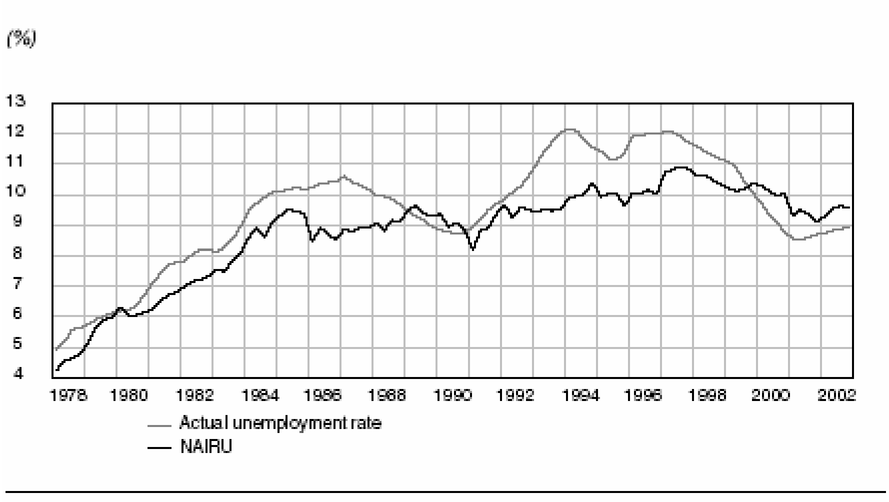
The NAIRU derived from the Mascotte model is shown in the chart below. This evaluation reproduces several stylised features of the French economy, with a gradual increase in the NAIRU until the mid-1980s, relative stability until the end of the 1990s, followed by a downtrend at the end of the period.

The respective influences of the equilibrium unemployment rate determinants vary depending on the period under consideration. Nevertheless, changes in the NAIRU over the period stem mainly from variations in the wage wedge, which includes the social security wedge and the terms of trade, and, more specifically, social security contributions.

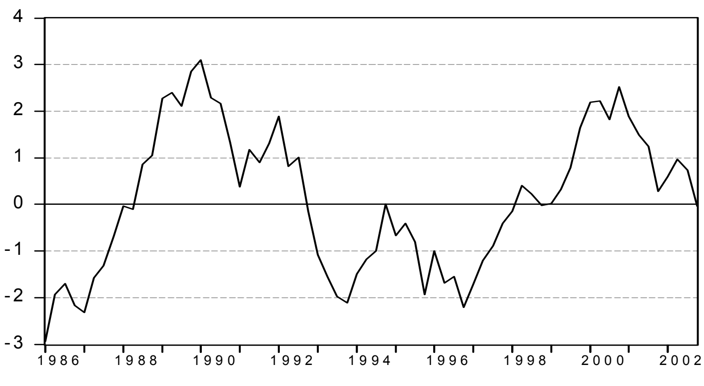
The increase in relative energy prices following the second oil shock explains much of the large increase in the NAIRU in the early 1980s. After that, the rise stemmed largely from the increase in the social security contributions, which became an increasingly important determinant. In the second half of the 1980s, the oil counter-shock offset some of the impact of the steady increase in the social security wedge in France, which meant the NAIRU stood at an average of 9.1%, before starting to rise again in the early 1990s. After the 1990s ended, the NAIRU fell steadily, in response to a series of policies aimed at reducing social security contributions. At the end of 2002, the NAIRU stood at 9.6%. The nature of this value, derived from an econometric model, requires us to interpret the figures with care and to keep in mind that, despite its decline since the mid-1990s, the NAIRU is now nearly the same as the actual unemployment rate, whereas it had previously been lower.

It is hard to measure the NAIRU since it relies on many assumptions and on the accuracy of econometric estimates. The assumptions include one that states that potential substitutability between direct compensation and deferred compensation could lead to significant changes in the way the level of the NAIRU is evaluated (Baghli, 2003).

Equilibrium unemployment rate of the model



The output gap of the model (%)



The output gap (EP) that can be derived from the Mascotte model is ultimately similar to the one put forward by De Bandt and Rousseaux (see Baghli *et alii*, 2002). Starting with the Cobb-Douglas production function estimated for $\beta = 0.28$ above, we can estimate potential growth. This enables us to identify the contributions that the different factors of production (capital, labour and technological progress) make to growth. In order to determine potential employment, which is the product of the working-age population, the medium-run labour force participation rate and the complement of

NAIRU to 1 ($L^* = POP2564^* \cdot (POPBIT / POP2564)^* \cdot (1 - NAIRU)$), we use the NAIRU and calculate the corresponding potential output[21].

According to the chart above, the GDP gap shows that the position of the French economy in the cycle is coherent. A downward phase in the business cycle (negative output gap) from 1986 to 1988 was followed by an upward phase (positive output gap) from 1989 to 1992. The next downward phase from 1993 to 1998/1999 was interrupted by two upswings in 1994 and 1997. The next upward phase, which lasted until 2000, was smaller than the upward phase in the mid-eighties. At the end of 2002, the output gap stood near zero.

1.3 Employment-unemployment relationship[22]

The labour force is the number of people in the working-age population who have jobs or are seeking jobs.[23] Changes in the labour force stem from demographic factors, which cause changes in the working-age population, and economic factors, which influence the decisions of working-age individuals with regard to seeking work, whether or not they actually find it.

In most cases, demographic changes cannot be modelled, especially at the macroeconomic level. On the other hand, labour force participation in the working-age population can be tracked by a number of economic variables. The variable with the most durable influence on the labour force participation rate (meaning the ratio of the labour force over the working-age population) is the business cycle: when growth is strong, there is an abundant supply of employment and the conditions offered are often attractive, which can spur a greater portion of the working-age population to join the labour market. On the other hand, when economic growth is weak, a portion of the working-age population has no incentive to participate in the labour force, and some of the unemployed may give up looking for employment under adverse conditions and choose not to participate in the labour force. This phenomenon is called the “discouraged worker effect”.

In addition to the business cycle, overall transfer income also influences the labour force participation rate. The factors involved in this income include the amount of unemployment benefits compared to income from work and possible changes to the unemployment insurance system to over time, legislation on retirement pensions and changes to it, subsidies for job creation and the growth of part-time employment.

For our definition of the working-age population, we started by noting that the inclusion of early retirees did not provide any explanatory elements in the more general specification of the equation. Therefore, we consider that early retirement does not necessarily reduce the labour force in the highest age brackets, but it is one of the motivations for participation decisions. Furthermore, the labour force participation rate amongst 15-to-24-year-olds is low enough in France to be ignored. Therefore, the working-age population is defined as the population aged 25 to 64 years. Of the other attempts made to discern participation decisions, such as the influence of unemployment benefits, the growth of part-time employment and early retirement, the lowering of the retirement age from 64 to 60 years in 1983 and the downtrend in working hours, only the addition of a term for real wages that deviate from apparent labour productivity turned out to be significant. According to the specification of the wage equation, real wages tend to track productivity, which means that this term does not contribute to changes in the labour force in the long run. In the short to medium run, however, when real wages rise

[21] The variables with an asterisk are smoothed versions of the corresponding variables. The model also determines a TFP trend adjusted for changes in capacity utilisation rates and the age of buildings and equipment (see Baghli *et alii*, 2002).

[22] This section is partially based on the results of Willer, 2002.

[23] The ILO unemployed definition is used, meaning people who do not have jobs and are seeking work.

more quickly than labour productivity, there is an incentive for a portion of the working-age population to join the labour force, and vice-versa when real wages do not match productivity gains. The identification of the role of this term is not clear, however, since it also influences employment directly and unemployment benefits indirectly via indexation mechanisms. Nevertheless, we preferred to include this wage term insofar as, in the direct form, unemployment benefits, which we can only construct as the ratio of benefits to the number of unemployed in a closed-ended model, seem to be negatively correlated with the labour force. Other additional business cycle variables did not appear to be significant.

POPBIT:	ILO labour force
EMPTOT:	total employment
POP2564:	working-age population, 25 to 64 years old
W:	Nominal per capita wage cost (gross/gross terms)
Pc:	Household consumption deflator
Prod:	Apparent labour productivity

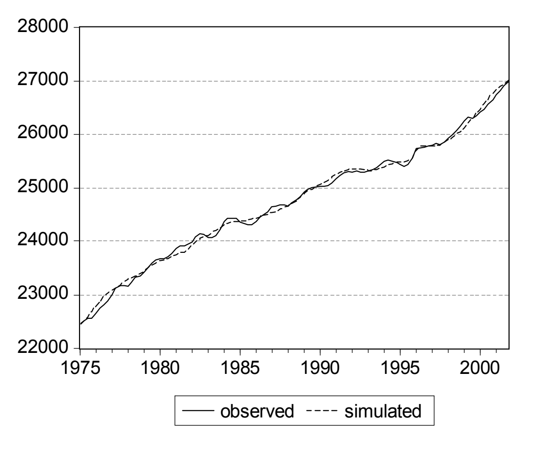
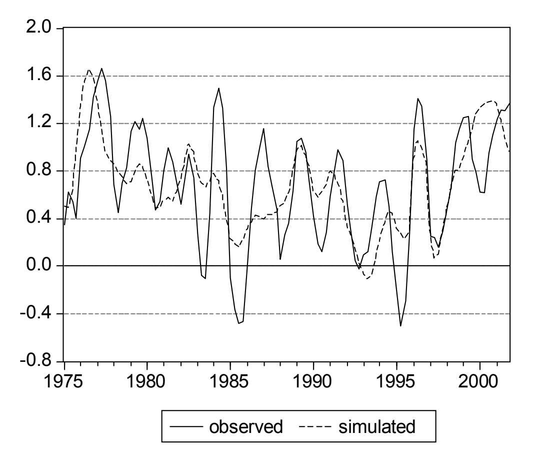
The whole estimated equation is written:

$$B(L)\Delta \ln POPBIT = b_0 + B_1(L)\Delta \ln EMPTOT + \rho\left(\ln POPBIT_{-1} - b_1 \ln EMPTOT_{-1} - (1-b_1)\ln POP2564_{-1} - b_2\left(\ln \frac{w_{-1}}{Pc_{-1}} - \ln prod_{-1}\right)\right) \quad (1.3.1)$$

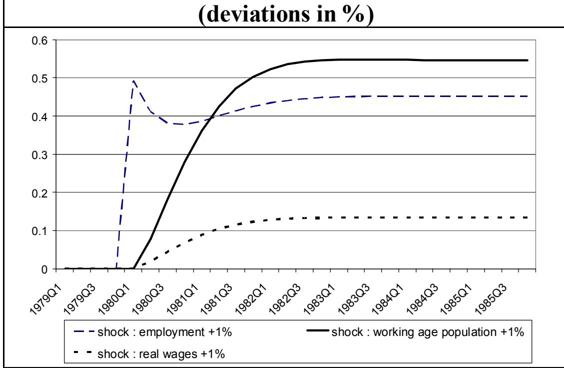
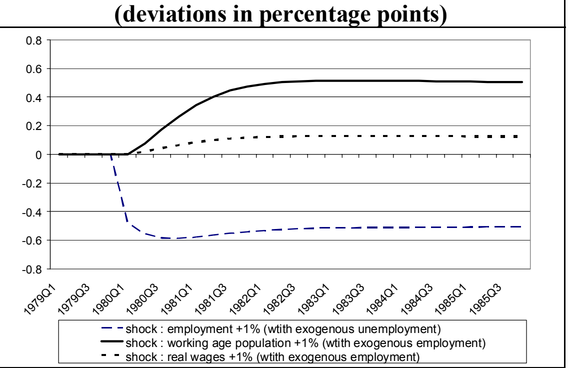
Estimation results: labour force equation

	1970q3 –2001q4	
	Coeff.	T-stat
ρ	-0.144	-4.99
$-b_1 \cdot \rho$	0.065	5.17
$-b_2 \cdot \rho$	0.019	4.87
b_1	0.45	-
b_2	0.13	-
$\Delta popbit_{-1}$	0.494	4.92
$\Delta emptot$	0.504	4.53
$\Delta emptot_{-1}$	-0.297	-2.77
b_0	0.007	4.63
δ_{96q1}	0.005	3.83
DW	1.74	
R2	0.57	
SER	0.12%	

Dynamic simulations of the labour force equation

Level	Year-on-year change
	

Impulse response functions for shocks to the labour force equation

Labour force responses (deviations in %)	Unemployment rate responses (deviations in percentage points)
	

Elasticity of the labour force

After…	1 quarter	1 year	2 years	5 years	Long run
total employment	0.50	0.38	0.43	0.45	0.45
working-age population	0.0	0.28	0.50	0.55	0.55
real wage	0.0	0.07	0.12	0.13	0.13

Semi-elasticity of the unemployment rate

After…	1 quarter	1 year	2 years	5 years	Long run
total employment	-0.47	-0.58	-0.53	-0.49	-0.50
working-age population	0.00	0.26	0.46	0.49	0.50
real wage	0.00	0.06	0.11	0.12	0.12

Based on the determination of employment and the labour force, the number of unemployed is defined as the balance between the labour force (members of the working-age population in employment or seeking employment) and total employment. Changes in unemployment stem from employment growth, demographic factors and the discouraged worker effect.

In the long run, a 1% increase in the working-age population, all else being equal, leads to a 0.55% increase in the labour force. When employment is an exogenous variable, this leads to a 0.5-point increase in the unemployment rate $\left(\Delta u \approx (1-u)\left(\frac{\Delta POPBIT}{POPBIT} - \frac{\Delta EMPTOT}{EMPTOT}\right) = (1-0.09)\times 0.55\right)$. A 1% increase in employment leads to a 0.45% increase in the labour force, which, when the number of unemployed is an exogenous variable, also leads to a 0.5-point decrease in the unemployment rate. Therefore, we show that the same rate of growth in employment and the working-age population stabilises the long-run unemployment rate.

A 1% increase in the real wage leads to a 0.10% increase in the labour force. When employment is an exogenous variable, this leads to a 0.1-point rise in the unemployment rate.

1.4 Demand price and foreign trade price equations

1.4.1 Final demand prices

Consumption and investment are made up of domestically produced and imported goods and services. It follows that, in the case of consumption, for example, the aggregate consumption deflator can be written in accounting terms as the weighted mean of the deflator for domestically produced consumer goods and services and the deflator for imported consumer goods and services. Despite this accounting equation, we still have to estimate an econometric equation, primarily because the import content of final demand components is not known. This means that neither the deflators for the different types of goods and services consumed according to their origin nor the weightings can be used precisely.[24] However, the accounting foundation that links final demand prices to domestic and import prices is used in the specification for demand price equations as a function of the value-added prices and import prices.

Another accounting problem arises because the value-added price and the import prices do not include the VAT, unlike the national accounts demand deflators, which do. Therefore, we have to start by constructing demand deflators that exclude the VAT.

[24] However, we do calculate the import content of final demand items in order to define demand for imported goods and services (section 1.7.1.).

PDH:	demand price excluding VAT (consumption or investment)
P:	value-added price
Pm:	import price
λ :	estimated share of output in the aggregate demand for goods and services being considered[25]
Pi:	price of business sector equipment and buildings investment
Pt:	price of aggregate business sector investment

Ultimately, the demand price equations are estimated using logarithmic approximation:

$$\ln PDH = \lambda \ln P + (1-\lambda) \ln Pm + c \qquad (1.4.1)$$

The specification of an error-correction equation is estimated for the long-run equation:

$$B(L)\Delta pdh = b_0 + B_1(L)\Delta pm + B_2(L)\Delta p + \rho(pdh_{-1} - \lambda p - (1-\lambda)pm) + b_1 t \qquad (1.4.2)$$

A determinist trend was introduced for the business sector investment price to account for the unstable estimated share of imports. After a preliminary estimation, the import content was constrained to zero for government sector and NPISH consumption and for household and government sector GFCF. It was estimated freely for household consumption at 0.20 and for business sector investment at 0.12.

The aggregate import price was disaggregated into goods excluding energy and energy in some cases. The price of imported services on its own never appeared to be a significant explanatory factor for demand prices.

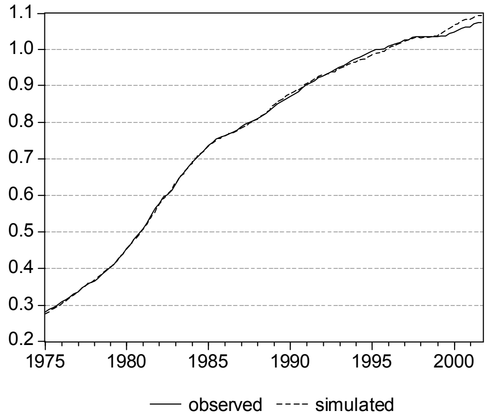
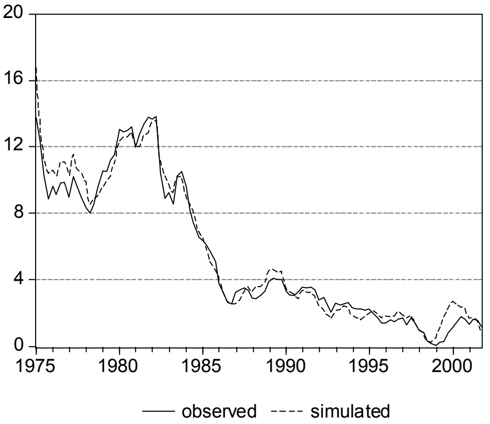
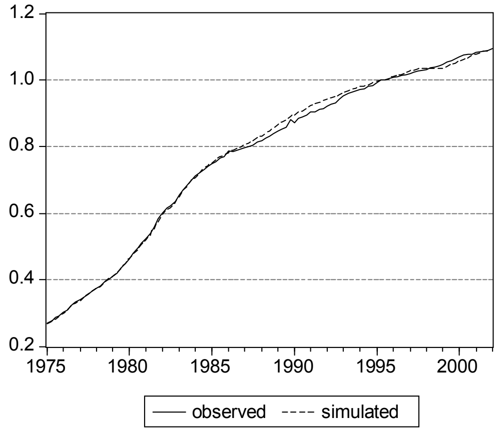
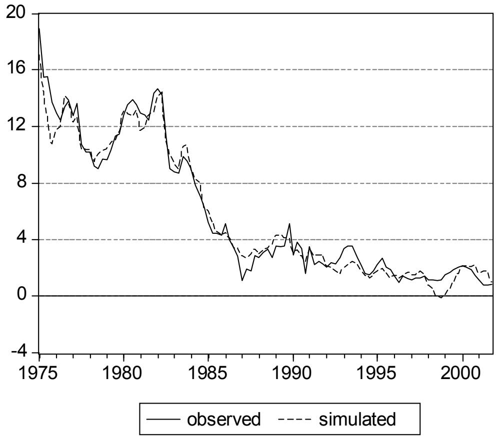
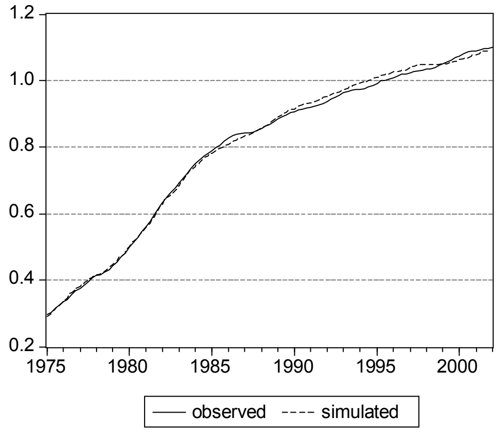
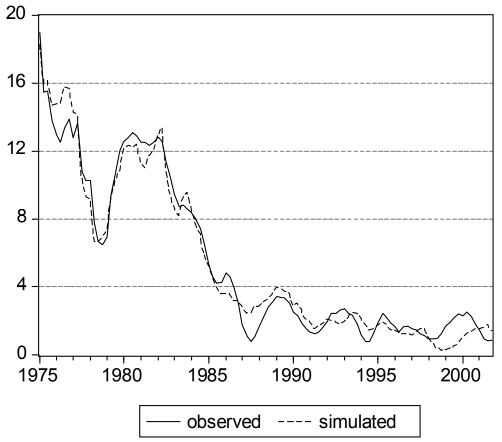
[25] The calculation of the logarithmic approximation shows that the share λ is a nominal share and is therefore subject to changes in relative prices, especially the relative prices of goods and services. Assuming that it is constant for the purposes of the estimation could lead to stability problems for the estimated equations.

Estimation results for demand prices excluding VAT: $B(L)\Delta pdh = b_0 + B_1(L)\Delta pm + B_2(L)\Delta p + \rho(pdh_{-1} - \lambda p - (1-\lambda)pm) + b_1 t$

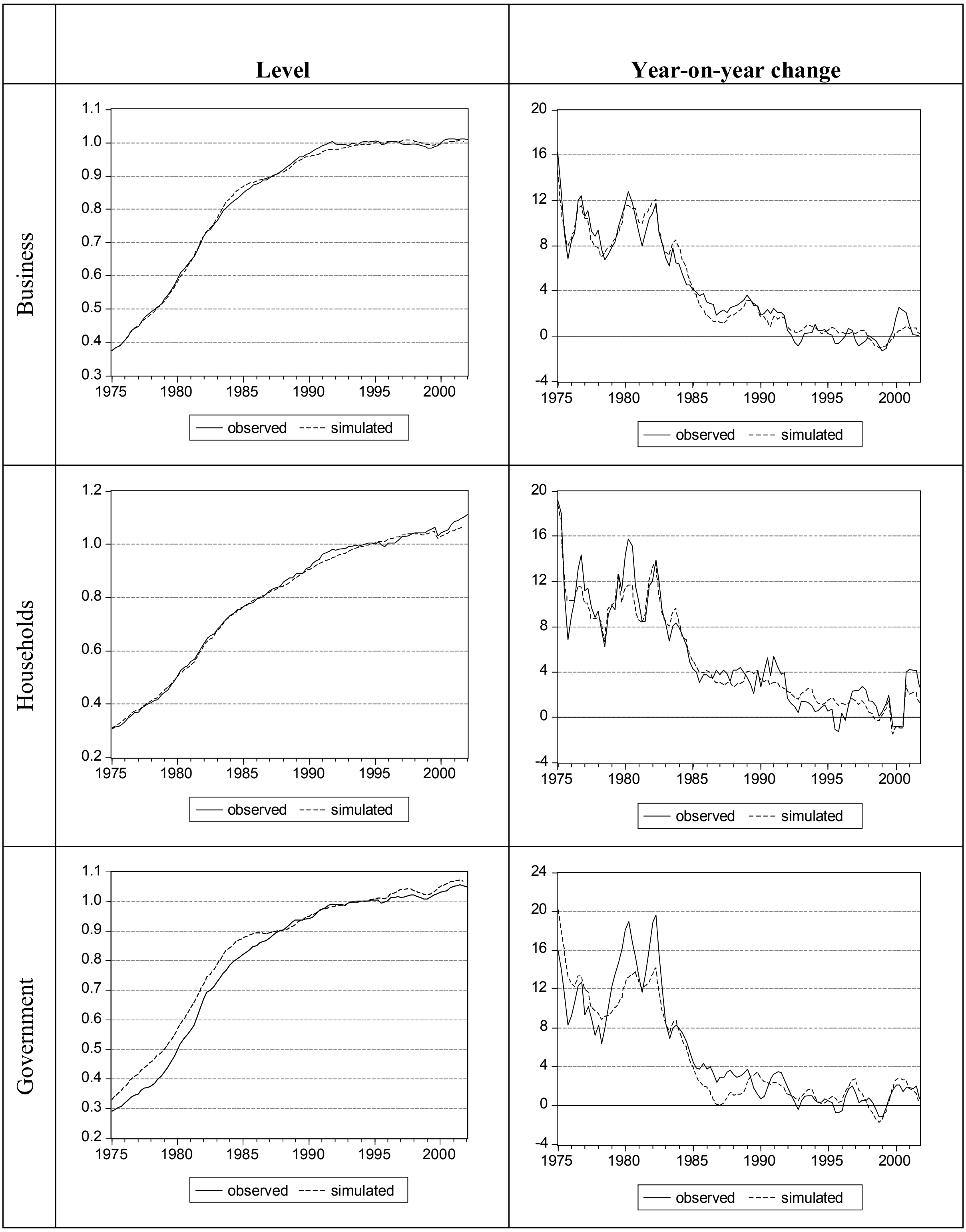
	Consumption						Investment					
	Households		Government		NPISHs		Business		Households		Government	
	1970q3 –1999q4		*1970q3 –1999q4*		*1972q3 –1999q4*		*1970q4 –1999q4*		*1970q3 –1999q4*		*1978q1 –1999q4*	
	Coeff.	T-stat	Coeff.	T-stat	Coeff.	T-stat	Coeff.	T-stat	Coeff.	T-stat	Coeff.	T-stat
ρ	-0.157	-4.63	-0.019	-2.03	-0.047	-4.67	-0.102	-2.66	-0.073	-1.97	-0.026	-2.66
λ	0.853	-	1.0	-	1.0	-	0.875	24.96	1.0	-	1.0	-
Δpdh_{-1}					0.270	6.21	0.172	2.89			0.436	7.20
Δpm_{-1} (*)					0.080	7.17	0.134	10.27				
Δpmb (2)	0.039	2.18										
Δpmb_{-1} (2)			0.074	2.65								
Δpme (3)	0.020	5.45	0.020	3.79					0.026	4.74	0.028	5.22
Δpms (4)	0.087	3.49										
Δpms_{-1} (4)	0.067	2.85										
Δpms_{-2} (4)	0.051	2.54										
Δp	0.648	11.34	0.961	17.56	0.722	14.71	0.762	10.96	0.813	9.09	0.784	9.43
Δp_{-1}									0.260	2.77		
b_1	2.29×10^{-4}	4.57					-0.0002	-2.48				
b_0	-0.024	-4.34	0.001	0.64	0.001	1.72	0.021	2.26	0.0005	0.40	-0.002	-1.97
δ_{73q2}					-0.019	-5.49						
δ_{73q4}									-0.021	-3.02		
δ_{74q3}									0.029	4.21		
δ_{75q3}					0.020	5.97						
δ_{76q3}	-0.010	-2.74			0.016	4.62						
δ_{78q1}	-0.009	-2.48										
δ_{78q2}					-0.015	-4.64						
δ_{78q3}									-0.020	-3.12		
δ_{78q4}									0.024	3.64		
δ_{80q4}									-0.023	-3.37		
δ_{91q1}					-0.009	-2.55						
δ_{96q2}											0.009	2.24
δ_{99q4}									-0.034	-5.17		
DW / R2	2.25	0.89	2.46	0.84	2.09	0.94	1.96	0.89	2.17	0.81	1.94	0.92
SER	0.36%		0.53%		0.33%		0.40%		0.65%		0.41%	

(1) Aggregate import price (2) Price of imports of goods excluding energy (3) Price of energy imports (4) Price of imported services

Dynamic simulations of the consumption price equations

	Level	Year-on-year change
Households		
Government		
NPISHs		

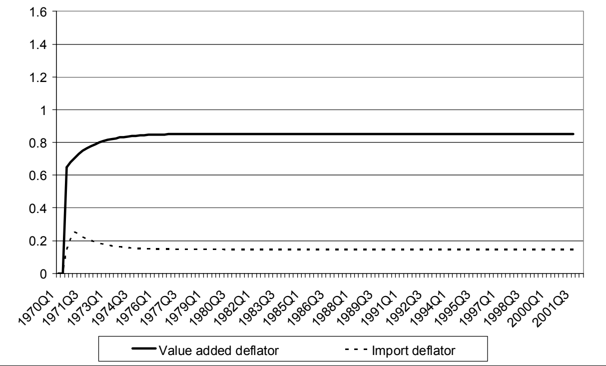
Dynamic simulations of the investment price equations



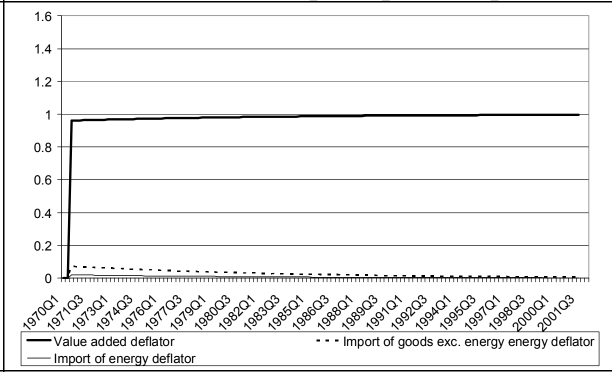
We tested the sensitivity of these equations to different explanatory variables by simulating 1% shocks to the value-added price and import prices, all else being equal:

Impulse response functions for shocks to the final demand price equation

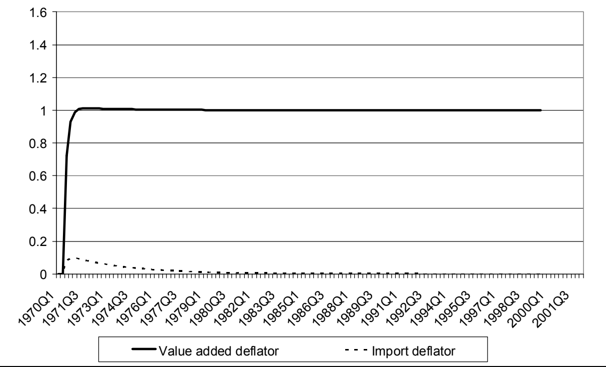
Household consumption price responses



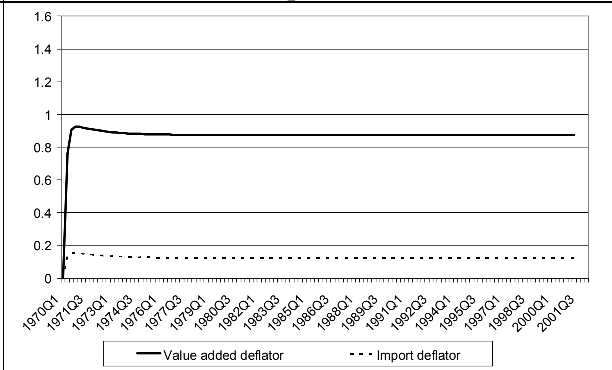
Government consumption price responses



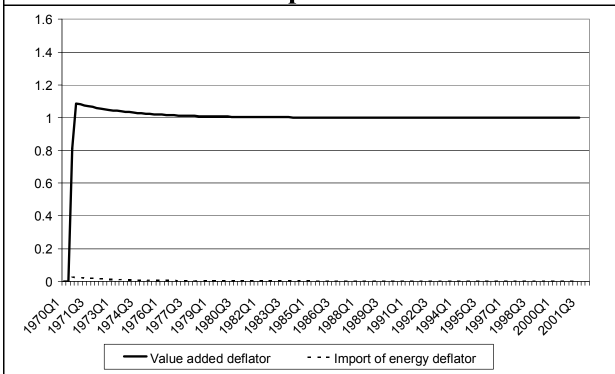
NPISH consumption price responses



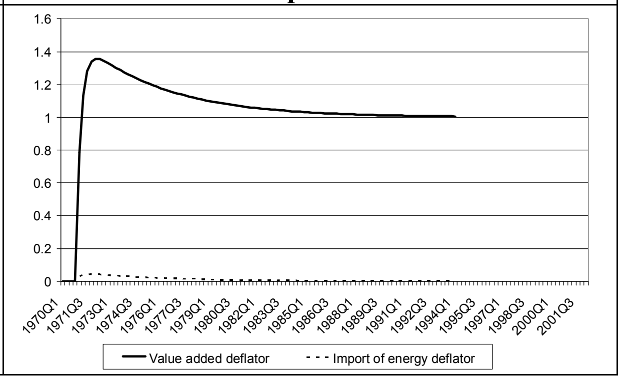
Business investment price responses



Household investment price responses



Government investment price responses



The error correction terms are usually pretty small, but they are offset by the scale of the short-run effects. Some of the prices over-adjust in the short run, especially the government investment price after a shock to the value-added price.

Household consumption price elasticities to

After…	1 quarter	1 year	2 years	5 years	Long run
value-added prices	0.65	0.73	0.79	0.84	0.85
import prices	0.14	0.24	0.19	0.15	0.15

Government consumption price elasticities to

After…	1 quarter	1 year	2 years	5 years	Long run
value-added prices	0.96	0.96	0.97	0.97	1.00
prices of imports of goods excluding energy	0.07	0.07	0.06	0.05	0.00
energy import prices	0.02	0.02	0.02	0.01	0.00

NPISH consumption price elasticities to

After…	1 quarter	1 year	2 years	5 years	Long run
value-added prices	0.72	1.01	1.01	1.00	1.00
import prices	0.08	0.09	0.07	0.03	0.00

Business GFCF price elasticities to

After…	1 quarter	1 year	2 years	5 years	Long run
value-added prices	0.76	0.92	0.90	0.88	0.87
import prices	0.13	0.15	0.14	0.13	0.13

Household GFCF price elasticities to

After…	1 quarter	1 year	2 years	5 years	Long run
value-added prices	0.84	1.10	1.07	1.03	1.00
energy import prices	0.03	0.02	0.02	0.01	0.00

Government GFCF price elasticities to

After…	1 quarter	1 year	2 years	5 years	Long run
value-added prices	0.81	1.38	1.37	1.21	1.00
energy import prices	0.03	0.04	0.04	0.02	0.00

Specific modelling based on the aggregate GFCF enables us to distinguish the price of equipment from the price of buildings.[26] We need this distinction in the model to calculate the users' cost of

[26] This specific model does not provide complete consistency of the aggregate GFCF deflator and the deflator for equipment and buildings GFCF. This has no effect within the accounting framework of the model since the evaluation only counts aggregate business sector GFCF. In this case, the aggregate GFCF deflator is used.

capital separately for the two types of products. The specification of these transition equations is based on the assumption that relative prices are stable in the long run. Yet, this assumption has not been tested, especially for the end of the sample. Therefore, we introduced a trend in the building price equation that starts in 1995:

$$B(L)\Delta \ln Pi = b_0 + B_1(L)\Delta \ln Pt + \rho(\ln Pi_{-1} - \ln Pt_{-1}) + b_1 1_{t \geq 95q1} t \qquad (1.4.3)$$

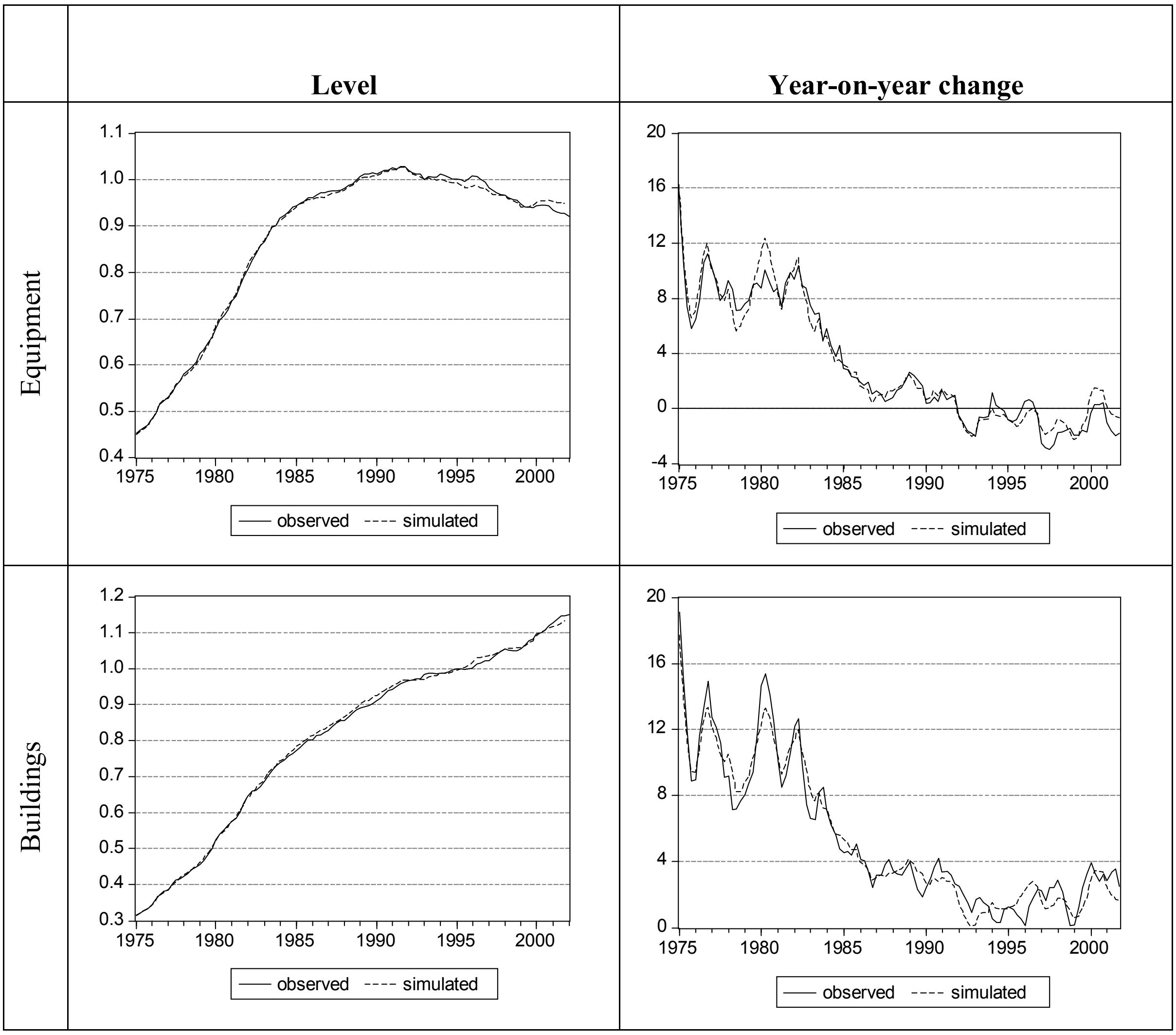
Pi: price of business sector equipment and buildings investment
Pt: price of aggregate business sector investment

Estimation results: equipment and buildings GFCF price equations

$$B(L)\Delta pi = b_0 + B_1(L)\Delta pt + \rho(pi_{-1} - pt_{-1}) + b_1 1_{t \geq 95q1} t$$

	Equipment investment price		**Building investment price**	
	1970q4 –1999q4		*1971q4 –1999q4*	
	Coeff.	t-stat	Coeff.	t-stat
ρ	-0.013	-1.83	-0.016	-1.27
b_0	-0.002	-4.26	0.001	1.12
Δpi_{-1}			0.158	2.43
Δpt	1.101	23.15	0.762	10.32
b_1			$3 \cdot 10^{-5}$	1.87
DW	1.75		1.91	
R2	0.91		0.86	
SER	0.40%		0.47%	

Dynamic simulations of the equipment and building investment price equations



The equipment investment price series shows a decline in the mean price since the early nineteen-nineties.

1.4.2 Foreign trade prices

We have seen that the value-added price is determined by firms' optimisation behaviour and the application of a price mark-up to the marginal output cost.

The derivation of specifications for foreign trade price equations is less rigorous. The specification also attempts to account for mark-up behaviour, albeit indirectly, when firms have to cope with competition on markets in other countries as well. This includes the competition that foreign firms encounter on the French market in the case of import prices, and the international competition that French firms encounter on foreign markets, in the case of export prices.

In the model, the volume of activity is defined in terms of value added rather than in terms of output. Nevertheless, imports include imported inputs and price formation in the model needs to account for them. The presence of imported inputs requires us to compare import prices to the output price and not the value-added price. Yet, the main price equation in the Banque de France model is a value-added price equation. Therefore, we had to introduce equations for the transition from value-added price to the different output prices. This required several developments in the price system, but it saves us from having to model input prices fully and from having to deal with inputs in real terms in the transition from output to value added. This approach helps us to keep the model small.

Pm: import price (Pm_i : price of imports of product *i*)
Px: export price (Px_i : price of exports of product *i*)
Pm^* : Competitors' import price
Px^* : competitors' export price (on foreign markets)
Pq: domestic output price *(* Pq_i : output price of product *i)*
P_{ci}: input prices
P_{cim} *:* price of imported inputs
Pm_{mp} : price of imported commodities
P_{brente} : oil price (Brent) in euros
α : elasticity of import prices to the corresponding output price
ω : elasticity of export prices to the corresponding output price
ξ : elasticity of the output price under consideration to the value-added price

1.4.2.1 Import prices

The general form of these equations in the long run is:

$$\ln Pm = \alpha \ln Pq + (1-\alpha) \ln Pm^* \qquad (1.4.4)$$

The constraint on the coefficients of ln*Pq* and lnPm^* imposes long-run price homogeneity: the sum of the elasticities is equal to one, which means that a permanent increase of 1% in both output prices and foreign trade prices will lead to a 1% increase in import prices in the long run. Therefore, there is no distortion of relative prices.

The foreign price Pm^* is the mean price at which foreign suppliers export to all destinations.[27] When $\alpha = 0$, the price of foreign products in the French market is not different from the average prices that France's suppliers charge on all of their export markets. More specifically, this price is not dependent on the output price in France.

When $\alpha \neq 0$, if foreign products are more competitive than domestic products ($Pm^* \leq Pq$), foreign suppliers can use this competitiveness advantage to increase their price mark-ups on the French market compared to their mean export price mark-ups on all markets ($Pm > Pm^*$). Since the price *Pm* is a weighted mean of the prices Pm^* and Pq in this case, it gives us:

$$Pm^* \leq Pm \leq Pq$$

On the other hand, if the foreign products are less competitive than French products on average, the foreign suppliers will have to reduce their price mark-ups on the French market:

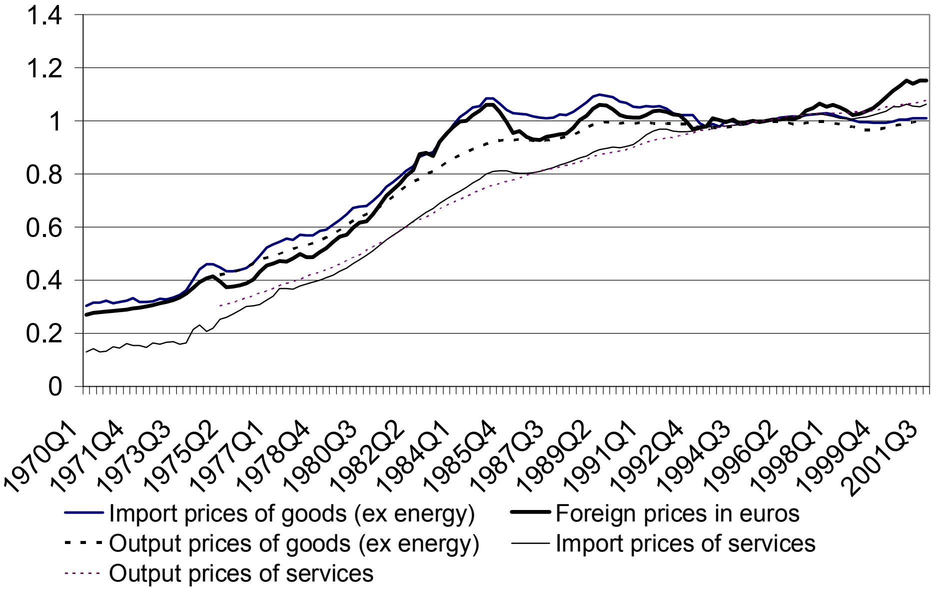
[27] See Appendix 4 for the definition of foreign price indices.

$Pm^{*} \geq Pm \geq Pq$

The scale of foreign suppliers' mark-up adjustments is estimated by the parameter α; the closer α is to 1, the larger the mark-up adjustments are to supply conditions in France.

For imports, we distinguish between three types of products: goods excluding energy, energy and services. For exports, we do not distinguish be between goods and services. In addition to the value of separating out energy imports, the main reason for making this distinction between goods and services is that the price trends in our sample are different for goods and services.

Import prices, output prices and foreign prices



Prices of goods and services all rose rapidly up until the mid-nineteen-eighties. After that, service prices continued to increase steadily, but goods prices were more stable. Yet, domestic output is mostly made up of services, whereas foreign trade is mostly made up of goods. This difference in the structure of domestic output and foreign trade, along with the differences in the price trends between goods and services, make it difficult to estimate equations at the aggregated level that show significant links between domestic and foreign prices on the one hand, and between price differentials and quantities traded, on the other hand.

For each type of product, the estimated import price equations are error-correction models that ensure the stability of the long-run equation:

$$B_i(L)\Delta pm_i = \rho_i(pm_{i,-1} - \alpha_i pq_{i,-1} - (1-\alpha_i)pm^{*}_{-1}) + B_{i,1}(L)\Delta pq_{i,-1} + B_{i,2}\Delta pm^{*} + a_i t + b_{i,0} \quad (1.4.5)$$

In the model database, there is only one indicator of the competitors' import price (Pm^{*}) and it represents the price of goods. It will be used both for the price equation for goods, excluding energy, and for the price equation for services. In the case of energy, the variable Pm^{*} represents the price of Brent in euros.

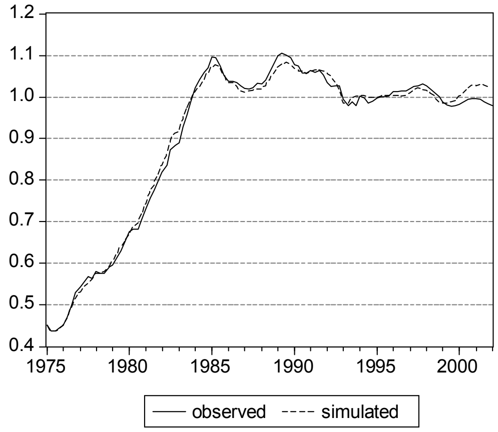
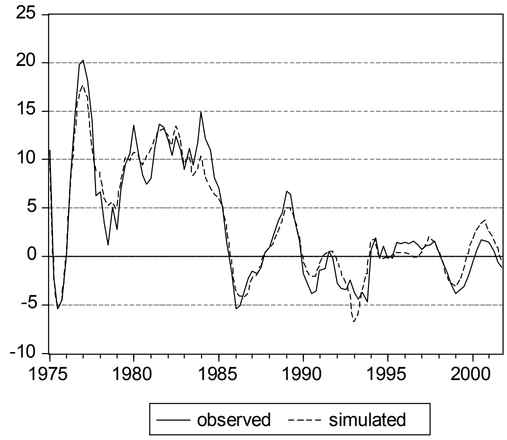
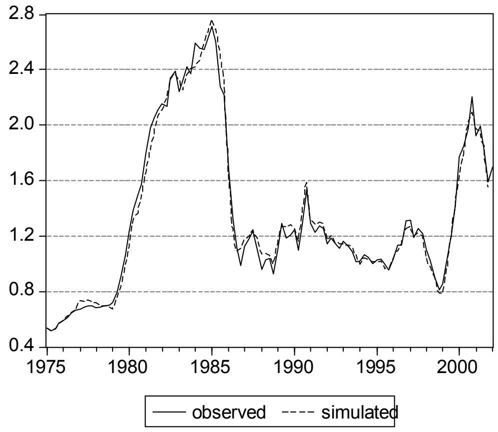
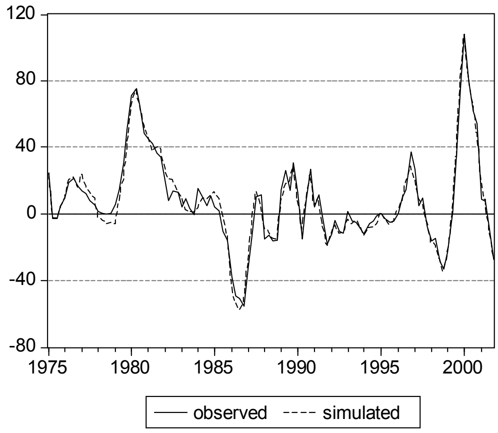
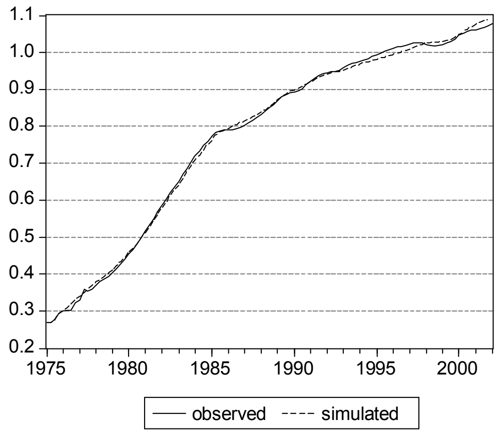
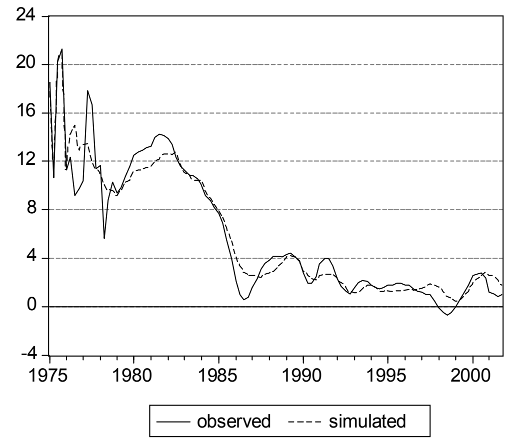
Estimation results: import price equation

$$B_i(L)\Delta pm_i = \rho_i(pm_{i,-1} - \alpha_i pq_{i,-1} - (1-\alpha_i)pm^*_{-1}) + B_{i,1}(L)\Delta pq_{i,-1} + B_{i,2}\Delta pm^* + b_{i,1}t + b_{i,0}$$

	Goods excluding energy		***Energy***		***Services***	
	1976q2 –1999q4		*1976q2 –1999q4*		*1976q2 –1999q4*	
	Coeff.	T-stat	Coeff.	T-stat	Coeff.	T-stat
ρ_i	-0.185	-4.06	-0.338	-5.18	-0.156	-3.36
$-\alpha_i \cdot \rho_i$	0.079	3.11	0.081	3.09	0.107	2.78
α_i	0.43	-	0.24	-	0.69	-
$\Delta pm_{i,-1}$	0.167	2.56	-	-		
Δpq_i	-	-	-	-	0.277	1.29
$\Delta pq_{i,-1}$	-	-	0.633	4.67	-	-
Δpm^*	0.421	8.53	0.547	17.14	0.097	2.04
$b_{i,1}$	-0.0004	-4.86	-0.0005	-1.92	-	-
$b_{i,0}$	0.036	4.89	-0.617	-4.70	-0.004	-2.02
δ_{93q1}	-0.029	-3.52				
DW	2.06		2.20		2.08	
R2	0.81		0.84		0.66	
SER	0.81%		3.76%		0.81%	

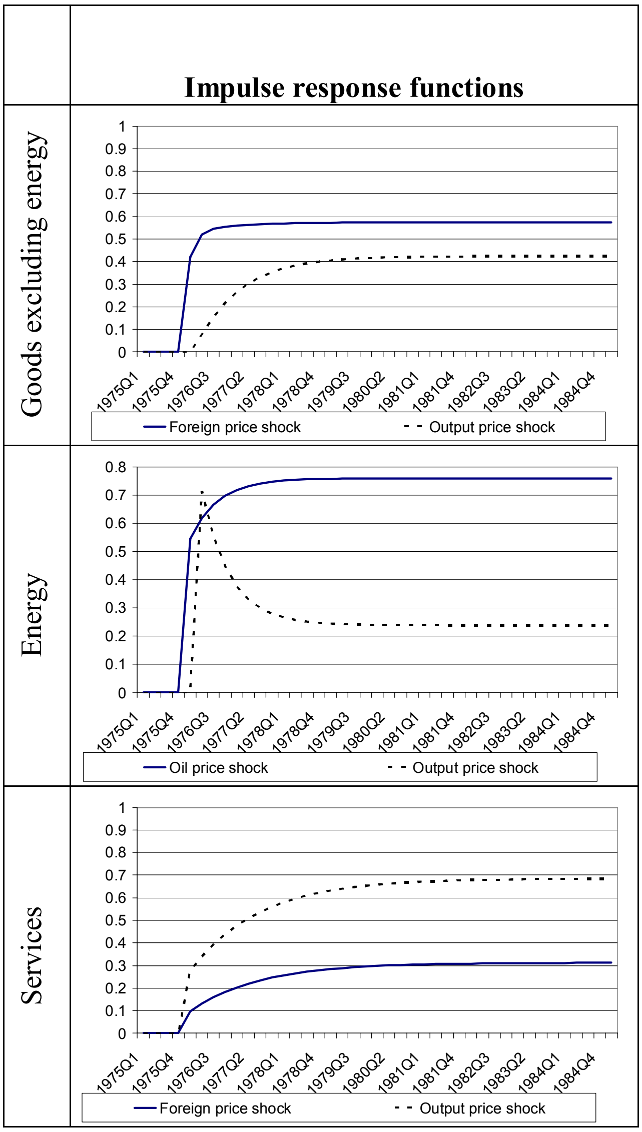
This specification of the equations seems to be fairly stable for all three types of goods and services. However, we note that the level and increase of prices for imports of goods excluding energy are underestimated in 2000 and thereafter.

Dynamic simulations of the import price equations

	Level	Year-on-year change
Goods excluding energy		
Energy		
Services		

We analysed the dynamics of these equations by simulating 1% shocks on each equation and on each explanatory variable.

Shock simulations on the import price equations



Import price elasticities of goods excluding energy to

After…	1 quarter	1 year	2 years	5 years	Long run
output prices	0.00	0.22	0.35	0.43	0.43
foreign prices	0.42	0.56	0.57	0.57	0.57

Energy import price elasticities to

After…	1 quarter	1 year	2 years	5 years	Long run
output prices	0.00	0.45	0.28	0.24	0.24
oil prices	0.55	0.70	0.75	0.76	0.76

Service import price elasticities to

After…	1 quarter	1 year	2 years	5 years	Long run
output prices	0.28	0.44	0.56	0.67	0.69
foreign prices	0.10	0.18	0.25	0.30	0.31

We see that, in the long run, goods import prices (goods excluding energy and energy) are more sensitive to foreign prices than to output prices. On the other hand, the price of service imports is more sensitive to output prices than to foreign prices. This means that foreign suppliers have less power to change their price mark-ups on the service market in France than they do on the goods market. This may be because the foreign price indicator in the equation provides a poor account of prices for traded services. The available statistics on international trade do not always distinguish between volumes and prices in traded services, which makes it difficult to come up with a foreign price indicator for services alone. Therefore, our foreign price indicators relate to goods prices, which hampers our attempts to find econometric relationships between variables.

We see that energy import prices over-adjust to an output price shock in the short run. There is no clear economic interpretation for this phenomenon, but we have maintained it so that the results fit the data: the short-run output price coefficient is 0.6, whereas the long-run coefficient is 0.2. This is very significant (t-stat=4.7) and omitting this term would seriously impair the statistical fit.

With regard to service import prices, we note that they adjust sluggishly.

1.4.2.2 Export prices

As is the case for import prices, the export price equation specification is based on a long-run equation of the form:

$$\ln Px = \omega \ln Pq + (1-\omega)\ln Px^* \qquad (1.4.6)$$

Px: export price
Pq: domestic output price
Px^* : competitors' export price, the mean price of France's competitors on its export markets.[28]

The analysis of this specification is analogous to the analysis presented for import prices, but it is made from the point of view of French firms instead of that of foreign firms. The implicit price mark-up behaviour is the one that leads to the setting of the output price *Pq*. These are the price mark-ups that exporting firms may increase or may have to decrease depending on foreign competition. When $\omega = 0$, firms have no leeway for setting mark-ups: French exporters charge the same prices on their export markets as the mean prices charged by their competitors.

When $\omega \neq 0$, if the foreign products are more competitive than the French products ($Px^* \leq Pq$), then French exporters have to trim their price mark-ups on exports to maintain some of their competitiveness ($Px < Pq$). In this case, they are "price-takers" to some extent. On the other hand, if

[28] See Appendix 4 for the definition of foreign price indices.

the output prices of French products are lower than the prices charged by their foreign competitors ($Pq < Px^*$), French exporters can increase their price mark-ups on exports ($Px > Pq$).

The scale of exporters' mark-up adjustments is estimated by the parameter ω; the closer ω is to one, the larger the mark-up adjustments are to supply conditions.

For each type of product, the price equations are specified with an error-correction mechanism that ensures the stability of the long-run equation:

$$B_i(L)\Delta px_i = \rho_i(px_{i,-1} - \omega_i pq_{i,-1} - (1-\omega_i)px^*_{-1}) + B_{i,1}(L)\Delta pq_i + B_{i,2}(L)\Delta px^* + b_{i,0} \quad (1.4.7)$$

As is the case for foreign import prices, we use the same foreign price indicator for goods exports Px^*, in the goods price equation and in the services price equation.

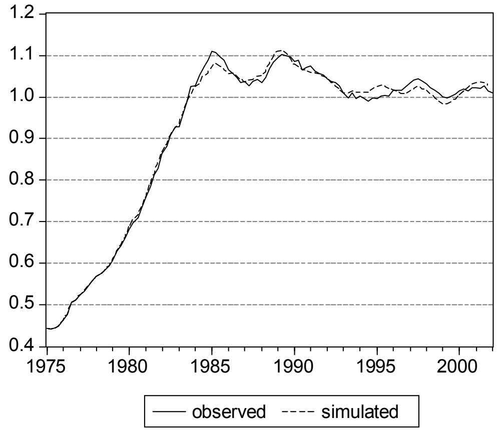
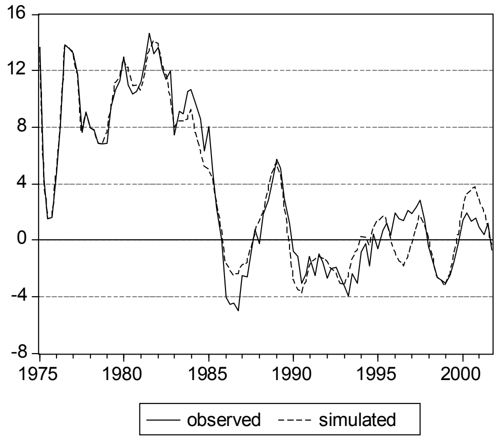
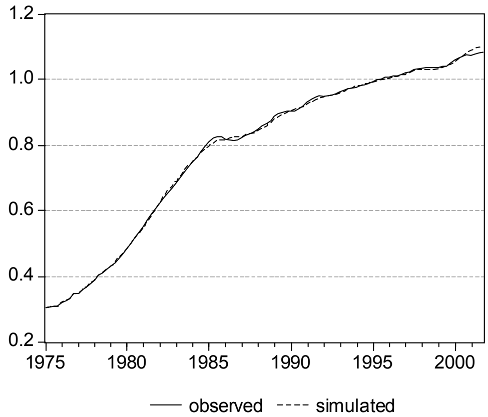
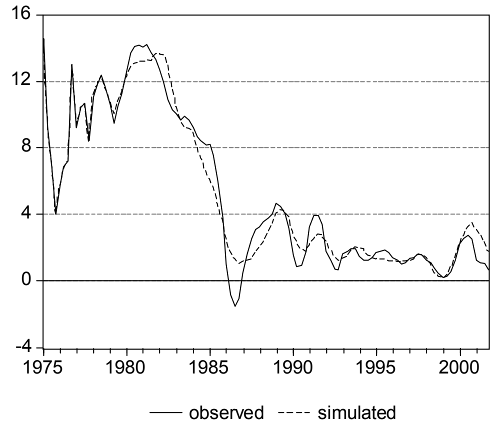
Estimation results: goods export price equation

$$B_i(L)\Delta px_i = \rho_i(px_{i,-1} - \omega_i pq_{i,-1} - (1-\omega_i)px^*_{-1}) + B_{i,1}(L)\Delta pq_i + B_{i,2}(L)\Delta px^* + b_{i,0}$$

	Goods		***Services***	
	1976q2 –2001q4		*1977q2 –2001q4*	
	Coeff.	T-stat	Coeff.	T-stat
ρ_i	-0.064	-2.43	-0.086	-4.26
$-\omega_i \cdot \rho_i$	0.050	2.32	0.068	4.51
ω_i	0.77	-	0.79	-
$\Delta px_{i,-1}$	-	-	0.368	6.27
$\Delta px_{i,-2}$	-	-	0.130	2.39
Δpq_i	0.98	7.78	0.447	5.81
Δpx^*	0.19	4.44	0.069	4.03
$b_{i,0}$	0.0051	1.51	-0.001	-2.44
$\delta_{t\geq 89q1}$	-0.0055	-1.85	-	-
DW	2.37		1.65	
R2	0.79		0.94	
SER	0.69%		0.28%	

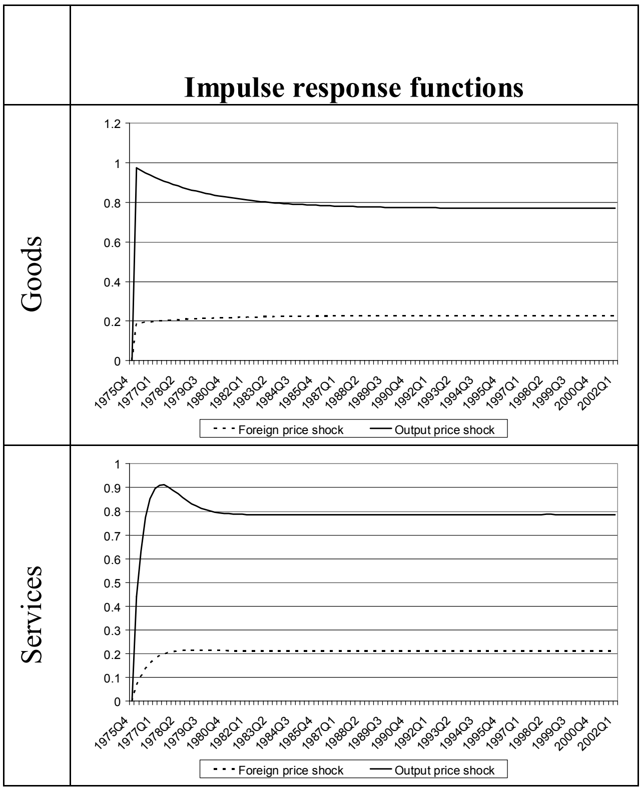
A dummy variable equal to 1 after 1989Q1 accounts for the slower rise in export prices after that date.

Dynamic simulations of the export price equations

	Level	Year-on-year change
Goods		
Services		

As was the case for the import price equations, the impulse response functions for the export price equations are calculated by simulating 1% shocks on each of the exogenous variables: output prices and foreign prices. The long-run impact is about the same for goods and for services with elasticity to output prices of slightly less than 0.8 and elasticity to foreign prices of slightly more than 0.2. In both cases, export prices over-adjust in the short run to output prices. Services export prices adjust to an output price shock a bit more rapidly, but there is no clear interpretation for this result. With regard to services, the foreign price indicator suffers from the previously mentioned problem that it is, in fact, a goods price indicator.

Shock simulations on the export price equations



Goods export price elasticities to

After…	1 quarter	1 year	2 years	5 years	Long run
output prices	0.98	0.94	0.90	0.83	0.77
foreign prices	0.19	0.20	0.20	0.22	0.23

Services export price elasticities to

After…	1 quarter	1 year	2 years	5 years	Long run
output prices	0.45	0.86	0.91	0.80	0.79
foreign prices	0.07	0.16	0.21	0.21	0.21

1.4.2.3 Equations for the transition from value-added prices to output prices

The specification for these equations uses the price of imported inputs and avoids dealing explicitly with data series on input prices or modelling them. By definition, value added is equal to the net output of inputs. This gives us the logarithmic form of a quasi-accounting equation:

$$pq = \lambda_p p + (1 - \lambda_p) p_{ci} \qquad (1.4.8)$$

P:	value-added price of business sector
Pq:	output price
P_{ci}:	input price
P_{cim}:	imported input price
ξ :	elasticity of the output price under consideration to the value-added price

Inputs are domestically produced or imported. We assume that they are produced at the same output price p_q as all the other products and imported at the price p_{cim}:

$$p_{ci} = \lambda_{ci} pq + (1 - \lambda_{ci}) p_{cim} \qquad (1.4.9)$$

λ_{ci} : produced share of inputs

The reduced form of equations (1.4.8) and (1.4.9) gives the transition equation:

$$\begin{aligned} pq &= \frac{\lambda_p}{1 - \lambda_{ci}(1 - \lambda_p)} p + \frac{(1 - \lambda_p)(1 - \lambda_{ci})}{1 - \lambda_{ci}(1 - \lambda_p)} p_{cim} \\ &= \xi p + (1 - \xi) p_{cim} \end{aligned} \qquad (1.4.10)$$

where: $\xi = \dfrac{\lambda_p}{1 - \lambda_{ci}(1 - \lambda_p)}$

The use of the reduced form (1.4.10) does not enable us to identify the parameters λ_p and λ_{ci}, but it does save us of the trouble of having to deal explicitly with aggregate input price P_{ci} series by introducing only the price of imported inputs directly into the output price equation.

The imported input price P_{cim} is not observed, which means that further assumptions have to be made. Our assumptions are specific to each type of product, meaning goods excluding energy, energy and services.

Output price of goods excluding energy

For these products, the imported input price P_{cim} in equation (3) is the price of imported commodities Pm_{mp}.[29] Thus, the estimated equation is of the form:

$$B(L)\Delta pq = \rho(pq_{-1} - \xi p_{-1} - (1 - \xi) pm_{mp_{-1}}) + B_1(L)\Delta p + B_2(L)\Delta pm_{mp} + b_1 t + b_0 \quad (1.4.11)$$

A deterministic trend is added to account for the remaining deviation between the various deflators. In the long run, the homogeneity of the price system is imposed, as it is in equation (1.4.10).

[29] In the forecasting work done at the ESCB the common assumptions about non-energy commodity prices are used.

Estimation results: equation for the output price of goods excluding energy

$$B(L)\Delta pq = +\rho(pq_{-1} - \xi p_{-1} - (1-\xi)pm_{mp_{-1}}) + B_1(L)\Delta p + B_2(L)\Delta pm_{mp} + b_1 t + b_0$$

	1979q1 –2000q4	
	Coeff.	T-stat
ρ	-0.17	-4.38
$-\xi \cdot \rho$	0.15	4.29
ξ	0.89	
Δpq_{-1}	0.46	6.09
Δp	0.34	4.90
Δpm_{mp}	0.03	5.40
b_1	-0.0006	-4.42
b_0	-0.02	-1.69
DW	1.91	-
R2	0.93	-
SER	0.28%	-

In the long run, the output price elasticities to the value-added price and the price of imported commodities are 0.9 and 0.1 respectively.

1.4.2.4 Energy output price

For energy, the imported input price P_{cim} in equation (1.4.10) is the Brent price in euros $P_{brent€}$. Thus, the estimated equation is of the form:

$$B(L)\Delta pq = \rho(pq_{-1} - \xi p_{-1} - (1-\xi)p_{brent€,-1}) + B_1(L)\Delta p + B_2(L)\Delta p_{brent€} + b_0 \quad (1.4.12)$$

Estimation results: energy output price equation

$$B(L)\Delta pq = \rho(pq_{-1} - \xi p_{-1} - (1-\xi)p_{brent€,-1}) + B_1(L)\Delta p + B_2(L)\Delta p_{brent€} + b_0$$

	1974q1 –2000q4	
	Coeff.	T-stat
ρ	-0.20	-6.89
$-\xi \cdot \rho$	0.10	5.64
ξ	0.52	-
$\Delta p_{brent,-1}$	0.19	14.43
b	-0.25	-7.79
du_{80q1}	0.09	4.33
DW	1.78	-
R2	0.75	-
SER	02.1%	-

In the long run, the output price elasticities to the value-added price and the price of imported commodities are both 0.5. However, the value-added price has no effect in the short run.

1.4.2.5 Services output price[30]

For services, the imported input price P_{cim} in equation (1.4.10) is the same as the Brent price in euros $P_{brent€}$. However, this term does not seem to be significant in the long-run equation. The Brent price, therefore, only has a direct effect on the services output price in the short run. In the long run, the effect is indirect, through the induced effects on the value-added price. Thus, the estimated equation is of the form:

$$B(L)\Delta pq = \rho(pq_{-1} - p_{-1}) + B_1(L)\Delta p + B_2(L)\Delta p_{brent€} + b_0 \qquad (1.4.13)$$

Estimation results: services output price equation

$$B(L)\Delta pq = +\rho(pq_{-1} - p_{-1}) + B_1(L)\Delta p + B_2(L)\Delta p_{brent€} + b_0$$

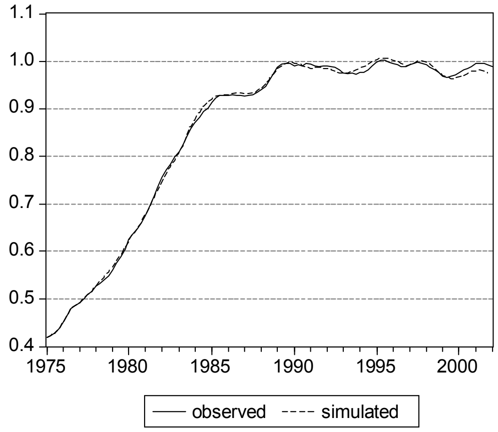
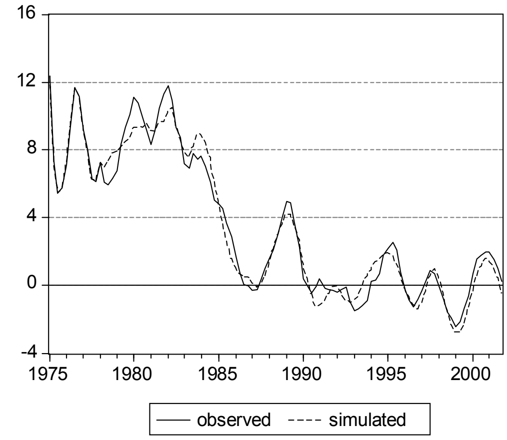
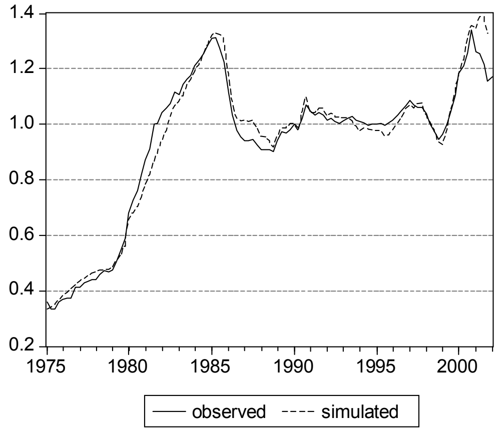
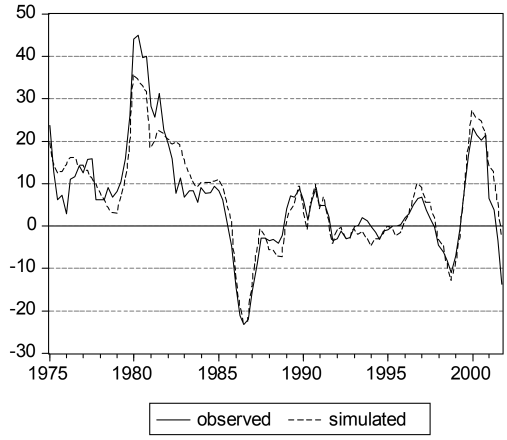
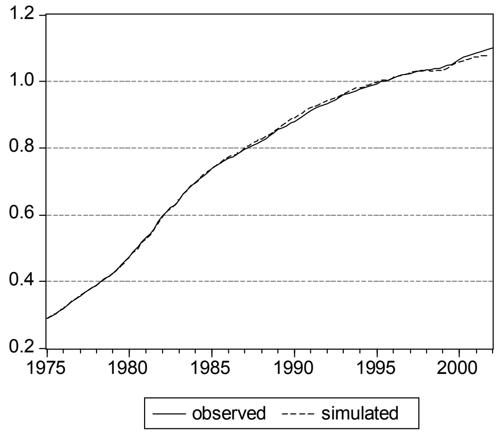
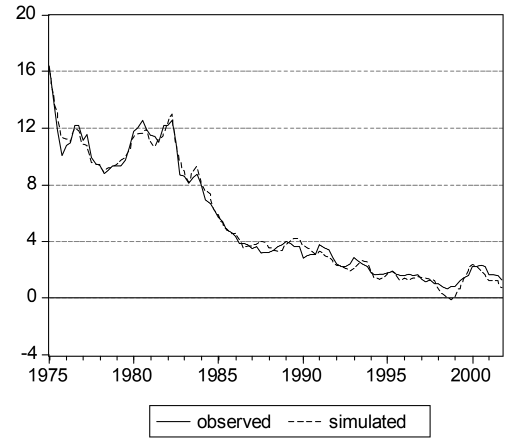
	1974q2 –2000q4	
	Coeff.	T-stat
ρ	-0.081	-3.08
ξ	1	-
Δpq_{-1}	0.333	6.80
Δp	0.596	12.57
$\Delta p_{brent€}$	0.009	4.17
$\Delta p_{brent€,-1}$	0.005	3.18
b_0	0.001	1.70
DW	2.48	
R2	0.95	
SER	0.25%	

The small coefficients on the Brent price are noteworthy. They show that only large fluctuations in the energy price have any effect on the services output price. Without this variable, the equation simulation cannot track the services output prices in 1985, 1999 and 2000.

The charts below show the simulation results for each of the equations.

[30] We apply the same specification for the services output price equation, despite questions about the economic significance and measurement of this notion.

Dynamic simulations of the output price equations

	Level	Year-on-year change
Goods excluding energy		
Energy		
Services		

We can see that the level of the output price for goods excluding energy is under-estimated from 2000 on. On the other hand, changes in 2001 are correctly simulated, which means the difference in level persists.[31] Furthermore, the equation fails to simulate the big drop in the energy output price in 2001 stemming from the drop in the Brent price even though it did simulate the previous price increase correctly. This result may change as revised data are published. If it does not, it will mean that there is a break, either in the estimated elasticities, or in the equation dynamics, because the energy price passes through to the output price more rapidly.

Import price responses to variations in foreign prices and output prices

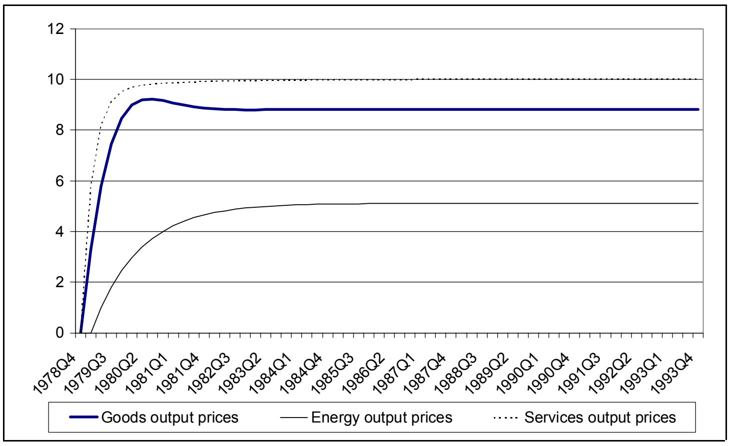
We use the estimated equations to simulate permanent shocks with 10% increases in value-added prices and imported input prices (both energy and non-energy inputs) (see Chart 4).

Services output prices adjust more rapidly to a value-added price shock than the output prices of goods excluding energy and, more importantly, more rapidly than energy output prices do. On the other hand, a commodities price shock has a more rapid and larger impact on energy output prices than it does on the output prices of goods excluding energy. The Brent price shock has only a passing impact on services output prices, not including the induced effects on value-added prices.

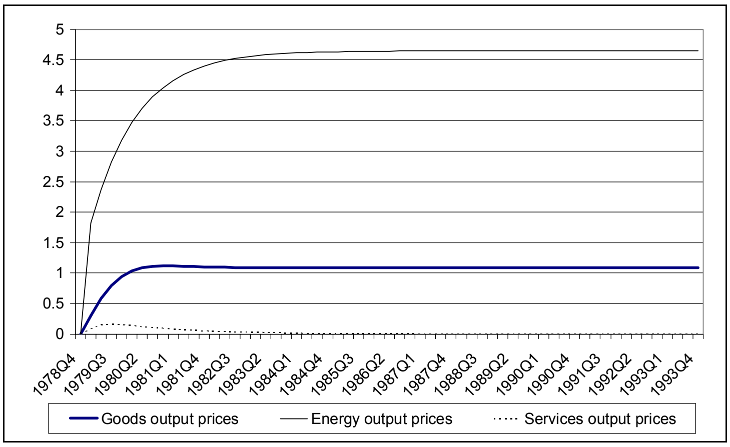
The output prices of goods excluding energy over-adjust to a value-added price shock in the short run.

[31] The direct impact of the Brent price on this goods output price did not appear to be significant, contrary to what we observe in the short run for the services output price equation below. It should be noted that the services sector includes “transportation”, which consumes mineral energy sources.

Responses to a value-added price shock



Responses to a commodity price shock



Output price elasticities of goods excluding energy to

After…	1 quarter	1 year	2 years	5 years	Long run
value-added prices	0.34	0.85	0.92	0.89	0.89
commodity prices	0.03	0.10	0.12	0.11	0.11

Energy output price elasticities to

After…	1 quarter	1 year	2 years	5 years	Long run
value-added prices	0.00	0.25	0.41	0.51	0.52
oil prices	0.19	0.33	0.41	0.47	0.48

Services output price elasticities to

After…	1 quarter	1 year	2 years	5 years	Long run
value-added prices	0.59	0.95	0.99	1.00	1.00
commodity prices	0.01	0.02	0.01	0.00	0.00

1.5 Households

1.5.1 Household consumption

Pc:	Private consumption deflator
R:	Real disposable income
C:	Real household consumption
CRT:	Outstanding amount of cash credit to households
tc:	Short term interest rate
ν :	Share of cash credit in disposable income

The consumption equation has the usual specification since the work by Davidson *et alii* (1978). Real consumption is a function of real disposable income and inflation, with dynamic adjustment being the result of an error correction mechanism.

The presence of the inflation term is often discussed. Indeed, if we call *RN* the nominal disposable income, *CN* nominal consumption, *SN* nominal savings and *WN* nominal net wealth, we have the following identities:

$$SN = RN - CN$$
$$WN = WN_{-1} + SN$$

Nominal savings is hence equal to the change in net nominal wealth.

In real terms – *i.e.* dividing by *Pc* – we get:

$$S = R - C$$

$$\begin{aligned} W &= \frac{WN_{-1}}{Pc} + S \\ &= \frac{WN_{-1}}{Pc_{-1}}\left(\frac{1}{1+\pi}\right) + S \\ &= W_{-1} - \left(\frac{\pi}{1+\pi}\right)W_{-1} + S \end{aligned}$$

Real savings has to be defined by $S - \left(\frac{\pi}{1+\pi}\right)W_{-1}$ to be equal to the change in real net wealth. The second term represents the effect of the inflation tax on the outstanding amount of net wealth. For the first equation to hold with this definition of real savings, real disposable income has to be defined accordingly by $R-\left(\frac{\pi}{1+\pi}\right)W_{-1}=R\left(1-\frac{W_{-1}}{R}\left(\frac{\pi}{1+\pi}\right)\right)\approx R\left(1-\frac{W_{-1}}{R}\pi\right)$. In other words, the usual definition of "real disposable income" $\left(R=\frac{RN}{Pc}\right)$ has to be corrected by the inflation tax in order to match the accounting framework in real terms. This is the very reason why an inflation term must be included in the consumption equation. Nevertheless, it is not sure that the total of net assets has to be taken into account in this correction: some assets may lead to an income that includes a "premium" for the inflation risk. A first approximation would be to reduce the computation of the inflation tax to net balances. In addition, some households may be subject to money illusion, in which case, only part of the inflation tax would be taken into account. Finally, since for the moment the model does not include a fully specified stock-flow system of account, we will use the form $\ln\left(R\left(1-\frac{W_{-1}}{R}\pi\right)\right)\approx \ln R-\alpha\pi$, where α is an estimated coefficient.

In addition, financial liberalisation in the mid-eighties led to a dramatic rise in cash credit to households. This allowed a fall in the saving ratio, which compounded the effect of the disinflation that occurred at that time. Real disposable income is hence increased by a share ν of cash credit. The estimation of this share presents a bias that has to be corrected with a dummy variable over the period 1986-1990. In particular, even though this coefficient can be bigger that 1, the free estimate is close to 3, which is an abnormally high value.[32] Hence, the specification of the consumption equation is:

$$\Delta\ln C=b_0+B_1\left[\Delta_2\ln R+\nu\Delta_2\left(\frac{\Delta CRT}{PcR}\right)\right]+\rho\ln\left(\frac{C_{-1}}{R_{-1}}\right)-\rho\nu\frac{\Delta CRT_{-1}}{Pc_{-1}R_{-1}}+B_2\Delta\ln Pc+b_1 1_{[86-90]} \quad (1.5.1)$$

This expression is derived using the first order approximation to adjust income:

$$\begin{aligned}\ln\left(R+\nu\frac{\Delta CRT}{Pc}\right)&=\ln R+\ln\left(1+\nu\frac{\Delta CRT}{PcR}\right)\\&\approx \ln R+\nu\frac{\Delta CRT}{PcR}\end{aligned} \quad (1.5.2)$$

If the steady state is defined by:

$$\Delta\ln C=\Delta\ln R=g$$
$$\Delta\ln Pc=\pi$$
$$\Delta\left(\frac{\Delta CRT}{PcR}\right)=0$$

in the long run:

$$\ln\frac{C}{R}=-\frac{b_0}{\rho}-\frac{2B_1-1}{\rho}g+\nu\frac{\Delta CRT}{PcR}-\frac{B_2}{\rho}\pi-\frac{b_1}{\rho}1_{[86-90]} \quad (1.5.3)$$

[32] Indeed, when a cash credit helps to finance only a part of a given expenditure, the econometrician will observe *ex-post* that 1 euro of credit is connected with more than 1 euro of consumption: the estimated propensity to consume out of cash credit may be greater than one. In addition, the variable used is the change in the outstanding amount of cash credit, equal to the flow of credits minus the reimbursements. This variable underestimates the true determinant of consumption, the flow of credits. This may also be reflected in the large size of the estimated coefficient.

Household consumption: estimation results

$$\Delta \ln C = b_0 + B_1\left[\Delta_2 \ln R + \nu\Delta_2\left(\frac{\Delta CRT}{PcR}\right)\right] + \rho \ln\left(\frac{C_{-1}}{R_{-1}}\right) - \rho\nu\frac{\Delta CRT_{-1}}{Pc_{-1}R_{-1}} + B_2\Delta \ln Pc + b_1 1_{[86-90]}$$

	1972q1-1999q4	
	Coefficients	t-stat
b_0	-0.026	-5.19
ρ	-0.181	-5.65
ν	1.649	2.18
B_2	-0.268	-3.35
B_1	0.069	1.39
Du_{74q4}	-0.021	-3.23
Du_{80q1}	0.016	2.52
Du_{96q4}	-0.016	-2.58
b_1	0.006	2.61
$-\frac{2B_1 - 1}{\rho}$	-4.76	
$-\frac{B_2}{\rho}$	-1.48	
Ser	0.6%	
DW	2.72	
R2	0.45	

Under this specification, interest rates have no direct impact on consumption. In the model, their impact is felt through interest payments taken into account in the definition of disposable income and through the cash credit equation.

Elasticities of consumption
(equation in isolation)

after…	1 quarter	1 year	2 years	5 years	long run
real disposable income	0.07	0.53	0.79	0.97	1.00
consumption deflator	-0.27	-0.15	-0.07	-0.01	0.00
inflation (*)	-0.06	-0.20	-0.29	-0.35	-0.37
cash credit (*)	0.11	0.88	1.31	1.63	1.65

(*) + 1 percentage point in annual terms

(**) permanent shock: increase in the purchasing power of the change in the outstanding amount of cash credit equivalent to 1 percent of real disposable income

Semi-elasticities of the saving ratio
(equation in isolation)

after…	1 quarter	1 year	2 years	5 years	long run
real disposable income	0.76	0.38	0.18	0.02	0.00
consumption deflator	0.22	0.12	0.05	0.01	0.00
inflation (*)	0.05	0.16	0.24	0.30	0.30
cash credit (*)	-0.09	-0.73	-1.09	-1.39	-1.40

(*) + 1 percentage point in annual terms
(**) permanent shock: increase in the purchasing power of the change in the outstanding amount of cash credit equivalent to 1 percent of real disposable income

We use the credit modelling from the MEFISTO model (1993) to specify the ratio of variations in cash credit to disposable income as a function of the real interest rate, the growth of disposable income and an inflation term:

$$B(L)\frac{\Delta CRT}{PcR} = B_1(L)\Delta\ln R + B_2(L)\Delta\ln Pc + b_1(TC - 4\Delta\ln Pc) + b_2 1_{[84-89]} + b_0 \quad (1.5.4)$$

Estimation results: cash credit equation

$$B(L)\frac{\Delta CRT}{PcR} = B_1(L)\Delta\ln R + B_2(L)\Delta\ln Pc + b_1(TC - 4\Delta\ln Pc) + b_2 1_{[84-89]} + b_0$$

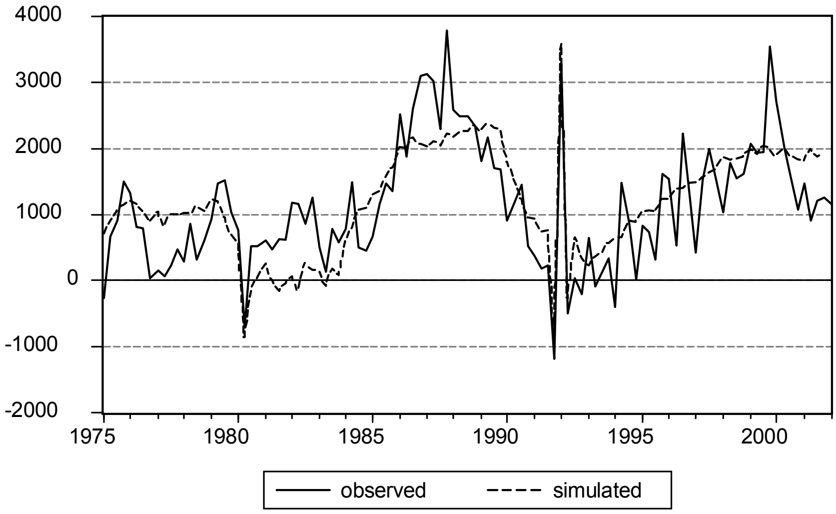
(linear least squares)

	1972q1-1999q4	
	Coefficients	t-stat
b_0	0.004	3.83
$\left(\frac{\Delta CRT}{PcR}\right)_{-1}$	0.475	5.81
$\left(\frac{\Delta CRT}{PcR}\right)_{-2}$	0.202	2.66
$\Delta\ln R_{-2}$	0.060	1.65
$\Delta\ln p$	-0.094	-2.79
b_1	-0.038	-2.88
b_2	0.003	3.02
Du_{73q1}	-0.014	-4.58
Du_{80q2}	-0.010	-3.09
Du_{91q4}	-0.008	-2.61
Du_{92q1}	0.020	6.21
Du_{92q2}	-0.010	-2.87
Ser	0.3%	
DW	2.12	
R2	0.74	

Such an equation has an ambiguous status because it is, at best, the reduced form of a supply equation and a credit demand equation. Inflation can be an incentive for households to incur debts because it reduces the real value of debts. On the other hand, the declining real value of their claims may cause banks to restrict their lending. The net effect that we estimate shows that households do not fully reconstitute their debts in real terms following an inflation shock, since the supply effect is greater than the demand effect. In the case of fairly short-term consumer loans, the inflationary gains estimated for individual borrowers are smaller than the estimated losses for lenders on aggregate outstanding loans. The income term is only slightly significant and it should be noted that neither real consumption growth nor the unemployment rate turned out to be significant explanatory variables for the share of credit in income. We also have to include a dummy variable for the period of financial deregulation, even though it covers a different interval than the interval used for the consumption function (1984-1989). Finally, the equation cannot explain the end of 1991 and the beginning of 1992.

This equation does not track quarterly variations in credit, but it does enable us to make interest rate effects endogenous.

Dynamic simulation of the cash credit equation: variations in outstanding credit in real terms



One criticism made of using a credit variable in a consumption function is based on the possible bedirectional causal relationship between credit and consumption. The estimation results provide a preliminary answer by showing that consumption is not a significant explanatory variable for credit, whereas credits do explain consumption. Furthermore, simultaneous estimation of the consumption and credit equations using the maximum likelihood method gives estimates that are close to those obtained for each equation separately. In particular, consumption is still insignificant in the credit equation. Therefore, there is no obvious simultaneity bias.

Therefore, we use equations (1.5.1) and (1.5.4), with the estimation results for the period 1970Q2-1994Q4 from the simultaneous estimation of both equations.

The long-run solution of equation (5) in the steady state is written as:

$$\frac{\Delta CRT}{PcR} = \frac{B_1(1)}{B(1)} g + \frac{B_2(1)}{B(1)} \pi + \frac{b_1}{B(1)}(tc - \pi) + \frac{b_0}{B(1)} + \frac{b_2}{B(1)} 1_{[84-89]} \quad (1.5.5)$$

The reduced form of equations (1.5.2) and (1.5.5) ultimately gives:

$$\ln\frac{C}{R} = -\frac{b_{0,C}}{\rho} + \nu\frac{b_{0,CRT}}{B_{CRT}(1)} + \left(\nu\frac{B^2_{1,CRT}}{B_{CRT}(1)} - \frac{2B^0_{1,C}-1}{\rho}\right)g + \nu\frac{b_1}{B_{CRT}(1)}(tc-\pi) + \left(\nu\frac{B^0_{2,CRT}}{B_{CRT}(1)} - \frac{B^0_{2,C}}{\rho}\right)\pi$$
$$+\nu\frac{b_{2,CRT}}{B_{CRT}(1)}1_{[84-89]} - \frac{b_{1,C}}{\rho}1_{[86-90]} \quad (1.5.6)$$

Using the estimated coefficients, we can use the long-run equation (1.5.6) to calculate the effects that a variation in any one of the long-run x arguments in the consumption equation will have on the long-run savings rate τ, including the effects on cash credit as well, since:

$$d\tau = -(1-\tau)\frac{\partial}{\partial x}\ln\frac{C}{R} \quad (1.5.7)$$

The table below sums up the different effects.

Main effects causing variations in the long-run savings rate (consumption equation and cash credit equation)

For a savings rate of 15.5% (mean value from 1993 to 2002)	Effect on the long-run savings rate
+ 1 point in income growth rate (annualised rate)	+ 0.9 points
+ 1 point in the inflation rate (annualised rate) (*)	+ 0.4 points
+ 1 point in the interest rate	+ 0.16 points
+ 1 point *ex post* cash credit share of GDI	- 1.4 points

(*) with exogenous real interest rate

1.5.2 Housing investment

Housing investment in the national accounts, combines gross fixed capital formation (GFCF) strictly speaking and maintenance expenditures. In addition, government incentives are often introduced in order to support investment. The equation concerns households' GFCF, which represents 90% of total housing investment. The lack of coherence in the data themselves and the absence of a well structured theoretical framework led, after several attempts, to specify the flow of investment as a function of real disposable income, corrected for a time trend. In addition, the long-term real interest rates and the various government incentives have been taken into account. These incentives take various forms: tax rebates, lower interest rates or other benefits.

il: household investment
Pil: deflator of household investment
G: government incentives in nominal terms
R: real disposable income $\left(=\frac{RN}{Pc}\right)$
TL: nominal long-term interest rate; $TLR = TL - \ln(Pc/Pc_{-4})$,

1.5.2.1.1.1 Household investment: estimation results

$$B(L)\Delta il = b_0 + \rho[pil_{-1} + il_{-1} - (r_{-1} + pc_{-1}) - b_1 time_{-1}] + B_1(L)TLR$$
$$+ B_2(L)\Delta(r + pc - pil) + B_3(L)\Delta pc + B_4(L)\Delta(g - pil)$$

Δil	1984q1-2001q4	
	Coef.	t-stat
b_0	-0.17	-2.73
Δil_{-2}	0.35	3.62
tlr_{-2}	-0.66	-3.60
$\Delta(r_{-1} + pc_{-1} - pil_{-1})$	0.35	2.14
$\Delta(g - pil)$	0.12	1.85
DU864892	0.02	4.47
Temps $_1$	0.003	2.88
ρ	-0.08	-3.18
SER	1.1%	
DW	2.33	
R^2	0.53	

Elasticities of housing investment

After………	1 quarter	1 year	2 years	5 years	Long run
real disposable income	0	0.67	0.88	0.99	1
long-term interest rate	0	- 1.15	- 3.66	- 6.66	- 7.11

1.6 Inventories

The specification of the equation for stockbuilding expresses the ratio of changes in inventories to GDP as a function of a demand variable, excluding inventories – otherwise stated, the sum of consumption, investment and exports – and variables representing firms' operating costs, namely the short-term interest rate and the unit labour cost. Faced with an increase in unit labour cost, firms tend to draw from inventories instead of maintaining the level of production.

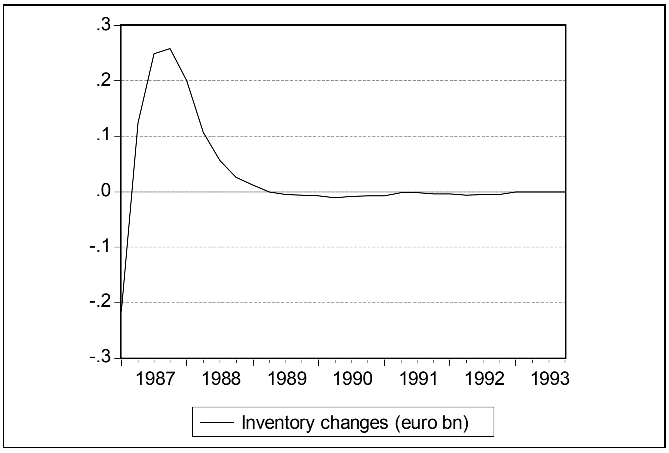
ΔStocks: changes in inventories
GDP: Gross domestic product
DHS: demand excluding inventories
CUT: unit labour cost
TC: nominal short-term interest rate
P: value added deflator

Changes in inventories: estimation results

$$B(L)\Delta Stocks / PIB = b_0 + B_1 \Delta dhs$$
$$+ B_2 (0.4\Delta dhs_{-1} + 0.3\Delta dhs_{-2} + 0.2\Delta dhs_{-3} + 0.1\Delta dhs_{-4})$$
$$+ B_3 \Delta cut + B_4 \Delta(TC - \ln(P / P_{-4}))$$

$\Delta Stocks / PIB$	**1979q2 – 2002q2**	
	Coef	t-stat
b_0	-0,002	-2,35
$\Delta Stocks_{-1} / PIB_{-1}$	0,55	8,98
Δdhs	-0,25	-4,37
B_2	0,69	8,38
Δcut	-0,05	-1,94
$\Delta(TC - \ln(P/P_{-4}))$	-0,09	-2,89
DU 2001	-0,01	-4,20
R^2	0,79	
SER	0,3%	
DW	2,43	

Effect of an increase
in domestic demand excluding inventories
of 1 billion euros on Δ stocks



1.7 Foreign trade

In keeping with the general principle governing the construction of the model, imports and exports are primarily determined by demand. Demand variables are constructed from the structure of imports by products to define French demand for imported goods and services, and France's export market shares to define world demand for French exports. The import content structure and market share structure are those of a base year, which enables us to interpret changes in these variables as what the flows of imports and exports would have been if the base year structures had remained stable over time. Deviations between actual changes in trade flows and these demand variables are then naturally interpreted as market share losses or gains, which are explained by changes in relative prices between domestic prices and foreign prices.

For foreign trade volumes and prices, we distinguish between three types of imports: goods excluding energy, energy and services. For exports, we make a distinction between goods and services only.

1.7.1 Imports

i:	product indicator (goods excluding energy, energy and services)
M_i:	imports of product *i* in real terms
D_i:	import demand for product *i*, weighted sum of final demand components (Table 1)
Pm_i:	deflator for imports of product *i*
Pq_i:	deflator for output of product *i*
TUC*:*	capacity utilisation rate
t:	time trend

Each final demand component is made up in part of imported products. The import content can be further broken down into direct import content, meaning products imported directly for the final use in question, and indirect import content, meaning products imported for use in the output of products for the final use in question. The breakdown of supply between domestic output and imports is available from national accounts data, but the import content of demand is not and, therefore, has to be estimated. We have constructed demand variables for each type of product on the basis of an estimation of the import content of final demand components in each type of product (see Table below). More specifically, the production input content of imports is accounted for in the calculation of the weightings (Villetelle, 2002).

$$D_i = \sum_k a_{i,k} DF_k \qquad (1.7.1)$$

D_i: import demand for product *i*, weighted sum of final demand components (Table 1)
DF_k: Final demand component *k* (consumption, GFCF, stockbuilding)
$a_{i,k}$: import content in product *i*, of final demand component *k*

Import content of different demand variables in the model (1995)

	Final consumption		GFCF			Changes in inventories	Exports
%	Households	Government and NPISHs	Business sector	Households	Government and NPISHs	Total	Total
Goods excl. energy	15.2	5.8	28.8	9.9	16.6	30.1	14.2
Energy	1.8	0.5	0.4	0.5	0.5	1.6	0.9
Services	2.7	1.3	1.6	1.7	1.4	1.0	1.5
Total	19.7	7.6	30.8	12.1	18.5	32.7	16.6

These evaluations give us results that reflect the nature of France's imports, with a high goods content of aggregate goods and services imports and, more specifically, the high import content of capital formation, with imported goods excluding energy accounting for 28.8% of business sector GFCF and 30.1% of changes in business sector inventories.

The demand variables constructed in this manner for each type of product represent what imports of these products would have been if the import content, technical coefficients and demand structure for the product in question had been the same as in the base year. The deviations between actual imports and demand are explained by price competitiveness. Thus, the import equations are of the form:

$$\ln M_i = \ln D_i - \phi \ln \frac{Pm}{Pq} \qquad (1.7.2)$$

We also have to include a deterministic trend to account for the distortion of the ratio of imports to demand that cannot be explained by changes in competitiveness and correspond to greater import penetration of the domestic market.[33] Supply considerations have also been incorporated through the capacity utilization rate (TUC), since pressure on production capacities leads to increased import flows. This can only occur if France's foreign suppliers are not themselves producing at full capacity. Therefore, we have constructed a relative capacity utilisation rate variable that is the difference between the French rate and a foreign rate, which is the weighted mean of France's main suppliers' rates.[34] This variable is included for its economic relevance solely in the equation for imports of goods excluding energy, in which it is not significant in any case. Only the French capacity utilisation rate is included in the energy import equation. No capacity utilisation rate variable seems to be relevant in the case of services imports. The cyclical lag between France and its leading trading partners is fairly small and does not provide much information about changes in imports.

Thus, the import equations are of the form:

$$\begin{aligned} B_i(L)\Delta m_i &= \rho_i \left(m_{i_{-1}} - d_{i_{-1}} + \phi_i \left(pm_{i_{-1}} - pq_{i_{-1}}\right)\right) \\ &\quad + B_1(L)\Delta d_i + B_2(L)\Delta\left(pm_i - pq_i\right) + B_3(L)TUC + b_{i,1}t + b_{i,0} \end{aligned} \qquad (1.7.3)$$

[33] The export equations do not include an explicit deterministic trend. However, we could consider that such a trend is implicit in the world demand variable, which is calculated on the basis of the imports of the countries in the rest of the world.

[34] The countries concerned are the ones used to construct foreign prices. The weightings are the ones for import competitors' prices shown in Appendix 4. Foreign capacity utilisation rates are forecast using the same type of equation as the one presented for France in Section 1.1.5, which links the capacity utilisation rate to variations in the GDP of each country under consideration. The results are presented in Appendix 5.

Estimation results: import equations

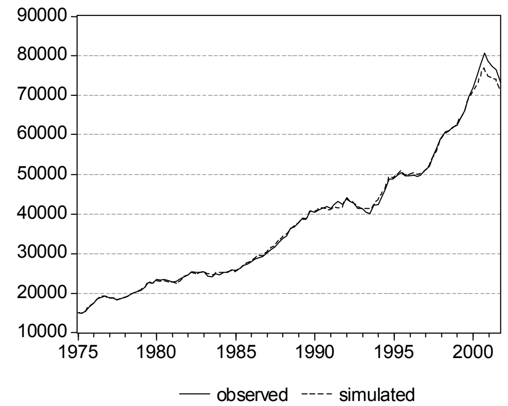
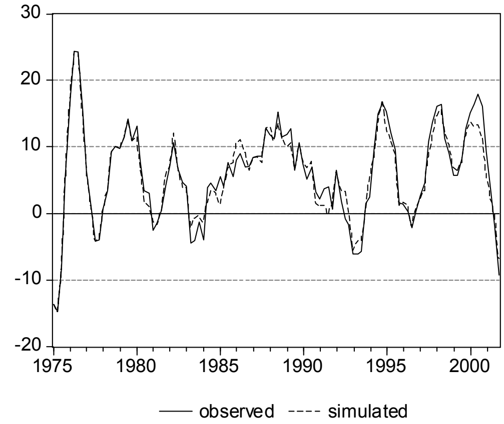
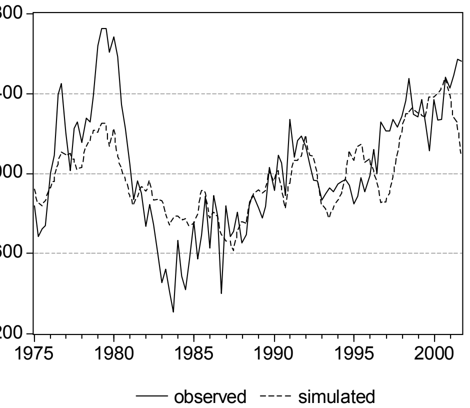
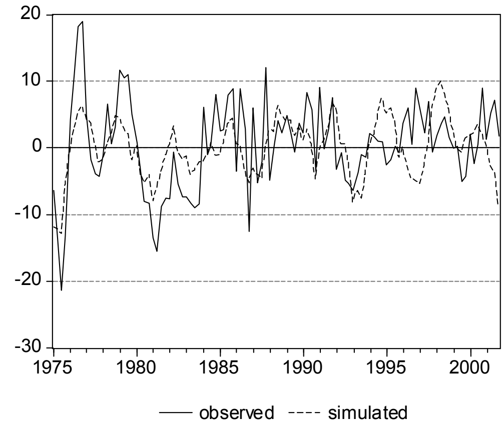
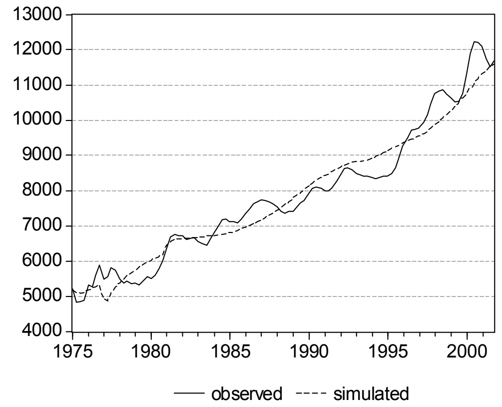
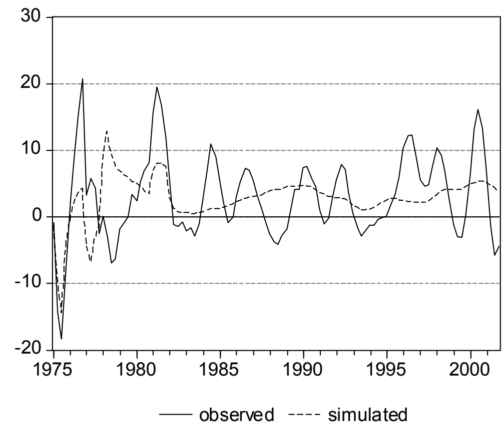
$$B_i(L)\Delta m_i = \rho_i\left(m_{i_{-1}} - d_{i_{-1}} + \phi_i\left(pm_{i_{-1}} - pq_{i_{-1}}\right)\right) + B_1(L)\Delta d_i + B_2(L)\Delta\left(pm_i - pq_i\right) + B_3(L)TUC + b_{i,1}t + b_{i,0}$$

	Goods excluding energy		***Energy***		***Services***	
	1980q1 –1999q4		*1971q2 –1999q4*		*1975q1 –1999q4*	
	Coeff.	T-stat	Coeff.	T-stat	Coeff.	T-stat
ρ_i	-0.192	-3.94	-0.287	-4.78	-0.093	-2.66
$\rho_i\phi_i$	-0.107	-2.58	-0.034	-2.04	-0.093/10	-
ϕ_i	0.56	-	0.12		0.10	-
$\Delta m_{i_{-1}}$	-	-	-0.234	-2.46	0.378	4.88
$\Delta m_{i_{-2}}$	-	-	-0.156	-1.88	-	-
Δd_i	1.971	15.07	2.148	4.16	0.189	0.60
$\Delta d_{i_{-1}}$	-	-			-	-
$\Delta(pm_i - pq_i)$	-0.399	-3.31	-0.082	-1.80	-	-
$\Delta(pm_{i_{-1}} - pq_{i_{-1}})$	-	-	-	-	-	-
TUC (1)	0.182	1.42			-	-
TUC_{-1}	-	-	0.379	1.75	-	-
b_1	0.0013	3.66	-0.0017	-4.40	0.00016	1.74
b_0	-0.146	-3.53	-0.157	-0.87	0.008	1.39
δ_{77q1}			-	-	-0.089	-4.49
δ_{77q3}	-	-	-	-	0.039	2.03
δ_{81q1}	-	-	-	-	0.040	2.09
δ_{86-90}	-	-	-0.040	-3.17	-	-
DW	2.60		2.18		2.08	
R2	0.79		0.33		0.39	
SER	1.02%		4.02%		1.85%	

(1): Relative capacity utilisation rate in the case of imports of goods excluding energy.

These estimation results show that the elasticities of imports of goods excluding energy and energy to demand are greater than one in the short run (parameters for the polynomial B_1), giving rise to an over-adjustment following a shock. These elasticities reach 2.0 or more in the first quarter.

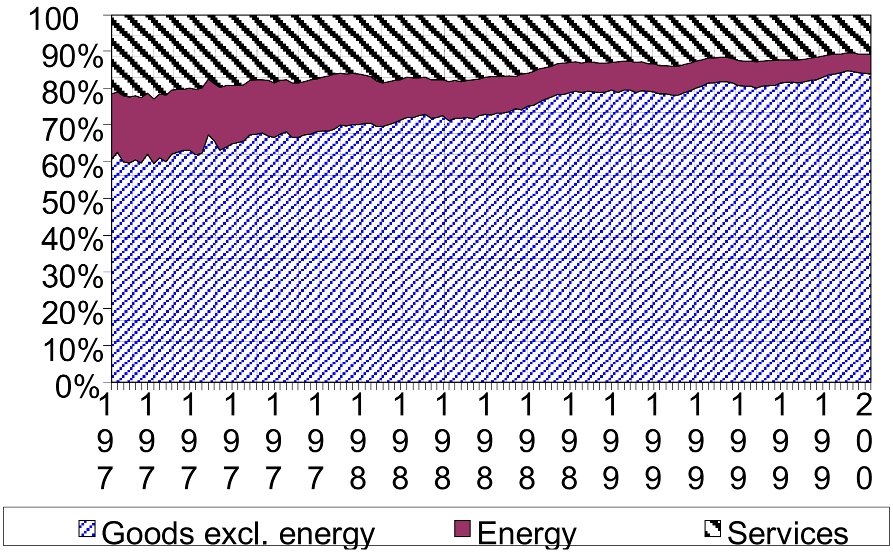
Dynamic simulations of the import equations

	Level	Year-on-year change
Goods excluding energy		
Energy		
Services		

The specification for the equation for imports of goods excluding energy is very robust and does not raise any special problems. On the other hand, the dynamics of the observed energy import series is only tracked more or less correctly between the mid-nineteen-eighties and the early nineteen-nineties. At other times, either the simulated fluctuations are smaller than the actual ones, as in the nineteen-seventies, or else the simulation produces fluctuations that do not appear in the observed data, as in the nineteen-nineties. The services import equation is particularly mediocre as well. The simulated growth rate of services imports with this equation is not very different from the mean growth rate arrived at by a simple calculation. Consequently, the equation does not track any of the fluctuations in services imports nor does it simulate the increase in services imports observed since the mid-nineteen-nineties. Attempts to modify the determinist trend or introduce a degree of complementarity between services imports and goods imports did not produce satisfactory results. It is especially difficult to show any impact of prices on services imports. This difficulty is surely due to the fact that we do not have a specific foreign price indicator for services. Therefore, we decided to constrain long-run price elasticity to 0.1.

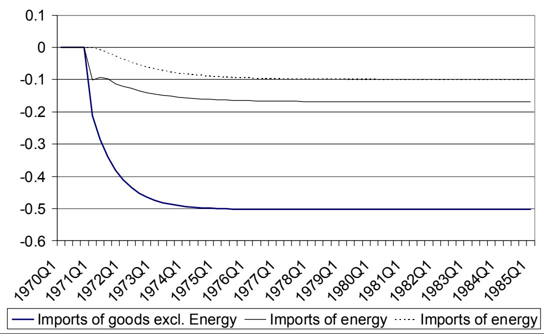
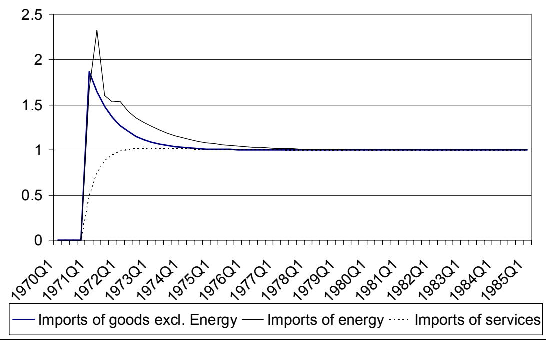
In view of the import structure, the overall simulation is dominated by the equation for imports of goods excluding energy and it produces fairly satisfactory results.

Structure of French imports of goods and services



We analysed the dynamics of these equations by simulating shocks on each equation and on each explanatory variable.

Shock simulations on the import volume equations

Impulse response functions to a price shock	**Impulse response functions to a demand shock**
	

Elasticities of imports of goods excluding energy

After…	1 quarter	1 year	2 years	5 years	long run
to demand	1.98	1.52	1.22	1.02	1.00
to import prices of goods excluding energy	-0.40	-0.47	-0.52	-0.55	-0.55
to French capacity utilisation rate (*)	0.18	0.55	0.78	0.94	0.95

(*) semi-elasticity (symmetrical effect for aggregated foreign capacity utilisation rate)

Energy import elasticities

After…	1 quarter	1 year	2 years	5 years	long run
to demand	2.16	1.42	1.11	1.00	1.00
to energy import prices	-0.08	-0.11	-0.12	-0.12	-0.12
to French capacity utilisation rate (*)	0	0.85	1.21	1.33	1.33

(*) semi-elasticity

Services import elasticities

After…	1 quarter	1 year	2 years	5 years	long run
to demand	0.19	0.55	0.79	0.98	1.00
to services import prices	0.00	-0.03	-0.07	-0.10	-0.10

The most price-sensitive component of aggregate imports is imports of goods excluding energy, both in the short run and in the long run (parameters ϕ_i and parameters for the polynomial B_2). The services component is the least price-sensitive.

1.7.2 Exports

The demand variable for exports is the world demand for French goods exports. It is expressed as the sum of the rest of the world's imports, weighted by France's market share in each country, which is measured as the ratio of France's exports to the country to the country's aggregate imports. The weightings used are those for 1996 (Dauphin, 1999).[35] The world demand in the equation therefore represents what France's goods exports would be, if the market shares were the same as in 1996.

The same world demand variable is also used for services in order to simplify management of the database for the model, and because services account for a smaller share of trade than they do of output. Similarly, we use only one indicator for foreign prices of exports Px^*, both in the goods equation and in the services equation.

Thus, the export equations are of the form:

[35] The weightings are presented in Appendix 6.

$$\ln X = \ln D_x - \zeta \ln \frac{Px}{Px^*} + c \qquad (1.7.4)$$

X: exports
D_x: foreign demand indicator
Px: export prices
Px^*: mean export price in euros of foreign competitors ("foreign prices")

Long-run elasticity equal to one is imposed for world demand, but this fits the data. ζ is the long-run elasticity of exports in real terms to competitiveness.

This specification is used for both goods exports and services exports. The short-run dynamic is modelled by adding lagged growth rates for each of the explanatory variables. For prices, we constrained the dynamics to focus on competitiveness and not on export prices and foreign prices separately.

The estimated equations for each of the products are of the form:

$$B_i(L)\Delta x_i = \rho_i \left(x_{i_{-1}} - d_{x_{-1}} + \zeta_i \left(px_{i_{-1}} - px^*_{-1}\right)\right) + B_1(L)\Delta d_x + B_2(L)\Delta\left(px_i - px^*\right) + b_0 \qquad (1.7.5)$$

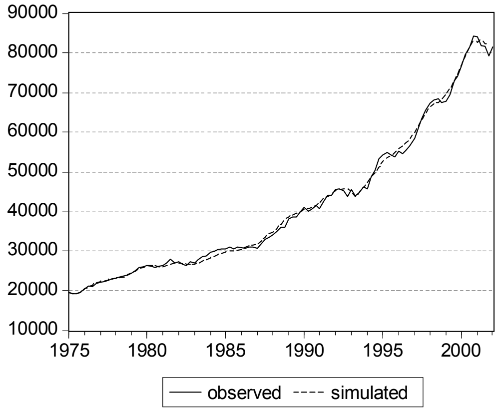
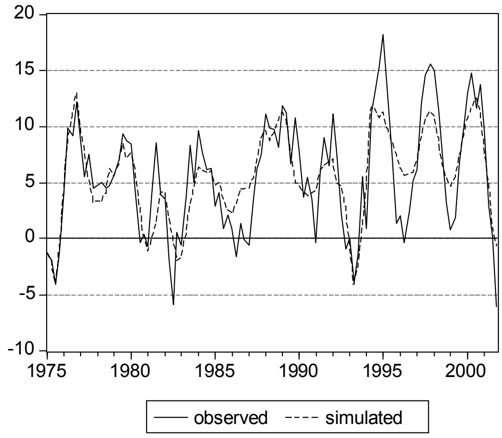
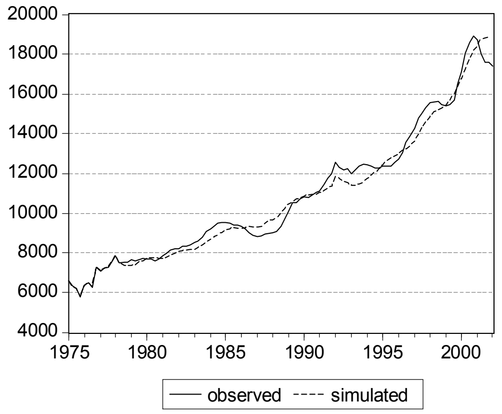
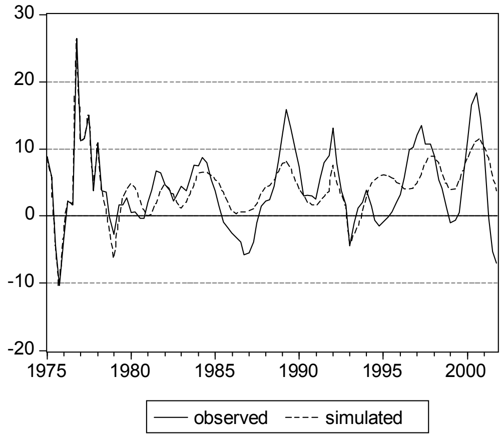
Estimation results: export equations

$$B_i(L)\Delta x_i = \rho_i \left(x_{i_{-1}} - d_{x_{-1}} + \zeta_i \left(px_{i_{-1}} - px^*_{-1}\right)\right) + B_1(L)\Delta d_x + B_2(L)\Delta\left(px_i - px^*\right) + b_0$$

	Goods		***Services***	
	1977q1 –2001q4		*1978q3 –2001q4*	
	Coeff.	T-stat	Coeff.	T-stat
ρ_i	-0.272	-3.93	-0.041	-1.82
$\zeta_i \cdot \rho_i$	-0.048	-1.84	-0.045	-1.61
ζ_i	0.18	-	1.10	-
$\Delta x_{i_{-1}}$	-	-	0.456	5.97
Δd_x	0.699	5.49	0.289	3.17
$\Delta(px_i - px^*)$	-0.225	-2.01	-0.181	-2.41
b_0	2.892	3.94	0.375	1.82
δ_{92q1} and $-\delta_{92q2}$	-	-	0.0327	4.1
δ_{93q2}	-0.047	-2.77	-	-
DW	2.15		1.85	
R2	0.42		0.58	
SER	1.64%		1.10%	

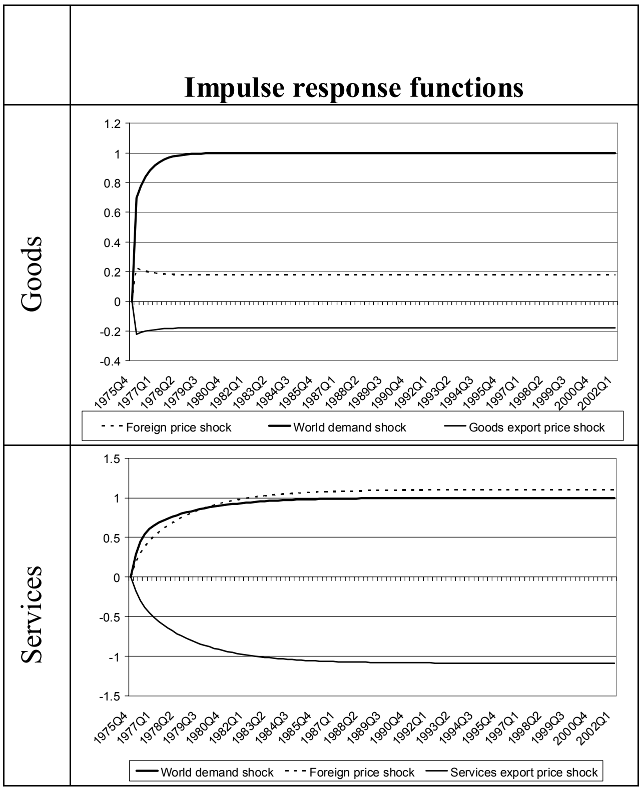
The price effects are symmetrical for each equation since we have specified price dynamics in terms of competitiveness, even in the short run.

Dynamic simulations of the export equations

	Level	Year-on-year change
Goods		
Services		

Simulation of the goods export equation did not raise any particular problems. On the other hand, the equation does not track services exports in 2001 properly, but we cannot say yet whether the problem stems from the data or the poor performance of the equation.

Shock simulations on the export volume equations



Goods export elasticities

After…	1 quarter	1 year	2 years	5 years	long run
to demand	0.70	0.88	0.97	1.00	1.00
to goods export prices	-0.22	-0.20	-0.18	-0.18	-0.18

Services export elasticities

After…	1 quarter	1 year	2 years	5 years	long run
to demand	0.29	0.59	0.71	0.88	1.00
to services export prices	-0.16	-0.40	-0.58	-0.87	-1.10

As the estimation results show, services exports in real terms are much more sensitive in the long run to competitiveness than goods exports in real terms are, with the long-run elasticity of services exports standing at around 1, as opposed to 0.2 in the case of goods exports. This result is consistent with those generally found in the literature. It shows that, on the other hand, non-price competitiveness plays a more significant role for goods exports than it does for services exports. However, both demand and prices adjust more rapidly for goods than they do for services.

1.7.3 The Marshall-Lerner Condition

A variation in exchange rates leads to a degree of variation in foreign prices stated in euros. This has an influence on competitiveness and leads to a variation in the quantities of imports and exports. The result is an improvement or a decline in the trade balance, depending on the relative size of the adjustments made between exports and imports in both real and nominal terms. The Marshall-Lerner condition defines the relationships between the different demand and price elasticities that have to exist in order for a devaluation to improve the trade balance.

The trade balance, expressed in the form of the import coverage ratio in nominal terms is written as:[36]

$$S = \frac{Px \cdot X}{Pm \cdot M} \tag{1.7.6}$$

and, except for the first order, a variation dS in this import coverage ratio compared to a reference situation can be subjected to an accounting decomposition of the variations in nominal and in real terms.

$$dS = S\left[\left(\frac{dPx}{Px} + \frac{dX}{X}\right) - \frac{dPm}{Pm} - \frac{dM}{M}\right] \tag{1.7.7}$$

Our specifications of the equations give the following elasticities (see sections 1.4.2, 1.7.2 and 1.7.3):

$$\frac{dM}{M} = -\phi\left(\frac{dPm}{Pm} - \frac{dPq}{Pq}\right) \tag{1.7.8}$$

$$\frac{dX}{X} = -\zeta\left(\frac{dPx}{Px} - \frac{dPx^*}{Px^*}\right) \tag{1.7.9}$$

$$\frac{dPm}{Pm} = \alpha\frac{dPq}{Pq} + (1-\alpha)\frac{dPm^*}{Pm^*} \tag{1.7.10}$$

$$\frac{dPx}{Px} = \omega\frac{dPq}{Pq} + (1-\omega)\frac{dPx^*}{Px^*} \tag{1.7.11}$$

The situation under consideration is one where domestic prices are exogenous, which means that they do not adjust following the change in the exchange rate $\left(\frac{dPq}{Pq} = 0\right)$. Therefore, we consider an exchange rate depreciation that leads to an equal increase in foreign prices stated in euros, or:

$$\frac{dPm^*}{Pm^*} = \frac{dPx^*}{Px^*} = \chi \tag{1.7.12}$$

The set of equations above can express the variation in the import coverage ratio as a function of the different elasticities:

[36] The Marshall-Lerner condition is presented on the basis of the import coverage ratio and not the trade balance. This does not change anything in the calculation of the conditions, but it does simplify the presentation of the long-run effects.

$$dS = S\left[(1-\alpha) + \zeta\alpha - (1-\alpha)(1-\phi)\right]\chi \qquad (1.7.13)$$

We deduce from this that the import coverage ratio will only improve ($dS > 0$) if $\left[(1-\alpha) + \zeta\alpha - (1-\alpha)(1-\phi)\right] > 0$ (Marshall-Lerner condition). When the trade balance is nearly in equilibrium ($S = 1$), an increase of 1% ($\chi = 1\%$) in all foreign prices, if domestic prices are exogenous, leads to a variation in the import coverage ratio given by the Marshall-Lerner condition: $\left[(1-\alpha) + \zeta\alpha - (1-\alpha)(1-\phi)\right]$.

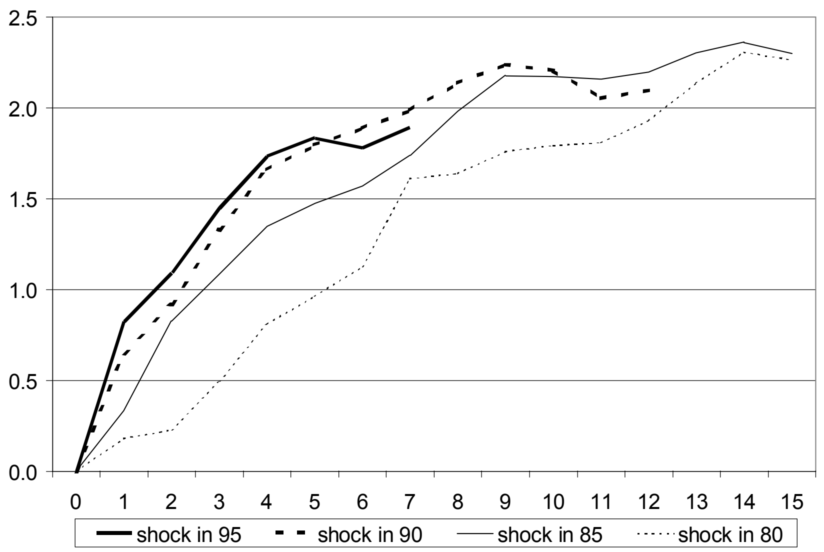
If we apply the same assumptions and consider a full adjustment of domestic prices $\left(\frac{dPq}{Pq} = \chi\right)$, all of the prices move in equal proportions, which means the competitiveness terms do not change. In this case, the real terms do not change either, because they respond only to changes in relative prices. Thus, the import coverage ratio is not affected by the change in exchange rates ($dS = 0$).

When we use the structure calculated as a mean of the sample to aggregate the different estimated elasticities, we get:

$$\left[(1-\alpha) + \zeta\alpha - (1-\alpha)(1-\phi)\right] = 0{,}20 \qquad (1.7.14)$$

The charts below show the impact of a 10% increase in foreign prices stated in euros on the import coverage ratio. The shock is simulated at different dates in 1980, 1985 and 1990.

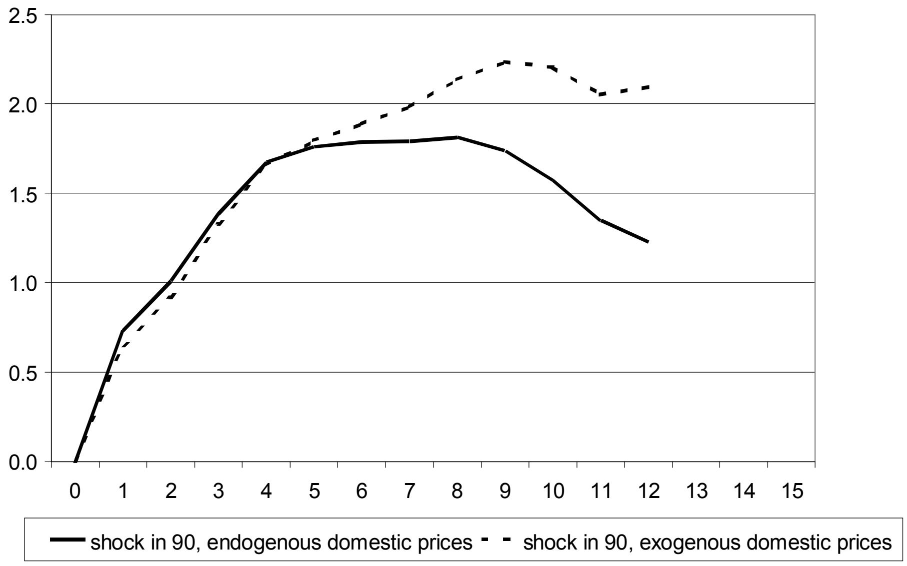
10% foreign price shock at different dates:
impact on the nominal import coverage ratio when domestic prices are exogenous
(deviations in percentage points in the years following the shock)



According to the Marshall-Lerner condition calculation, the 10% increase in foreign prices leads to a rise of around 2 percentage points in the import coverage ratio in the long run. Nevertheless, these simulations show that the short-run impulse response function depends on the reference period. The actual improvement in the trade balance in the nineteen-eighties was slower than it has been since then. The decomposition by products shows the phenomenon stems from energy imports, which are incompressible. But the share of energy shrank from nearly 15% of total imports in real terms to around 5% at the end of the period, and in nominal terms, they shrank from 25% to around 6%. This means that the improvement in the trade balance is more rapid when the same shock is simulated on a more recent period. This simulation run on all goods and services obscures the J-curve phenomenon, where the balance declines in the short run as a result of short-run demand rigidity. The J-curve only appears in the case of energy. Once this short-run effect fades, the trade balance improves more rapidly as the demand for imported goods and services shrinks following the rise in foreign prices.

The second chart below tracks the 1990 simulation, but with endogenous domestic prices.

10% shock on foreign prices in 1990:
impact on the nominal import coverage ratio when domestic prices are endogenous
(deviations in percentage points in the years following the shock)



We see that, compared to the previous simulation, the trade balance shows less improvement, particularly from the fourth year after the shock onwards. Since domestic prices rise in response to the increase in foreign prices stated in euros, the competitiveness gains are smaller. As this phenomenon continues, trade flows become more similar to the ones observed in the reference situation. Because the specifications for the equation impose total homogeneity of the price system in the long run, domestic prices eventually rise by exactly 10%. The trade balance then stands at the value that prevailed before the exchange rate shock, and the permanent shock to the level of exchange rates has had only a temporary impact on the trade balance. However, we see that the temporary impact can last a fairly long time and that 12 years after the shock, the import coverage ratio is still significantly lower than it would be in the reference situation.

1.8 Transfer payments

In addition to the equations tracking price formation and the main macroeconomic variables, there are a number of other equations to ensure the equilibrium of transfers between agents. The transfers with the biggest role in income formation are interest payments and other property income.

1.8.1 Interest payments

Modelling of interest flows paid and received by the different agents usually relies on specification of quasi-accounting equations linking such flows to outstanding claims and debts by means of apparent interest rates. This type of specification is used for flows to avoid having to use stock variables and having to decompose assets and liabilities at this stage in the development of the model. Therefore, we use an accounting framework where the agents' net lending is equal to the variation in their net assets. For net asset items that do not generate interest payments, we assume that these "other net assets" vary in proportion σ to the variation in net interest-bearing assets. We then assume that the apparent interest rate used to calculate interest paid is not very different from the rate used to calculate interest received. This gives us:

$$\begin{aligned} CF &= (1+\sigma)\Delta ANI \\ INR &= r(API - PPI) \\ &= rANI \\ &= r\left(ANI_{-1} + \Delta ANI\right) \\ &= \frac{r}{r_{-1}} INR_{-1} + r\Delta ANI \end{aligned} \qquad (1.8.1)$$

hence, ultimately:

$$INR = \frac{r}{r_{-1}} INR_{-1} + \frac{r}{1+\sigma} CF \qquad (1.8.2)$$

CF: Net lending
ANI: Net interest-bearing assets
INR: Net interest received
API: All interest-bearing assets
PPI: All interest-bearing liabilities

The assumption that remuneration of assets and liabilities is comparable is a particularly delicate one in the case of the rest of the world, since the interest paid by the rest of the world is primarily calculated on the basis of foreign and French interest rates. This means we cannot assume that the same apparent rates should be applied to assets and liabilities.[37] Since we are dealing with an income redistribution transaction, the aggregate interest paid by all agents is equal to the aggregate interest received. We chose to use the rest of the world to balance this item.

Thus, for the rest of the world, we have:

$$INR_{rdm} = -\sum_{i \neq rdm} INR_i \qquad (1.8.3)$$

[37] Unless we assume full parity between French and foreign rates.

The apparent interest rate r is not an observable variable for the other agents. In order to approximate this rate, we start by using the fact that an apparent rate applied to a total stock of assets can be written as the weighted mean of the specific apparent interest rates applied to each component of the stock, with the relative share of each component of the total stock being used as the weights. Hence, when we distinguish between two categories of claims and debt: short-term and long-term, and two respective remuneration categories, RC and RL, we get:

$$r = \varphi RC + (1-\varphi)RL \tag{1.8.4}$$

Furthermore, we define the different apparent interest rates for each agent on the basis of linear smoothing of market rates:[38]

$$RC = \phi(L)TC \tag{1.8.5}$$

$$RL = \theta(L)TL \tag{1.8.6}$$

The weightings φ used to divide the influence of interest rates between short-term rates and long-term rates are estimated from balance sheets, with mean distribution of "other deposits" excluding sight deposits, short-term loans and long-term loans and securities other than equities between 1995 and 2000, in the total assets and liabilities of each agent.

Estimation of the short-term share of agents' claims and debts
(weighted means 1995-2000)

Households	38%
Non-financial corporations	21%
Financial corporations	49%
Government	6%
NPISHs	20%
Rest of world	51%

The smoothing coefficients can be interpreted as the term structure of stocks of claims and debts. The proxy for this structure here is a series of linearly decreasing coefficients that sum to one. The length of the structure for each agent was set arbitrarily to ensure a degree of goodness of fit between the calculated series of interest flows and the observed flows.[39]

Lag lengths for smoothing interest rates
(years)

	Short-term	Long-term
Households	1	7
Non-financial corporations	2	5
Financial corporations	3	7
Government	3	5
NPISHs	1	3

Therefore, we have the following system of equations for each agent, except the rest of the world:

[38] The short-term interest rate (tc) is the weighted mean of the overnight rates. The long-term interest rate (tl) it the yield on long-term government bonds.

[39] The very poor fit means we cannot conduct tests. Therefore, we determined the lag structures on a very much *ad hoc* basis.

$$INR = \frac{r}{r_{-1}} INR_{-1} + \frac{r}{1+\sigma} CF + c \qquad (1.8.2')$$

$$r = \varphi\phi(L)TC + (1-\varphi)\theta(L)TL \qquad (1.8.4')$$

Equation (1.8.4') is a defining equation, since the weights φ are set (see above) and since the coefficients ϕ_i and θ_i are wholly determined by the form $\frac{n-i}{\frac{n(n+1)}{2}}$, assuming linearly decreasing smoothing coefficients, and with fixed lag lengths n. On the basis of these values, the apparent interest rate r can be calculated and substituted in equation (1.8.2').[40]

Under the accounting framework of the model, the net interest received by each agent can be deduced from their net lending. Thus, we can write:

$$CF = \overline{CF} + INR \qquad (1.8.7)$$

$\overline{CF}$: The set of asset and liability items can be used to calculate net lending, excluding interest paid and received.

The reduced form of the interest flow equations is therefore written:

$$\left(1 - \frac{r}{1+\sigma}\right) INR = \frac{r}{r_{-1}} INR_{-1} + \frac{r}{1+\sigma}\overline{CF} + c \qquad (1.8.8)$$

This equation shows that with steady-state growth ($r_{-1} = r$), if nominal disposable income increases at rate g, then the ratio of net interest received to income is not stable unless:

$$\frac{1+\sigma}{1+g}\frac{1}{1+\sigma-r} < 1 \qquad (1.8.9)$$

This condition is analogous to the debt sustainability condition, where the interest rate must be lower than the growth rate of the economy, except that, in this case, the condition involves an unknown parameter. Parameter σ was set at 0.3 to ensure the stability of the model for a likely interval of values for r and g.

In this equation, only the constant, which is included to account for the mean biases introduced by all of the approximations, has been estimated.

Determining interest received and interest paid

The equations above enable us to determine the net interest received by each agent. In order to reconstitute each agent's assets and liabilities, we need to separate interest received and interest paid.

The interest flows of financial corporations are by far the largest flows between agents. This is only natural due to the nature of these agents. Among non-financial agents, non-financial corporations and government are structurally interest payers, whereas households receive more interest than they pay.

[40] In the case of financial corporations, problems in finding acceptable results with this form led us to linearise the variables.

This is also true of the rest of the world, except in the most recent period, where the flows are practically in equilibrium.

For agents other than the rest of the world, we assume that interest received varies in proportion to net interest received, which then enables us to determine interest paid as the balance, or:

$$\begin{aligned} \Delta IR &= \alpha \Delta INR + ec \\ IV &= IR - INR \end{aligned} \qquad (1.8.10)$$

ec is a differential term that ensures the equality of the right and left sides of the equation, if α is constant. This term is considered to be exogenous in the operation of the model.

The set of residents pays interest to other residents and to non-residents. Therefore, we have estimated a coefficient for distributing the aggregate interest paid by residents in order to determine the interest received by the rest of the world, with the interest paid balancing the operation, or:

$$\begin{aligned} \Delta IR_{rdm} &= \alpha\left(\sum_{i \neq rdm} \Delta IV_i\right) + ec \\ IV_{rdm} &= IR_{rdm} - INR_{rdm} \end{aligned} \qquad (1.8.11)$$

As above, ec is a differential term that ensures the equality of the right and left sides of the equation, if α is constant.[41]

Estimation of the distribution coefficient for calculating interest received

	α
Households	1.1
Non-financial corporations	-0.1
Financial corporations	2.2
Government	-0.1
NPISHs	1.1
Rest of world	*0.1*

We ran a dynamic simulation to evaluate the relevance of these equations. The whole system includes equations for determining the net flows of interest paid, equations for breaking flows down into interest received and interest paid and equations for flows with the rest of the world that balance the system. We then add equations that define net lending as net lending, excluding interest (considered to be an exogenous variable in this system, which is isolated from the other equations in the model) and with the addition of interest flows, which are treated exogenously. In this way, we ensure that net lending and interest flows match.

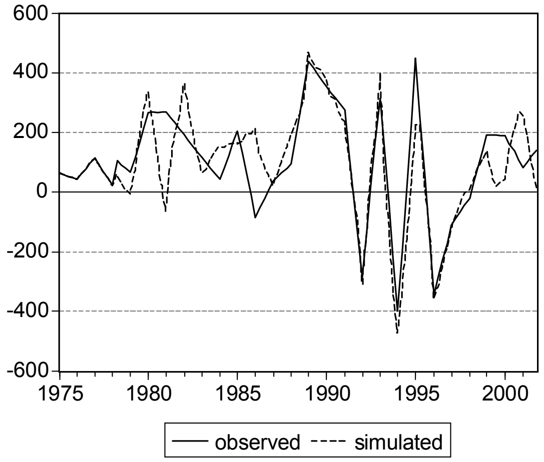
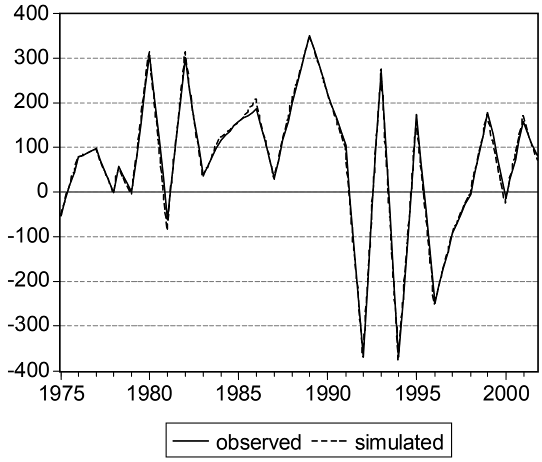
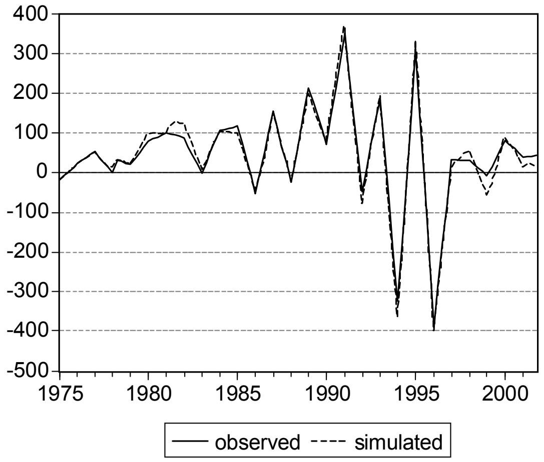
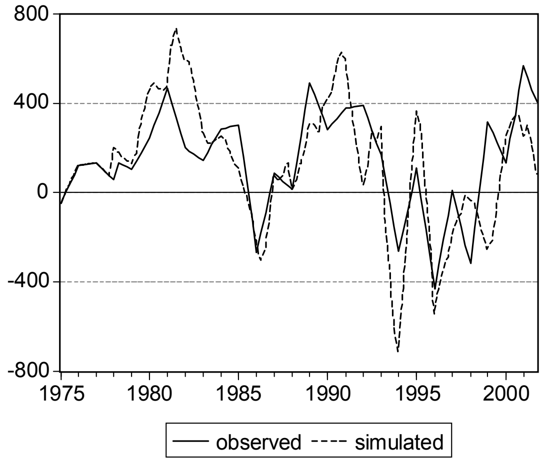
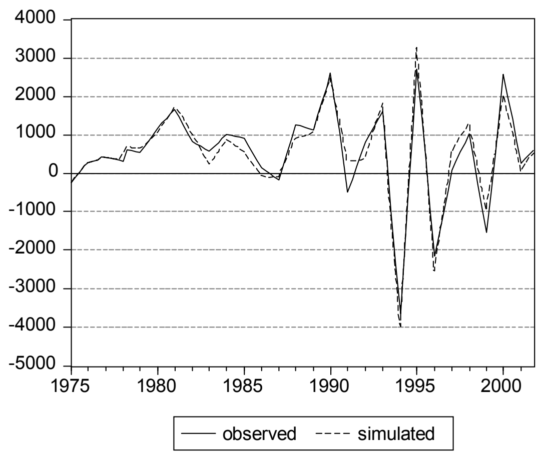
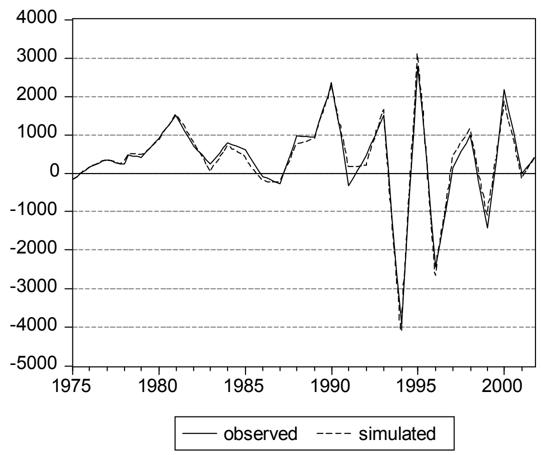
The simulation shows that these equations match observations with a degree of likelihood (see charts on following pages). Some simulation results are more volatile than the observed data. This was true for interest received by non-financial corporations and by government, and for interest received and paid by NPISHs.[42]

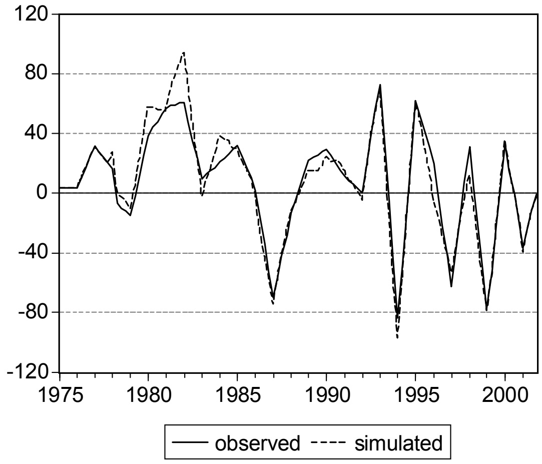
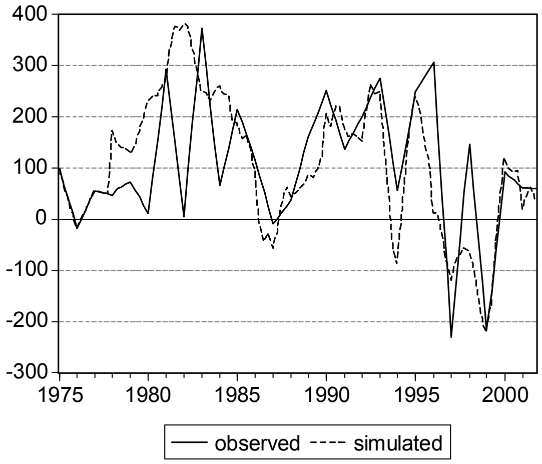
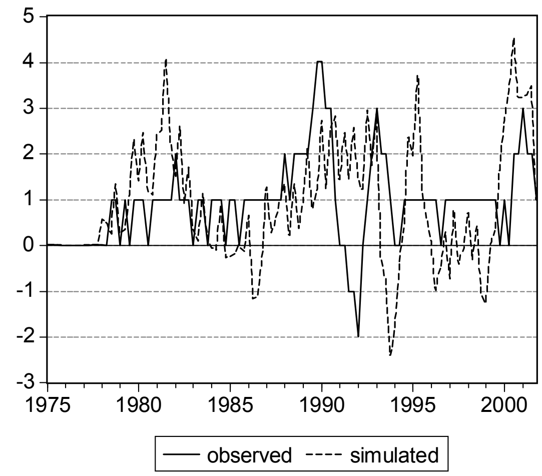
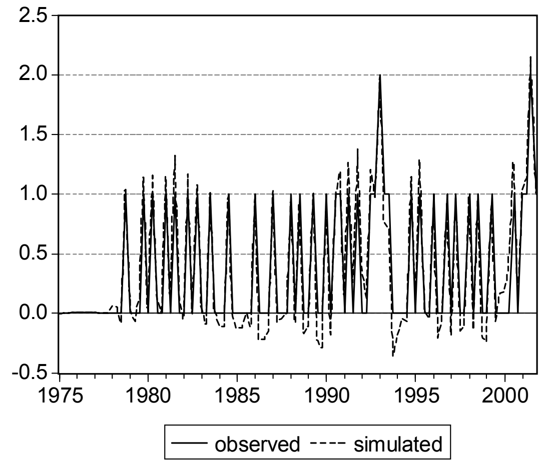
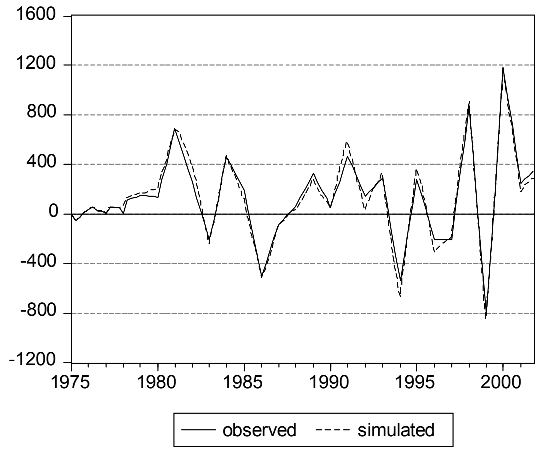
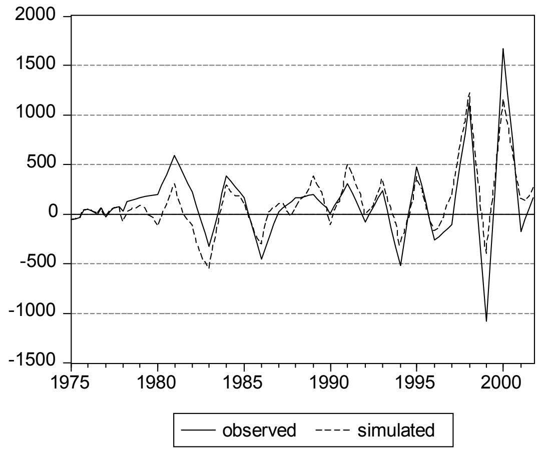
[41] Even though we use the same symbol in our notation, α represents the distribution coefficient for net interest received by resident agents used to derive the gross interest that these agents receive, but, when dealing with the rest of the world, α represents the distribution coefficient for all of the interest paid by residents, which is used to derive the interest received by the rest of the world.

[42] The amounts involved in this case are very small.

We see that the link to the rest of the world that completes the system enables us to match the observed data for this agent adequately.

Flows of interest received and paid: observed variations and dynamically simulated variations

Interest received (variations in EUR millions)	**Interest paid** (variations in EUR millions)
Households	
	
Non-financial corporations	
	
Financial corporations	
	

Interest received (variations in EUR millions)	Interest paid (variations in EUR millions)
Government	
	
NPISHs	
	
Rest of world	
	

1.8.2 Property income, other than interest payments

Under the accounting framework for the model, this type of income includes income distributed by companies, profits from foreign direct investment, property income allocated to insurance customers and income from land and mineral deposits. Therefore, this income is fairly heterogeneous and hard to model. Consequently, we have opted for a rough specification that is intended both to serve as a plausibility check for forecasts and to ensure consistency in the nominal sphere of the model.

We consider that three institutional sectors are net payers of such income: non-financial corporations, financial corporations and the rest of the world. In net terms, households and governments share all of this income.[43]

Our specification ensures the stability of the trend-adjusted proportion of income paid out of the gross operating surplus (out of aggregate exports, in the case of the rest of the world[44]), as a function of the spread between short-term and long-term interest rates.

REV:	property income, excluding interest (net interest paid)
EBE:	gross operating surplus for residents and exports for the rest of the world
pxX:	exports in nominal terms
TL:	long-term interest rate
TC:	short-term interest rate

43 NPISHs are considered to be exogenous.

44 Exports are used as dummy variable for economic activity in the rest of the world, which is the basis on which property income payments are made.

Estimation results: equations for property income, other than interest

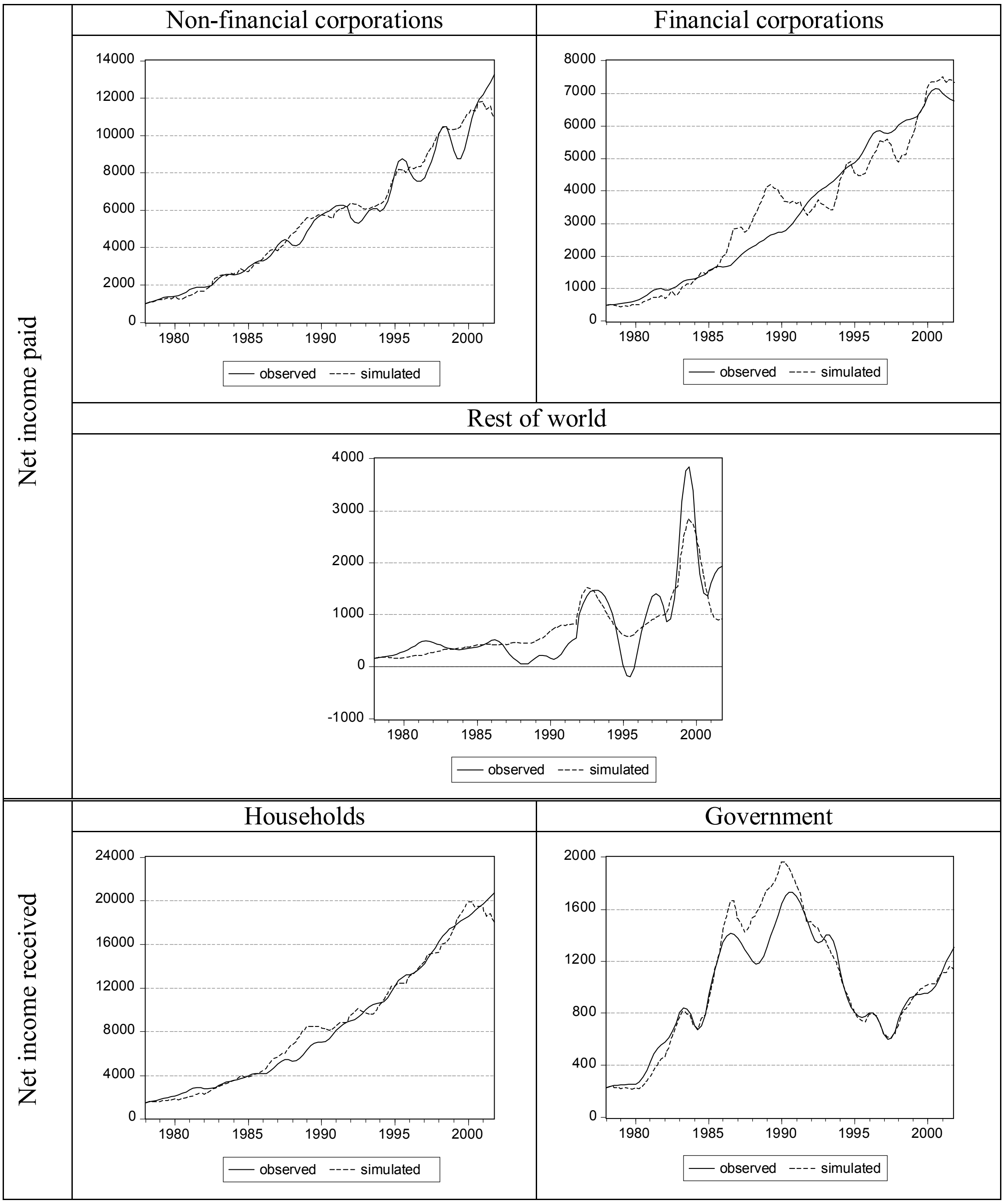
$$B(L)\Delta\frac{REV}{EBE} = b_0 + \rho\frac{REV_{-1}}{EBE_{-1}} + b_1(TL - TC) + b_2 t \qquad (1.8.12)$$

or

$$B(L)\Delta\frac{REV}{pxX} = b_0 + \rho\frac{REV_{-1}}{px_{-1}X_{-1}} + b_1(TL - TC) + b_2 t \qquad (1.8.13)$$

	Non-financial corporations		***Financial corporations***		***Rest of world***	
	1979q1 –2001q4		*1979q1 –2001q4*		*1979q1 –2001q4*	
	Coeff.	T-stat	Coeff.	T-stat	Coeff.	T-stat
ρ	-0.144	-2.76	-0.098	-3.61	-0.130	-7.53
b_1	0.100	1.96	0.585	1.83	-0.018	-1.60
$\Delta\frac{REV_{-1}}{EBE_{-1}}$ or $\Delta\frac{REV_{-1}}{px_{-1}X_{-1}}$	0.411	4.08	0.309	3.53	0.769	15.75
b_0	0.006	1.58	-0.010	-0.71	0.001	2.03
b_2	1.6E-04	3.17	0.001	2.96	8.5E-06	1.47
δ_{82q3}	0.024	3.89				
δ_{92q1}					0.006	4.28
δ_{98q2}			0.193	4.80	0.003	2.23
δ_{99q1}					0.008	5.09
DW	1.88		2.19		1.12	
R2	0.29		0.37		0.83	
SER	0.0061		0.0387		0.0014	

Observed and dynamically simulated net property income (excluding interest)
(EUR millions)



1.8.3 Other social and tax transfers

The purchasing power of some transfers is exogenous. Therefore, we consider them in a variant with full indexation on the corresponding deflators. Other transfers, especially through the tax system, have been modelled on the basis of exogenous apparent tax rates applied to the tax bases. However, unemployment benefits are specified in terms of purchasing power, based on the real mean cost per person applied to the number of unemployed people.

2 Part two : analytical simulations

The sole purpose of this part is to show how the model behaves by simulating exogenous shocks. These shocks are defined randomly and are not necessarily very realistic. Their sole purpose is to analyse the scale of the responses, the speed with which the various variables adjust and how different shocks are diffused. Therefore, these particular simulations cannot be used directly to analyse practical economic situations. They simply help isolate the main mechanisms at work in the dynamics of this model and help evaluate their relevance, all else being equal.[45]

More specifically, there is no impulse response function for the monetary and fiscal authorities. This means that nominal interest rates and tax rates are exogenous variables. Under these circumstances, the nominal anchor is defined by foreign prices, which are exogenous variables too. Furthermore, real interest rates in the model are defined on the basis of nominal rates, minus the various measurements of actual inflation, which are interpreted as being inflation expectations. These expectations can be dealt with in several different ways. In the simulations presented below, the expectations are considered to be exogenous and, therefore, they are not affected by the simulated shocks. Long-run inflation is determined by the growth of foreign prices and since none of the simulated shocks affects these growth rates in the long run, we make the extreme assumption that the agents are aware of this result and do not revise their inflation expectations when determining the real interest rate, despite the actual changes in the inflation rate that may occur in the short run.[46] Finally, the nominal exchange rate of the euro is also an exogenous variable.

We should also explain that the model is simulated with no consideration of any possible changes in other countries that could be caused by the shock under consideration, either when the shock affects other countries at the same time, as in the case of a change in oil prices, for example, or when the shock affects France, as the case of an increase in government expenditure, for example, and it effects are then felt in other countries, through increased French demand for their exports, for example.[47] We do not consider these important aspects of real economic activity in our analysis of the behaviour of the model.

All in all, because our model has a new-Keynesian structure we expect positive demand shocks to stimulate activity, in the short run at least. But we also expect prices to adjust after a while and play a stabilising role, following the initial shock.

In accordance with economic theory, the only impact on real activity should come from the structure of relative prices. In the framework used for these simulations, where the nominal anchor is defined by foreign prices, if the nominal magnitudes all increase by the same amount, say 10%, then the relative prices should not change and the real magnitudes should not be affected by the nominal increase in the long run. The first variant simulates the effect of a uniform 10% shock to all foreign prices, in order to test this property of the model.[48] Therefore, this variant analyses the stabilising mechanisms brought into play in the nominal sphere.

The second, oil price variant also represents a foreign price shock, but one that is concentrated on the price of a single import. The value of this variant lies in the fact that, unlike the previous variant, it leads to a permanent distortion of relative prices that prevents the economy from reverting to its

[45] For an example of using the model in practical economic situations, see Baghli, Brunhes-Lesage, De Bandt, Fraisse and Villetelle (2003).

[46] The opposite extreme assumption is to use actual inflation to measure inflation expectations. This is the same as saying that agents revise their inflation expectations whenever inflation varies from quarter to quarter. This solution leads to excessive instability of the real interest rates and has harmful consequences, especially for the response of capital formation to a price shock.

[47] This is also true for the transmission of all of these shocks to the other euro-area countries.

[48] Detailed results of all of the variants can be found in the tables in Appendix 8.

reference situation. More specifically, the equilibrium unemployment rate undergoes a permanent increase following the shock, because it depends on the structure of relative prices (domestic terms of trade).[49]

The third variant is similar to the second. It simulates a euro exchange rate shock. Because of the model structure, this is like a foreign price shock that is concentrated on the countries in the euro area.

All of the variants show how the price dynamics affects the macroeconomic balance of the model, under the assumptions used for these simulations (no impulse response function and a fixed nominal exchange rate). This means that when all prices change proportionately, the balance is not affected. When a distortion in relative prices occurs, the equilibrium unemployment rate changes and the previous equilibrium cannot be re-established.

The next two variants are demand variants. The first simulates a government sector demand shock. The second simulates a world demand shock affecting the demand for French exports from countries outside of the euro area. These two variants show both the effects of demand on activity and the role that prices play in stabilising mechanisms. More specifically, the inflationary pressures that arise following these positive demand shocks are adverse for exports and they cancel out some of the initial increase in demand.

The next variant simulates a wage shock. This variant provides a better understanding of how changes in wages influence nominal adjustment. A wage increase stimulates households' demand by increasing their income and it also generates inflationary pressures that are adverse for exports.

The next variants involve employers' social security contributions. The results depend critically on how wages are set. If wage earners consider employers' social security contributions as the source of financing for transfer income, they would agree to a cut in wages in exchange for an increase in social security contributions, which would change the shares of income from work and transfer income in their overall income. If, on the other hand, wage earners consider that employers' social security contributions are a deduction from their wages, they will not agree to a cut in wages. Finally, considering the deductions limited to contributions on low wages leads to analogous results, but on a smaller scale.

We then run another tax variant featuring an increase in the VAT rate. In addition to the distortion caused by the fact that foreign prices are exogenous, this variant also shows the distortion caused by a change in the VAT between the deflators that bear the tax (final demand prices) and the other deflators (value-added price and foreign trade price).

Unlike the previous variants, the following variants affect the structure of the economy directly. First of all, a trend productivity shock will by construction affect the real anchor for wage changes, which is exogenous in the model. In the preceding variants, deviations of the economy from this anchor give rise to a number of adjustments. In this variant, we change the value of this anchor and we analyse how the economy adjusts to the new value.

The next structural shock changes the labour force participation rate *ex ante* in order to analyse how this labour market shock affects the economy as a whole and the distribution of jobs and unemployment.

The last variant repeats a simulation run at the ESCB to analyse monetary policy transmission mechanisms (van Els *et alii*, 2001). It features a 100-basis-point increase in the short-term interest rate over a period of two years. The long-term interest rates vary according to the term structure of interest

[49] This simulation is a good illustration of the lack of practical applications for this exercise and it underlines its analytical role. In actual fact, higher oil prices would affect all oil-consuming countries, and not just France. Such a shock would also have an effect on our competitors' prices and their activity levels. Furthermore, if the oil-price increase leads to a substantial rise in the oil-producing countries' income, it would also affect the demand for industrialised countries' exports in return.

rates, and the exchange rate varies according to the uncovered interest rate parity hypothesis. However, interactions with the countries in the euro area or with the rest of the world are not taken into consideration.

2.1 Foreign prices simulation

The first variant simulates the response of the model to a permanent and simultaneous 10% increase in all foreign prices. The purpose of this variant is to analyse the consistency of the nominal sphere of the model with its real sphere. The nominal anchor is provided by foreign prices, since the model does not have an impulse response function and the nominal exchange rates are exogenous variables. Within this framework, if the nominal magnitudes are perfectly indexed, they should all increase by 10% eventually and, if there is no distortion of relative prices, the real magnitudes should revert to their reference values.

However, as is the case in most models, adjustment is relatively slow (*Economie et Prévision*, 1998). Only half of the expected adjustment has been achieved after five years. Ten years out, we observe an over-adjustment compared to the long-run effect, since all prices, except the import price, have increased by more than 10%, leading to a decrease in activity compared to the baseline trend. However, we did a projection that was long enough to verify that all the prices in the model and, more generally, all of the nominal magnitudes did increase by 10% farther out and that the real magnitudes, which deviate from the baseline trend in the short to medium run, then revert to the baseline trend. This means that the deviations remaining ten years after the shock are explained solely by adjustment lags.

The dynamics of the model in the presence of such a shock shows that, in the short run, the increase in foreign prices gives rise to competitiveness gains that make it possible to increase exports and decrease imports, thereby boosting domestic activity. In the medium run, this leads to job creation and a fall in the unemployment rate that leads to a tighter labour market and higher wages. These higher wages provide households with extra income, which stimulates their consumption. But, it also creates inflationary pressures, which compound the inflationary pressures caused by higher import prices. This cycle continues as long as there is a competitiveness deviation between the variant and the baseline trend or, in other words, until domestic prices have risen by 10%. In the long run, when unit labour costs and export prices have risen by 10%, the competitive advantage disappears and GDP returns to its initial level.

2.2 Oil price simulation

In the model, the oil price is both a final demand price and an input price, meaning a cost factor for businesses. The impact on demand prices reduces agents' wealth and incites them to reduce their aggregate demand.[50] In the business sector, for the same level of demand, the increase in production costs stemming from the higher oil price makes output less profitable and causes supply to shrink as well. A permanent 10% increase in the oil price leads to decreases in both demand and supply. The resulting impact causes stagflation, in which prices rise (with a 0.16% rise in the HICIP after one year and a 0.25% increase after five years) and activity declines by 0.1% after two years. It is noteworthy that most of the effects are felt quite rapidly. Nevertheless, the increase in import prices leads to a reduction in imports in real terms, which causes a slight improvement in the trade balance. All sectors are affected, with simultaneous declines in consumption and investment, and a decrease in the fiscal

[50] The reduction in wealth benefits the oil-exporting countries. Some of this wealth comes back in the form of increased demand for oil-consuming industrialised countries' exports of goods and services. This effect is not taken into consideration in this simulation.

balance stemming from the increase in expenditure on unemployment benefits. The oil price shock does not change the value-added price, all else being equal, since, in our model, the latter only changes as a function of labour costs and tightness on the market for goods. Value added equals the net output of inputs, which means that we assume that the increase in the energy input price is passed on in the output price in full. On the other hand, the energy price has a direct impact on the final demand price (consumption and investment), in proportion to the share of energy in final demand, and an indirect impact through the price mark-ups applied by foreign suppliers following the increase in domestic output prices. This means that demand prices increase more than value-added prices do. Businesses offset this price differential in wage formation by reducing the supply of employment, which causes the equilibrium unemployment rate to rise.

2.3 Exchange rate simulation

We simulated a 10% increase in the euro exchange rate. This variant is analogous to the oil price variant because it changes the price in euros of energy and other commodities, but it differs from the previous variant because it affects a wider range of goods and services. One of the effects of this variant is that the increase in the value of the euro compared to the dollar reduces the euro prices of oil and other non-energy commodities. This means that the shock has the opposite sign and is similar to the shock in the previous variant, but extended to non-energy commodities as well. In this respect, we can speak of a "counter-shock". But the rise in the value of the euro also reduces the euro prices of a large number of other goods and services where France faces stiff competition on export markets, which is not the case for oil and commodities. Given the weight of non-euro area countries in the model, the shock is equivalent to a 0.33% increase in the effective exchange rate of the euro, as calculated for France (see Appendix 4).[51] In this case, France suffers a loss of competitiveness with regard to countries outside of the euro area. This loss of competitiveness depresses activity, which increases unemployment and holds down wage growth. Wages that are lower than the baseline trend lead to disinflation, which gradually restores France's competitiveness. In the short to medium run, the positive effects of lower euro prices for commodities are offset by the loss of competitiveness and the ensuing decline in exports. In the long run, on the other hand, demand prices, which are directly influenced by import prices, fall further than value-added prices. For firms to maintain their equilibrium, nominal wages adjusted for productivity must fall in line with value-added prices, which means a smaller decline than the fall in consumption prices. This means that households make purchasing power gains and firms increase their demand for labour, which reduces the unemployment rate. All in all, despite the permanent reduction in the level of exports, activity settles at a higher level, with a lower equilibrium unemployment rate and lower prices. Ten years after the shock, the positive impact of the rise in the value of the euro can already be seen and it illustrates the adjustment lags of the model.

2.4 Public expenditure simulation

This is a fairly common variant used to reveal the multiplier effect. An increase in government demand, in the form of a permanent increase in government investment equal to 1 point of real GDP, increases the volume of activity through increased investment. It also increases consumption through the income generated by the new jobs created by the extra activity and creates pressures on wages resulting from the decline in unemployment. However, it also creates inflationary pressures that cause a loss of competitiveness and a decline in exports. This then reduces the impact of the multiplier. Furthermore, the extra demand leads to a surge in imports. All in all, the multiplier stands at around

[51] The countries considered are the United States, the United Kingdom, Japan and Switzerland. We assume that the prices of other countries follow the same pattern as in these four countries. We also implicitly assume that the currency used for invoicing foreign trade transactions, which may diverge from the geographical structure, is constant over time.

0.5 in the long run, which means that one euro in government expenditure purchasing power leads to a 0.5-euro change in real GDP. And, after ten years, the multiplier falls below this long-run value to around 0.1, as a result of the over-adjustment of prices observed in the analysis of the results from the first variant. In the long run, the crowding-out effect is not complete, because foreign prices and the nominal exchange rate are exogenous variables. This means that firms return to equilibrium before demand prices rise so much that the extra demand generated by government demand is completely met with imports.[52]

2.5 World demand simulation

This is another demand shock variant, but the shock comes from the rest of the world in this case. It features a 1% increase in real terms in the imports of countries outside the euro area, which corresponds to an increase of slightly less than 0.5% in the aggregate world demand for French exports.[53] The response is similar to the one seen in the previous variant, with an increase in activity and employment, a decline in unemployment and more inflationary pressure. But, unlike the public expenditure variant, the world demand variant improved the situation of the government sector. The government sector does not increase its expenditures to stimulate activity. On the contrary, its expenditures are reduced as unemployment declines and its revenues increase as the increase in activity boosts the tax base.

2.6 Wage simulation

This variant features an *ex ante* increase of 1% in the nominal per capita wage. It provides a better understanding of the changes in wages observed in the previous variants. A wage increase stimulates households' demand by increasing their income and it also generates inflationary pressures that are adverse for exports. Wage increases provide households with more disposable income, but most of the extra income is saved in the short run. When this effect is combined with rising prices, it causes a negative real balances effect that depresses consumption. All in all, consumption declines slightly over three quarters, but, after that, the decrease in the savings rate finally leads to the expected increase in consumption. This type of shock also distorts the wage-profit distribution in favour of wages, which reduces investment. This means that it has a negative effect on the other GDP counterparts. It increases investment prices and decreases profits. It also leads to a loss of competitiveness that reduces investment and exports and increases imports, which are substituted for domestic output. After ten years, the price-wage system limits the wage increases in real terms. The net effect simulated with the model is that of an overall decline in activity, despite a short-lived rise in consumption.

2.7 Employers' social security contributions simulation

This variant shows how important the specification for wage formation is. We simulate the effect of an increase in the employers' social security contributions rate that is calibrated to produce an *ex ante* increase of 1% in nominal per capita compensation, which is thus comparable with the wage variant above. In all of the configurations, wage bargaining focuses on compensation. In technical terms, this means that the equation used considers per capita compensation, which therefore includes wages and

[52] In order to achieve a total crowding-out effect, even in the absence of a fiscal impulse response function, we would have to impose wage indexation and the impact of labour force participation responses on value-added prices, and not on consumption prices. We would also have to redefine the users' real cost of capital.

[53] As in the previous variants, we do not consider the impact of the extra demand on the growth of other euro-area countries.

employers' social security contributions. The wage equation sums up wage bargaining comprehensively all on its own. Therefore, it can give rise to two interpretations, depending on the point of view taken. From the employees' point of view, employers' social security contributions are either seen as generating transfer income (in the equation with no social security wedge) or else they are seen as reducing wages through a deduction from the overall amount of compensation (in the equation with a social security wedge). In the first case, if the employers' social security contributions rate increases, employees will agree to a cut in wages equal to the increase in the employers' contributions, since the increased contribution rate merely represents a change in the division of aggregate compensation between direct wages and transfer income. In the second case, employees will resist the increase in employers' social security contributions and demand an increase in wages to offset it. This increases aggregate compensation and thereby increases the cost for businesses. From the employers' point of view, the first case results in a negotiated wage cut that offsets the cost of the higher contribution rate. In the second case, employers cannot negotiate a wage cut and they must bear the cost of a wage increase, which they then pass on in their prices.

Regardless of the employees' behaviour, the long-run equilibrium of the firm in our model depends on linking the real labour cost (wages and social security contributions, deflated by the value-added price) to labour productivity, which is an exogenous technical parameter. This condition is fulfilled by the value-added price equation. In other words, the real cost is not affected by the shock. The employers' social security contributions rate is one of the elements in compensation, which means that an increase in the rate automatically leads to a proportionate decrease in the real wage rate, in value-added price terms. In our model, most of the transfer incomes in real terms are exogenous, which means that there is a decrease in real income for households, which depresses activity and leads to a permanent decline in the employment level.

The long-run effects are different, depending on the form of the equilibrium unemployment rate. In an economy where the equilibrium unemployment rate is a structural constant, nominal compensation will be linked to the value-added price, and not to consumption prices, as is the case in our model. The distortion of the system of relative prices, resulting from the under-reaction of demand prices to the value-added price, would not affect the equilibrium unemployment rate in such an economy and the decline in employment would lead to a proportionate decline in unemployment.

On the other hand, if the terms of trade have an effect on the equilibrium unemployment rate, the distortion of relative prices would lead to a permanent rise in the equilibrium unemployment rate. Since the decline in consumption prices is smaller than the decrease in the value-added price, it is too small to bring about a nominal wage cut that maintains the real wage in value-added price terms. Thus the rise in the unemployment rate will be permanent, so that a new equilibrium is reached that is in line with the employers' equilibrium. The permanent rise in the unemployment rate, therefore, is not the result of the social security contributions per se; it stems from their impact on relative prices.

The inclusion of a social security wedge in the wage equation changes the direction of the adjustments. As in the previous case, a Phillips curve effect governs the adjustment of nominal compensation and pushes wages down, all else being equal. But the social security wedge creates a contrary pressure that pushes wages up. According to the estimation of the Phillips curve effect, the effect is too weak to prevail and thus, the result is a permanent rise in nominal compensation and prices. Therefore, the increase in the value-added price has to be higher than the increase in nominal compensation in order to achieve a real wage cut that ensures the employers' equilibrium. The under-reaction of consumption prices to the value-added price is too small to make this adjustment possible and this means that the unemployment rate must rise permanently. In this case, the permanent rise in the unemployment rate is the result of both the direct impact of social security contributions and the indirect impact of the distortion of relative prices.

In accounting terms, the increase in employers' social security contributions leads to an increase in the compensation paid to employees in the short run. This sets off the price-wage spiral and results in the ensuing loss of competitiveness with regard to foreign suppliers and exporters. In the wage equation with no social security wedge, this effect is only transitory because employees accept that the shock represents a promise of future transfer income and agree to reduce their wage claims. In the equation with the social security wedge, on the other hand, employees demand higher wages to offset the extra contributions, which they see as a deduction from their direct wages. These wage demands compound the effect in accounting terms and lead to further price rises.

2.8 VAT simulation

The apparent VAT rate on final consumption and investment is changed to achieve an *ex ante* 5% increase in VAT revenues, which represents about six billion euros in 2002, or approximately 0.4 GDP points.[54] Initially, the shock affects only the final consumption and investment prices on which the tax is levied. In our model, changes in the tax rate do not play any role in determining prices excluding taxes and we use an accounting procedure to make the transition from prices excluding taxes to prices including taxes. This means that the shock has no impact on producers' price mark-ups and the whole shock is immediately borne by the final users. Therefore, household and business sector demand for taxable products diminishes. This leads to a decline in activity that depresses employment. Wages, which are linked to prices, tend to rise in the short run, but the rise in unemployment has a larger impact in the medium to long run, which leads to lower wages and a lower value-added price compared to the baseline trend. However, the fall in prices excluding tax is too small to offset the increase in the VAT rate. Yet, it does produce permanent competitiveness gains compared to the exogenous foreign prices. The result is a new equilibrium with a lower level of activity. The rise in exports does not offset the fall in domestic demand. The new equilibrium features lower price levels compared to the reference situation, with lower prices excluding taxes, but higher prices when the VAT is included.

2.9 Productivity simulation

This variant features a permanent 1% increase in the trend labour productivity level. This means that the productivity growth rate is not affected, except at the date of the shock. The increase in the productivity level causes a transitory reduction in the unit labour cost. This makes a price cut possible and the cut is transmitted to the whole nominal sphere. The productivity trend is the anchor for the real wage growth path. This means that a 1% increase in the level of this trend eventually leads to a 1% increase in real wages measured in value-added price terms. In other words, nominal wages, corrected for the productivity trend, decrease in the same proportions as value-added prices do in the long run. However, demand prices are partially linked to foreign prices, which are exogenous in our model. With a fixed nominal exchange rate, the linkage of demand prices following the shock is limited to the link with the value-added price. This disrupts the homogeneity of the price system and leads to a fall in consumption prices that is smaller than the fall in value-added prices. Since nominal wages are linked to consumption prices and adjusted for labour productivity, they cannot match the decrease in the value-added price unless there is a rise in the equilibrium unemployment rate. In the long run, this means that the impact of the productivity shock makes it possible to attain a higher level of activity and a lower price level as a result of the decrease in the cost of labour. With fixed exchange rates and no change in foreign prices, there is a distortion of the price system compared to the reference situation, which leads to a rise in the equilibrium unemployment rate. As was the case in the employers' social security contributions variant with a wage equation with no social security wedge, the productivity shock does not have a direct impact on the equilibrium unemployment rate, but, when

[54] In the national accounts, final and intermediate uses are recorded at the purchase prices, meaning net of deductible VAT. Finla uses, including non-deductible VAT, correspond to virtually all final consumption and some capital formation (fixed capital formation and changes in inventories).

we run these variants, it does have an indirect impact because of the distortion of relative prices that it causes.[55]

Nevertheless, no increase in the unemployment rate shows up in the 10-year simulation period, which demonstrates the inertia of the model. The transitory effects have a lasting impact and the unemployment rate actually goes down. The reduction of unit wage costs leads to disinflation, competitiveness gains and increased purchasing power. The results are a rise in activity and employment at a lower price level than that of the baseline trend.

2.10 Labour force simulation

This variant features a permanent *ex ante* increase of 1% in the labour force compared to the reference situation. This shock is equivalent to an increase in the labour force participation rate, because the working-age population is an exogenous variable in our model. Labour market rigidities mean that the sudden increase in the labour force leads to a rise in unemployment in the short run. This leads to lower wages and prices compared to the baseline trend, which, in turn, produce competitiveness gains and increase purchasing power. The increase in activity gradually causes new jobs to be created, which are compatible with higher unemployment than under the baseline trend as a result of the *ex ante* increase in the labour force. Foreign prices and nominal exchange rates are exogenous, which means that the competitiveness gains achieved through changes in the behaviour of the labour supply are permanent gains, leading to permanent increases in economic activity and employment. In the long run, as was the case in the previous variant, the under-adjustment of demand prices, and especially consumption prices, to value-added prices leads to a permanent increase in the equilibrium unemployment rate. The distribution of the labour force between economically active and inactive individuals cannot be re-established in this case. Therefore, this variants leads to a level of economic activity and employment that is higher than under the baseline trend, with lower prices and wages, but a higher unemployment rate. The net effect is a deterioration of government finances.

2.11 Working-age population simulation

In this variant, the working-age population, which is an exogenous variable in our model, increases by 1% compared to the reference situation. Unlike the previous variant, the change here is not a change in behaviour, but a structural shock with no change in behaviour. Only part of increase passes into the labour force (Section 1.3), which leads to a fall in the participation rate in the short run. The mechanisms involved are very similar to the ones in the previous variant, with an increase in unemployment, lower wages and prices, competitiveness gains and increased purchasing power in the short run. After that, the increase in economic activity gradually causes new jobs to be created, but with an increase in the unemployment rate as a result of the rise in the equilibrium unemployment rate. However, there is one difference compared to the labour force variant: the shock in this case does not have a big enough impact on economic activity and leads to a decline of both the participation rate and the employment rate in the long run. Since the shock is a 1% increase in the working-age population, aggregate employment and the labour force would both have to increase by exactly 1% for the participation and employment rates to remain the same, and by more than 1% for them to rise. Yet the increase in aggregate employment compared to the reference situation is, in algebraic terms, the weighted mean of the deviations of government sector and private sector employment from their

[55] One of the determinants of the short-to-medium-run equilibrium unemployment rate is the difference between two productivity measurements: apparent labour productivity, used in the wage equation and trend productivity, used in the value-added price equation. But this difference is cancelled out in the long run as apparent productivity converges with its trend level. This means that the productivity level has no impact on the equilibrium unemployment rate.

respective reference situations, with the distribution of employment between the two sectors determining the weights. Government sector employment is an exogenous variable in this simulation. This means that it would take a fairly large increase in private sector employment to offset its 65% weighting with regard to aggregate employment. In this case, the increase is not large enough to do so, unlike the previous variant. The permanent increase in the level of economic activity made possible by lasting competitiveness gains is too small. Therefore, the rise in aggregate employment is less than 1% and consequently, so is the increase in the labour force. This leads to a decrease in the participation rate and in the employment rate.

2.12 Interest rate simulation

The last variant repeats a simulation run at the ESCB to analyse monetary policy transmission mechanisms (van Els *et alii*, 2001) and the analysis published in the Banque de France Bulletin (Baghli, Brunhes-Lesage, De Bandt, Fraisse and Villetelle 2003). It features a 100-basis-point increase in the short-term interest rate over two years. The responses of long-term interest rates and euro exchange rates to the shock depend on the term structure of interest rates and the uncovered interest rate parity hypothesis respectively.

This shock dampens economic activity by decreasing business investment, housing investment, stockbuilding and consumer credit. The income effect for households, as the flow of interest on their financial assets increases, is not big enough to boost consumption. Consequently, there is a decline in economic activity, a rise in unemployment and a fall in wages and prices.[56] Unlike the other variants, the shock is transitory in this case, as are all of its effects.

2.13 Some of the lessons to be learned from the simulations

These variants are primarily used to test the stability of the model. Occasional shocks do not have lasting impacts. The stabilisation mechanisms involving the nominal sphere show comprehensive indexation of the economy.

Whenever a shock has a heterogeneous and permanent impact, the price system, meaning relative prices, is distorted compared to the reference situation and the initial equilibrium cannot be re-established. More specifically, the unemployment rate has to change to offset the price differentials between value-added prices and consumption prices. With the exception of a homogenous shock to all foreign prices, the lack of a monetary or fiscal response, the exogeneity of nominal exchange rates and the exogeneity of variables concerning the rest of the world all explain the lasting deviations from the baseline trend.

Nominal rigidities are also present in the model, which make it a New-Keynesian Model. In addition, the response of prices and wages is limited to the short run only, and the full adjustments feature a phase of over-adjustment with regard to the long-run effects. Further developments for the model should focus on the adjustment dynamics of the long-run equations.

[56] The fall in prices would be limited if we used a price equation that incorporates the cost of capital formation, as well as wage costs (Section 1.1.6).

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4 Appendices

4.1 Appendix 1: Calculating elasticity of substitution

In order to determine the value of elasticity of substitution, we solved the firms' optimisation programme using a translog production function, which corresponds to the Taylor expansion of any production function that incorporates the assumptions of constant returns to scale and Harrod-neutral technological progress.

Solving the firm's optimisation programme:

$$\underset{P_i, Y_i, K_i, L_i}{Max} \quad P_i Y_i - WL_i - CkK_i$$

with the constraints: $Y_i = F_i(K_i, L_i)$ and $Y_i(P_i) = \frac{Y}{n}(P_i / P)^{-\eta}$

which means simultaneously estimating the system with constraints:

$$\begin{cases} g_{kt} = 0 \\ g_{ll} = -g_{kl} = g_{kk} \\ g_l + g_k = 1 \end{cases}$$

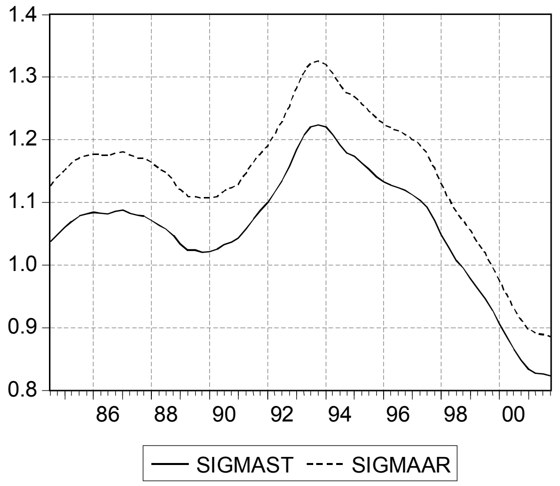
$$\begin{cases} \ln Y = g_0 + g_l \ln L + g_k \ln K + g_t t + \frac{g_{ll}}{2}(\ln L)^2 + \frac{g_{kk}}{2}(\ln K)^2 + g_{kl} \ln L \ln K + g_{lt} \ln Lt \\ + g_{kt} \ln Kt + \frac{g_{tt}}{2} t^2 \\ \frac{CK}{PY} = \frac{1}{\mu}\left(g_K + g_{KK} \ln K + g_{KL} \ln K\right) \\ \frac{WL}{PY} = \frac{1}{\mu}\left(g_L + g_{LL} \ln L + g_{LT} t + g_{KL} \ln K\right) \end{cases}$$

where $\mu = (1 - 1/\eta)^{-1}$ is the price mark-up rate

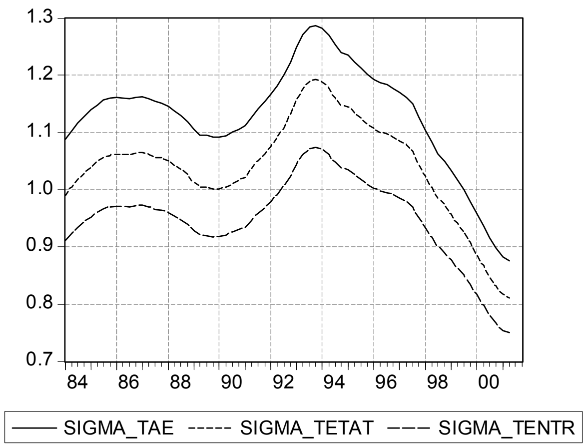
We use y_x and y_{xz} to denote the partial derivatives of the production function y with x, and with x then z. The elasticity of substitution between capital and labour is written:

$$\sigma = \frac{y_l y_k}{L \cdot K} \cdot \frac{\left(y_l L + y_k K\right)}{\left(y_{ll} y_k^2 - 2 y_{lk} y_l y_k + y_{kk} y_l^2\right)}$$

Sensitivity of the elasticity of substitution to investment price expectations



Sensitivity of the elasticity of substitution to the interest rate definition



Where:

Elasticity of substitution	Assumptions
Sigma_AAR	*adaptive expectations for investment prices and the 10-year bond yield*
Sigma_AST	*static expectations for investment prices and the 10-year bond yield*
Sigma_TETA	*benchmark 10-year bond yield and static expectations*
Sigma_TAE	*medium-to-long-term business loan rate from the Banque de France cost of borrowing survey and static expectations*
Sigma_TENT	*the mean of the two rates weighted by lenders' and borrowers' interest flows in the business sector and static expectations*

4.2 Appendix 2: Estimating a total-cost value-added price equation

A long-run target for the value-added price equation in the form of a factor price frontier establishes a direct link between the price and all of the factor costs:

$$p = (1-\beta)(w-e) + \beta c_k - \beta \ln(\beta) - (1-\beta)\ln(1-\beta) + \ln(\mu) - a$$

$$B(L)\Delta p = b_0 + B_1(L)\Delta csul + B_2(L)\Delta tuc + \rho \cdot \left(p_{-1} - (1-\beta)csul_{-1} - \beta ckl_{-1}\right)$$

Results of the estimation of the value added price equation (base 95)
Long-run target: factor price frontier

Δp	1979q1-1996q4		1979q1-2001q4	
	Coefficients	t-stat	Coefficients	t-stat
Δp_{-3}	0.2068	2.31	0.2158	2.79
Δcsul	0.3578	3.89	0.3421	4.58
$\Delta csul_{-1}$	0.3638	4.18	0.3629	5.00
Δtuc_{-4}	0.1417	2.09	0.1436	2.60
ρ	-0.0208	-1.97	-0.0191	-2.72
b_0	0.0228	2.09	0.0212	2.79
Ser	0.5%		0.4%	
DW	1.96		1.96	
R2	0.77		0.81	

4.3 Appendix 3: Defining the social security wedge

$$
\begin{aligned}
w &= \log(W) \\
&= \log\left(W^b (1 + tcse)\right) \\
&= \log\left(\frac{W^n (1 + tcse)}{(1 - tcss)(1 - tcsg)(1 - trds)}\right) \\
&= \log\left(W^n\right) + \log\left(\frac{(1 + tcse)}{(1 - tcss)(1 - tcsg)(1 - trds)}\right)
\end{aligned}
$$

where W, W^b and W^n are, respectively the nominal per capita gross/gross wage, the per capita wage in gross terms and the per capita wage in net terms (net of social security contributions and levies).

$$
\begin{aligned}
w &= w^n + \log\left(\frac{(1+tcse)}{(1-tcss)(1-tcsg)(1-trds)}\right) \\
&\approx w^n + tcse + tcss + tcsg + trds \\
&= w^n + cs
\end{aligned}
$$

because, when t_1 and t_2 are near zero, $\log(1+t_i) \approx t_i \; \forall \, i = 1,2$ and $(1+t_1)(1+t_2) \approx 1 + t_1 + \mathrm{t}_2$.

4.4 Appendix 4: Weightings for the foreign price indices for imports and exports

4.4.1 Foreign import prices

The volume M of imports from the rest of the world is decomposed according to the origin of the imports into:

$$M_{Fr} = \sum_{k \in RdM} X_{k,Fr}$$

where $X_{k,Fr}$ are the exports of country k to France (Fr)

Therefore, the price of these imports is:

$$P_M = \sum_{k \in RdM} \frac{X_{k,Fr}}{M_{Fr}} P_{k,Fr}$$

in other words, the weighted mean of the bilateral prices $P_{k,Fr}$ is the price of exports from k to France. The weightings are the suppliers' respective shares of the "French market", meaning each supplier's share of aggregate French imports.

The foreign price index for imports will be constructed as a weighted geometric mean using this formula. The weighting is that of a base year for a sub-set K of countries and prices, which are the prices of the aggregate exports of each country k, and not the bilateral price:

$$IndP_M = \prod_{k \in K} P_{X,k}{}^{\alpha_k}$$

$$\alpha_k = \left. \frac{X_{k,Fr}}{M_{Fr}} \right|_{t=0}$$

The price index differs from the actual import price in geographical coverage, the distortion of market shares compared to the base year for the index and the differences between each country's aggregate export prices and the prices that they specifically charge in the French market. If we ignore the differences due to geographical coverage and assume that market shares are constant, the index represents what import prices would be if our suppliers charged prices in the French market that are equal to their mean export prices.

4.4.2 Foreign export prices

Using an analogous calculation for exports to show the geographical structure of French exports would be inadequate. For example, such a single weighting for Italy would show only the share of aggregate French exports going to Italy. France also potentially encounters Italian competitors on all other export markets, such as Germany, Spain and the United Kingdom. In competitive terms, the weighting for

Italy must account for what these other markets represent in terms of France's aggregate exports, as well as Italy's share of these markets. In this case we are taking a "double weighting" approach.

For France, the weighting to be assigned to Italy with regard to exports will be:

$$\sum_{i \in RdM} \frac{X_{FR,i}}{X_{FR}} \frac{X_{It,i}}{M_i}$$

By restricting the geographical coverage to a set of countries K, we construct a foreign price index for French exports expressed as:

$$IndP_X = \prod_{k \in K} P_{X,k}^{\ \beta_k}$$

$$\beta_k = \sum_{i \in RdM} \frac{X_{FR,i}}{X_{FR}} \frac{X_{k,i}}{M_i}\bigg|_{t=0}$$

The indices used in the model cover nine countries and the weightings are as follows:

Weightings of foreign price indices for imports and exports

	%	For imports (single weighting)	For exports (double weighting)
Euro area	Germany	25.9	26.2
	Belgium	13.3	8.3
	Spain	10	3.5
	Italy	15.4	10.1
	Netherlands	8.1	12.7
	Euro area total	*72.7*	*60.8*
Outside euro area	United States	8	12.5
	Japan	3.3	11.2
	United Kingdom	12.5	10.6
	Switzerland	3.5	4.9
	Outside euro area	*27.3*	*39.2*

The effective exchange rate of the euro used in the model is derived from the weightings for the countries that are not part of the euro area.

4.5 Appendix 5: Equations for other countries' capacity utilisation rates

$$B(L)tuc = b_0 + B_2(L)\Delta y + b_1 t$$

	Germany		**Belgium**		**Spain**		**United States**		**Italy**		**Japan**		**Netherlands**		**United Kingdom**		**Switzerland**	
	1970q2-2003q1		1981q2-2003q1		1982q2-2003q1		1970q2-2003q1		1971q2-2003q1		1981q2-2003q1		1980q1-2003q1		1971q2-2003q1		1971q2-2002q4	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
tuc_{-1}	0.781	34.40	0.887	32.47	0.554	5.04	1.248	20.54	0.855	24.51	1.168	17.21					0.500	6.62
tuc_{-2}			-	-	0.212	2.05	-0.357	-3.30			-	-	0.911	30.01	0.842	24.58	0.434	5.15
tuc_{-3}			0.237	2.90			0.236	2.25			-0.534	-4.04					-0.184	-2.68
tuc_{-4}			-0.237	-			-0.206	-3.45			0.261	4.66						
Δy	0.762	8.98	0.649	4.91	0.375	1.37	1.120	12.24	1.064	7.36	0.569	2.81	0.210	2.28	0.780	6.02	1.444	7.47
Δy_{-1}	0.480	7.09	0.428	3.12	0.873	3.17					0.701	3.34	0.359	3.88	0.409	3.13		
Δy_{-2}	0.528	6.96			0.541	1.92									0.483	3.62		
Δy_{-3}	0.441	5.73															0.797	3.85
b_0	0.961	9.60	0.489	4.11	1.006	3.61	0.342	3.80	0.612	4.08	0.476	3.78	0.391	2.92	0.682	4.54	1.096	5.97
b_1									1.32×10^{-4}	3.71								
$Dum_{84T1-85T4}$							-0.008	-2.63										
Dum_{84T2}	-0.063	-6.67																
Dum_{91T1}	-0.108	-7.97																
$Dum_{91T2-91T4}$	-0.057	-6.50																
$Dum_{t<82T4}$	-0.012	-6.77																
Ser	0.92%		0.83%		1.72%		0.82%		1.30%		1.30%		0.79%		1.44%		1.48%	
DW	2.00		1.79		2.03		2.10		2.32		1.94		1.64		2.08		1.62	
R2	0.96		0.94		0.78		0.97		0.88		0.96		0.93		0.87		0.87	

4.6 Appendix 6: Weightings for world demand for French exports

	%
Germany	16.1
Austria	1.2
France	–
Belgium	8.6
Spain	8
Finland	0.5
Ireland	0.5
Italy	10.2
Netherlands	4.4
Portugal	1.4
Greece	0.8
Euro area	***51.7***
Denmark	0.9
United Kingdom	10
Sweden	1.4
EU outside euro area	***12.3***
European Union	*64*
United States	6.3
Canada	0.9
Japan	2.1
Other G 7 countries	***9.3***
Australia	0.6
New Zealand	0.1
Norway	0.5
Switzerland	4
Other industrialised countries	***5.2***
Latin America	2.2
Africa	5.2
Asia (excl. Japan)	7
Middle East	3.9
European countries in transition	3.3
Other countries	***21.6***
Total	**100**

4.7 Appendix 7: Overall economic table

Transactions and other flows

X	Exports
M	Imports
VA	Value added
SAL	Gross wages
CSE	Employers' and imputed social security contributions
REM	Compensation
TVA	VAT
IPR	Taxes on products
DTI	Customs duties
AIP	Taxes on labour and other taxes on output
SPI	Subsidies on products
SPRO	Other subsidies on output
EBE	Gross operating income
INT	Interest
RPRO	Other income from property
IRP	Direct taxes
CSS	Employees' social security contributions
CSN	Self-employed workers' social security contributions
PRS	Social benefits
TRC	Current transfers
RDB	Gross disposable income
COF	Final consumption
EPB	Gross savings
INV	Gross fixed capital formation
STO	Changes in stocks
TRK	Capital transfers
CAP	Net lending/borrowing

Institutional sectors

T	Corporations
SNF	*Non-financial corporations*
F	*Financial corporations*
I	*Own-account workers*
M	Households (inc. own-account workers)
N	Households (ex. own-account workers)
G	General government
H	Non-profit institutions serving households
U	Rest of the world
UF	Fictitious sector
R	Total

Goods and services account

Ent (T)	**SNF (S)**	**SF (F)**	**EI (I)**	**Mhei (M)**	**Men (N)**	**APU (G)**	**ISB (H)**	**RdM (U)**	**UF (UF)**	**Tot (R)**		**Ent (T)**	**SNF (S)**	**SF (F)**	**EI (I)**	**Mhei (M)**	**Men (N)**	**APU (G)**	**ISB (H)**	**RdM (U)**	**UF (UF)**	**Tot (R)**
								X			X											
											M									M		
											VA	VA				VA		VA	VA		AJ	VA
SAL				SAL		SAL	SAL	SAL			SAL											
CSE				CSE		CSE	CSE				CSE											
REM				REM		REM	REM				REM											
										TVA	TVA											
										IPR	IPR											
										DTI	DTI											
AIP				AIP		AIP	AIP				AIP											
										SPI	SPI											
SPRO				SPRO		SPRO					SPRO											
EBE	*EBE*	*EBE*	*EBE*	*EBE*	*EBE*	*EBE*					*EBE*											
											EBE	EBE	EBE	EBE	EBE	EBE	EBE	EBE				
											SAL						SAL			SAL		
					CSE			CSE			CSE		CSE	CSE			CSE	CSE		CSE		
											REM						REM					
											TVA							TVA		TVA		
											IPR							IPR		IPR		
											DTI							DTI		DTI		
											AIP							AIP				
											SPI							SPI		SPI		
											SPRO							SPRO		SPRO		
	INT	INT			INT	INT	INT	INT			INT		INT	INT			INT	INT	INT	INT		
											RPRO		RPRO	RPRO			RPRO	RPRO	RPRO	RPRO		
	IRP	IRP			IRP	IRP		IRP			IRP							IRP				
					CSS			CSS			CSS		CSS	CSS				CSS		CSS		
					CSN						CSN			CSN				CSN				
	PRS	PRS				PRS	PRS	PRS			PRS						PRS			PRS		
											TRC		TRC	TRC			TRC	TRC	TRC	TRC		
	RDB	*RDB*			*RDB*	*RDB*	*RDB*				*RDB*											
											RDB		RDB	RDB			RDB	RDB	RDB			
					COF	COF	COF			COF	COF											
	EPB	*EPB*			*EPB*	*EPB*	*EPB*				*EPB*											
											EPB		EPB	EPB			EPB	EPB	EPB			
INV	INV	INV		INV	INV	INV	INV			INV	INV											
	STO	STO			STO	STO				STO	STO											
	TRK	TRK			TRK	TRK	TRK	TRK			TRK											
	CAP	*CAP*			*CAP*	*CAP*	*CAP*	*CAP*			*CAP*											

4.8 Annex 8 : Analytical simulations results

Table 1. A permanent increase in foreign prices by 10%

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4	Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4
Prices	*Levels, percentage deviations from baseline*																									
HICP	0,74	1,73	2,75	3,87	5,10	10,36	0,31	0,61	0,90	1,14	1,37	1,60	1,85	2,10	2,35	2,61	2,87	3,16	3,43	3,73	4,02	4,31	4,63	4,95	5,26	5,58
Consumption Deflator	0,80	1,79	2,82	3,96	5,21	10,54	0,37	0,66	0,95	1,19	1,43	1,66	1,91	2,16	2,42	2,68	2,95	3,23	3,51	3,81	4,11	4,42	4,73	5,05	5,37	5,68
GDP Deflator	0,34	1,26	2,41	3,72	5,12	10,82	0,07	0,22	0,43	0,65	0,88	1,12	1,38	1,67	1,95	2,25	2,56	2,88	3,21	3,54	3,88	4,23	4,59	4,94	5,30	5,65
ULC	0,18	1,42	2,71	4,05	5,47	10,91	-0,26	-0,02	0,33	0,66	0,95	1,26	1,58	1,90	2,22	2,55	2,87	3,20	3,54	3,87	4,22	4,56	4,93	5,29	5,64	6,00
Compensation per employee	0,56	1,70	2,94	4,29	5,68	10,89	0,12	0,39	0,70	0,99	1,26	1,54	1,84	2,15	2,46	2,78	3,10	3,43	3,77	4,11	4,46	4,81	5,16	5,50	5,85	6,19
Productivity	0,37	0,27	0,23	0,23	0,20	-0,02	0,39	0,41	0,37	0,33	0,31	0,28	0,26	0,24	0,24	0,22	0,22	0,23	0,22	0,23	0,23	0,23	0,22	0,20	0,19	0,18
Export Deflator	2,38	3,53	4,55	5,63	6,77	11,11	1,88	2,22	2,56	2,87	3,15	3,42	3,67	3,91	4,17	4,42	4,67	4,94	5,20	5,48	5,77	6,05	6,34	6,63	6,91	7,19
Import Deflator	4,79	5,69	6,20	6,72	7,26	9,85	3,81	4,81	5,17	5,36	5,49	5,64	5,76	5,88	6,02	6,15	6,26	6,38	6,51	6,66	6,79	6,92	7,06	7,20	7,33	7,45
GDP and Components	*Levels, percentage deviations from baseline*																									
GDP	0,49	0,49	0,42	0,38	0,30	-0,21	0,42	0,50	0,52	0,51	0,51	0,50	0,48	0,45	0,44	0,42	0,40	0,40	0,39	0,38	0,37	0,36	0,34	0,31	0,28	0,25
Consumption	-0,17	-0,27	-0,31	-0,30	-0,29	-0,26	-0,10	-0,15	-0,20	-0,23	-0,25	-0,26	-0,28	-0,29	-0,30	-0,31	-0,31	-0,31	-0,31	-0,31	-0,30	-0,30	-0,29	-0,29	-0,29	-0,30
Investment	0,44	0,61	0,50	0,37	0,22	-0,46	0,30	0,41	0,49	0,57	0,63	0,63	0,61	0,58	0,55	0,51	0,48	0,46	0,42	0,39	0,36	0,33	0,29	0,25	0,20	0,15
Of which: Residential Inv.	0,15	0,40	0,44	0,39	0,27	-0,37	0,00	0,13	0,20	0,29	0,35	0,40	0,42	0,44	0,44	0,44	0,43	0,42	0,41	0,39	0,38	0,35	0,33	0,29	0,25	0,22
Gov. Consumption	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exports	1,67	1,69	1,64	1,45	1,21	0,06	1,62	1,67	1,69	1,69	1,70	1,68	1,68	1,69	1,65	1,66	1,64	1,60	1,57	1,49	1,43	1,35	1,29	1,23	1,18	1,14
Imports	-0,79	-1,08	-1,33	-1,23	-1,07	-0,24	-0,72	-0,78	-0,81	-0,84	-0,91	-1,03	-1,15	-1,24	-1,31	-1,34	-1,34	-1,32	-1,29	-1,25	-1,21	-1,16	-1,12	-1,09	-1,05	-1,02
Contributions to Shock	*Percentage of GDP, absolute deviations from baseline*																									
Domestic Demand	0,00	-0,03	-0,08	-0,10	-0,12	-0,24	0,01	0,00	-0,01	-0,01	-0,01	-0,02	-0,04	-0,05	-0,06	-0,08	-0,09	-0,09	-0,10	-0,10	-0,10	-0,10	-0,11	-0,12	-0,13	-0,14
Inventories	0,02	-0,03	-0,08	-0,08	-0,08	-0,05	0,44	0,47	0,49	0,49	0,52	0,54	0,55	0,56	0,58	0,58	0,58	0,58	0,56	0,56	0,55	0,54	0,52	0,51	0,49	0,47
Trade Balance	0,47	0,54	0,58	0,55	0,50	0,08	-0,03	0,03	0,04	0,03	0,01	-0,02	-0,04	-0,06	-0,07	-0,08	-0,09	-0,09	-0,08	-0,08	-0,08	-0,08	-0,08	-0,08	-0,08	-0,08
Labour Market	*Levels, percentage deviations from baseline, except unemployment: percentage points, absolute deviations from baseline*																									
Total employment	0,11	0,21	0,19	0,15	0,10	-0,19	0,03	0,09	0,14	0,18	0,20	0,21	0,22	0,21	0,21	0,20	0,19	0,17	0,16	0,15	0,14	0,13	0,12	0,11	0,09	0,08
Employees in employment	0,13	0,24	0,22	0,17	0,11	-0,20	0,04	0,10	0,17	0,20	0,23	0,24	0,25	0,24	0,23	0,22	0,21	0,20	0,18	0,17	0,16	0,15	0,13	0,12	0,10	0,08
Unemployment rate	-0,08	-0,18	-0,14	-0,09	-0,04	0,13	-0,01	-0,06	-0,10	-0,14	-0,17	-0,18	-0,18	-0,18	-0,17	-0,15	-0,14	-0,12	-0,11	-0,09	-0,08	-0,07	-0,06	-0,05	-0,04	-0,02
Household Accounts	*Levels, percentage deviations from baseline, except the savings rate: percentage points, absolute deviations from baseline*																									
Disposable income	0,09	0,12	0,18	0,28	0,30	0,06	0,09	0,09	0,09	0,10	0,11	0,11	0,12	0,13	0,15	0,17	0,19	0,23	0,25	0,28	0,29	0,30	0,30	0,30	0,30	0,30
Saving rate	0,23	0,33	0,42	0,49	0,50	0,28	0,16	0,21	0,25	0,29	0,31	0,32	0,34	0,36	0,38	0,40	0,43	0,47	0,47	0,50	0,50	0,50	0,50	0,50	0,50	0,50
Fiscal Ratios	*Percentage of GDP, absolute deviations from baseline*																									
Total Receipts	-0,09	-0,02	0,03	0,07	0,15	0,27	-0,08	-0,09	-0,09	-0,09	-0,05	-0,03	-0,01	0,00	0,02	0,03	0,04	0,04	0,05	0,06	0,08	0,10	0,12	0,14	0,16	0,18
Total Expenditure	-0,01	-0,01	0,00	0,00	0,01	0,10	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01	0,01	0,02
Budget surplus	-0,06	0,00	0,04	0,08	0,16	0,15	-0,05	-0,07	-0,07	-0,06	-0,02	-0,01	0,01	0,02	0,03	0,04	0,04	0,05	0,07	0,07	0,09	0,11	0,13	0,16	0,17	0,18
Government debt	0,06	0,06	0,03	-0,06	-0,22	-1,00																				
Financial Variables	*Percentage points, absolute deviations from baseline*																									
Short-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Demand	*Levels, percentage deviations from baseline*																									
World Demand	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices	*Levels, percentage deviations from baseline*																									
Effective Exchange Rate	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices (euro)	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00
Price of oil (euro)	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00

Table 2. A permanent increase in the crude oil price by 10%

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4	Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4
Prices	*Levels, percentage deviations from baseline*																									
HICP	0,16	0,22	0,24	0,25	0,25	0,28	0,10	0,16	0,19	0,20	0,21	0,22	0,22	0,23	0,23	0,24	0,24	0,24	0,25	0,25	0,25	0,25	0,25	0,25	0,25	0,25
Consumption Deflator	0,17	0,23	0,24	0,25	0,25	0,28	0,11	0,17	0,20	0,21	0,22	0,22	0,23	0,23	0,24	0,24	0,24	0,25	0,25	0,25	0,25	0,25	0,25	0,25	0,25	0,25
GDP Deflator	0,06	0,11	0,15	0,17	0,18	0,22	0,02	0,05	0,07	0,09	0,10	0,11	0,12	0,13	0,14	0,14	0,15	0,16	0,16	0,17	0,17	0,18	0,18	0,18	0,19	0,19
ULC	0,13	0,21	0,22	0,22	0,22	0,23	0,05	0,12	0,16	0,18	0,19	0,20	0,21	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22	0,22
Compensation per employee	0,10	0,17	0,19	0,20	0,20	0,22	0,04	0,09	0,13	0,14	0,15	0,16	0,17	0,18	0,18	0,19	0,19	0,19	0,20	0,20	0,20	0,20	0,20	0,20	0,20	0,20
Productivity	-0,03	-0,04	-0,03	-0,02	-0,02	-0,01	-0,01	-0,03	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,03	-0,03	-0,03	-0,03	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,01
Export Deflator	0,04	0,10	0,12	0,13	0,14	0,16	0,01	0,03	0,05	0,07	0,09	0,10	0,10	0,11	0,12	0,12	0,13	0,13	0,13	0,13	0,13	0,14	0,14	0,14	0,14	0,14
Import Deflator	0,67	0,73	0,75	0,68	0,61	0,82	0,52	0,65	0,73	0,77	0,71	0,75	0,73	0,73	0,76	0,77	0,76	0,70	0,70	0,70	0,68	0,62	0,62	0,62	0,61	0,59
GDP and Components	*Levels, percentage deviations from baseline*																									
GDP	-0,03	-0,07	-0,07	-0,07	-0,07	-0,07	-0,01	-0,03	-0,04	-0,05	-0,06	-0,07	-0,07	-0,07	-0,07	-0,07	-0,07	-0,07	-0,07	-0,07	-0,07	-0,07	-0,07	-0,07	-0,07	-0,07
Consumption	-0,07	-0,11	-0,12	-0,11	-0,10	-0,09	-0,04	-0,07	-0,09	-0,10	-0,10	-0,11	-0,11	-0,12	-0,12	-0,12	-0,12	-0,12	-0,11	-0,11	-0,11	-0,11	-0,11	-0,10	-0,10	-0,10
Investment	-0,04	-0,10	-0,12	-0,11	-0,10	-0,07	-0,01	-0,03	-0,05	-0,06	-0,08	-0,09	-0,10	-0,11	-0,11	-0,12	-0,12	-0,12	-0,12	-0,11	-0,11	-0,11	-0,10	-0,10	-0,10	-0,09
Of which: Residential Inv.	-0,05	-0,12	-0,13	-0,12	-0,10	-0,05	0,00	-0,04	-0,06	-0,09	-0,10	-0,12	-0,12	-0,13	-0,13	-0,13	-0,13	-0,13	-0,12	-0,12	-0,11	-0,11	-0,10	-0,10	-0,10	-0,09
Gov. Consumption	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exports	-0,01	-0,03	-0,04	-0,04	-0,05	-0,05	0,00	-0,01	-0,01	-0,02	-0,02	-0,03	-0,03	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,05	-0,05	-0,05
Imports	-0,13	-0,19	-0,14	-0,10	-0,07	-0,04	-0,06	-0,12	-0,17	-0,19	-0,19	-0,19	-0,18	-0,17	-0,16	-0,15	-0,14	-0,12	-0,11	-0,10	-0,09	-0,08	-0,08	-0,07	-0,07	-0,06
Contributions to Shock	*Percentage of GDP, absolute deviations from baseline*																									
Domestic Demand	-0,05	-0,08	-0,09	-0,08	-0,08	-0,06	-0,02	-0,05	-0,06	-0,07	-0,07	-0,08	-0,08	-0,09	-0,09	-0,09	-0,09	-0,09	-0,09	-0,08	-0,08	-0,08	-0,08	-0,08	-0,07	-0,07
Inventories	-0,01	-0,02	-0,01	0,00	0,00	0,00	0,01	0,02	0,03	0,03	0,03	0,03	0,03	0,03	0,02	0,02	0,02	0,02	0,01	0,01	0,01	0,01	0,01	0,00	0,00	0,00
Trade Balance	0,02	0,03	0,02	0,01	0,00	-0,01	0,00	-0,01	-0,02	-0,02	-0,02	-0,02	-0,01	-0,01	-0,01	-0,01	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Labour Market	*Levels, percentage deviations from baseline, except unemployment: percentage points, absolute deviations from baseline*																									
Total employment	-0,01	-0,03	-0,04	-0,05	-0,05	-0,06	0,00	0,00	-0,01	-0,01	-0,02	-0,02	-0,03	-0,03	-0,04	-0,04	-0,04	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05
Employees in employment	-0,01	-0,03	-0,05	-0,06	-0,06	-0,06	0,00	0,00	-0,01	-0,02	-0,02	-0,03	-0,03	-0,04	-0,04	-0,05	-0,05	-0,05	-0,05	-0,06	-0,06	-0,06	-0,06	-0,06	-0,06	-0,06
Unemployment rate	0,00	0,01	0,02	0,02	0,02	0,02	0,00	0,00	0,00	0,00	0,01	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
Household Accounts	*Levels, percentage deviations from baseline, except the savings rate: percentage points, absolute deviations from baseline*																									
Disposable income	-0,09	-0,11	-0,11	-0,10	-0,09	-0,09	-0,07	-0,10	-0,10	-0,11	-0,11	-0,11	-0,11	-0,11	-0,11	-0,11	-0,10	-0,10	-0,10	-0,10	-0,10	-0,10	-0,09	-0,09	-0,09	-0,09
Saving rate	-0,02	0,00	0,01	0,01	0,01	0,00	-0,03	-0,02	-0,01	-0,01	0,00	0,00	0,00	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
Fiscal Ratios	*Percentage of GDP, absolute deviations from baseline*																									
Total Receipts	-0,02	-0,02	-0,03	-0,03	-0,03	-0,03	-0,01	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03
Total Expenditure	0,04	0,05	0,05	0,05	0,04	0,03	0,02	0,04	0,04	0,04	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,04	0,04	0,04	0,04
Budget surplus	-0,06	-0,08	-0,09	-0,09	-0,08	-0,07	-0,04	-0,06	-0,07	-0,08	-0,08	-0,08	-0,09	-0,09	-0,09	-0,09	-0,09	-0,09	-0,09	-0,09	-0,09	-0,08	-0,08	-0,08	-0,08	-0,08
Government debt	0,06	0,15	0,24	0,32	0,40	0,75																				
Financial Variables	*Percentage points, absolute deviations from baseline*																									
Short-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Demand	*Levels, percentage deviations from baseline*																									
World Demand	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices	*Levels, percentage deviations from baseline*																									
Effective Exchange Rate	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Price of oil (euro)	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00	10,00

Table 3. A permanent increase in the euro exchange rate against all non-euro currencies by 10%

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4	Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4
Prices	*Levels, percentage deviations from baseline*																									
HICP	-0,35	-0,70	-1,00	-1,33	-1,68	-3,16	-0,17	-0,31	-0,42	-0,51	-0,58	-0,66	-0,73	-0,81	-0,88	-0,96	-1,04	-1,13	-1,20	-1,29	-1,37	-1,46	-1,55	-1,64	-1,72	-1,81
Consumption Deflator	-0,38	-0,72	-1,03	-1,36	-1,71	-3,22	-0,20	-0,34	-0,44	-0,53	-0,60	-0,68	-0,75	-0,83	-0,91	-0,98	-1,06	-1,15	-1,23	-1,31	-1,40	-1,49	-1,58	-1,67	-1,76	-1,84
GDP Deflator	-0,15	-0,46	-0,81	-1,20	-1,60	-3,21	-0,04	-0,11	-0,19	-0,27	-0,34	-0,42	-0,50	-0,59	-0,67	-0,76	-0,85	-0,95	-1,05	-1,14	-1,24	-1,34	-1,45	-1,55	-1,65	-1,75
ULC	-0,16	-0,60	-0,97	-1,34	-1,73	-3,26	0,05	-0,10	-0,24	-0,36	-0,46	-0,55	-0,65	-0,74	-0,83	-0,92	-1,01	-1,10	-1,20	-1,29	-1,39	-1,49	-1,59	-1,69	-1,78	-1,88
Compensation per employee	-0,25	-0,63	-1,00	-1,38	-1,77	-3,24	-0,07	-0,19	-0,31	-0,41	-0,50	-0,58	-0,67	-0,77	-0,86	-0,95	-1,04	-1,14	-1,24	-1,33	-1,43	-1,53	-1,63	-1,72	-1,82	-1,91
Productivity	-0,08	-0,03	-0,03	-0,04	-0,04	0,02	-0,11	-0,10	-0,07	-0,05	-0,04	-0,03	-0,03	-0,02	-0,03	-0,03	-0,03	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,03
Export Deflator	-1,36	-2,00	-2,28	-2,57	-2,88	-4,06	-0,97	-1,26	-1,51	-1,71	-1,85	-1,97	-2,05	-2,12	-2,19	-2,25	-2,31	-2,38	-2,45	-2,53	-2,61	-2,69	-2,77	-2,84	-2,92	-2,99
Import Deflator	-1,93	-2,35	-2,58	-2,70	-2,81	-3,66	-1,51	-1,90	-2,09	-2,21	-2,24	-2,33	-2,38	-2,45	-2,53	-2,58	-2,61	-2,61	-2,66	-2,70	-2,73	-2,73	-2,77	-2,81	-2,83	-2,85
GDP and Components	*Levels, percentage deviations from baseline*																									
GDP	-0,11	-0,06	-0,04	-0,03	-0,01	0,14	-0,12	-0,12	-0,11	-0,09	-0,08	-0,07	-0,06	-0,05	-0,05	-0,04	-0,04	-0,04	-0,04	-0,03	-0,03	-0,03	-0,02	-0,01	0,00	0,00
Consumption	0,11	0,18	0,21	0,20	0,20	0,18	0,06	0,10	0,13	0,15	0,17	0,18	0,19	0,20	0,20	0,21	0,21	0,21	0,21	0,20	0,20	0,20	0,20	0,20	0,20	0,20
Investment	-0,10	-0,07	-0,02	0,00	0,04	0,22	-0,09	-0,10	-0,10	-0,10	-0,10	-0,08	-0,06	-0,05	-0,04	-0,03	-0,02	-0,01	-0,01	0,00	0,00	0,01	0,02	0,03	0,04	0,06
Of which: Residential Inv.	-0,01	-0,02	-0,02	-0,02	0,00	0,14	0,00	-0,01	-0,01	-0,01	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,03	-0,03	-0,03	-0,03	-0,02	-0,02	-0,01	0,00	0,01
Gov. Consumption	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exports	-0,64	-0,62	-0,63	-0,59	-0,52	-0,21	-0,66	-0,65	-0,63	-0,62	-0,62	-0,61	-0,62	-0,63	-0,62	-0,63	-0,63	-0,63	-0,62	-0,60	-0,58	-0,56	-0,54	-0,53	-0,52	-0,51
Imports	0,15	0,24	0,29	0,22	0,16	-0,15	0,16	0,15	0,14	0,15	0,18	0,23	0,26	0,29	0,30	0,30	0,29	0,27	0,25	0,23	0,21	0,19	0,17	0,16	0,15	0,14
Contributions to Shock	*Percentage of GDP, absolute deviations from baseline*																									
Domestic Demand	0,04	0,09	0,11	0,11	0,12	0,14	0,01	0,04	0,05	0,06	0,07	0,08	0,09	0,10	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,12	0,12	0,12	0,12
Inventories	0,00	0,02	0,03	0,02	0,02	0,02	-0,15	-0,15	-0,15	-0,15	-0,16	-0,17	-0,17	-0,18	-0,18	-0,18	-0,18	-0,18	-0,17	-0,17	-0,17	-0,16	-0,16	-0,15	-0,15	-0,14
Trade Balance	-0,15	-0,17	-0,18	-0,17	-0,15	-0,02	0,02	-0,01	-0,01	0,00	0,01	0,02	0,02	0,03	0,03	0,03	0,03	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
Labour Market	*Levels, percentage deviations from baseline, except unemployment: percentage points, absolute deviations from baseline*																									
Total employment	-0,03	-0,03	-0,01	0,01	0,03	0,12	-0,01	-0,03	-0,04	-0,04	-0,04	-0,04	-0,03	-0,03	-0,02	-0,01	-0,01	0,00	0,00	0,01	0,01	0,02	0,02	0,03	0,03	0,04
Employees in employment	-0,03	-0,04	-0,01	0,01	0,03	0,13	-0,01	-0,03	-0,04	-0,05	-0,04	-0,04	-0,04	-0,03	-0,02	-0,01	-0,01	0,00	0,00	0,01	0,01	0,02	0,02	0,03	0,04	0,04
Unemployment rate	0,02	0,04	0,02	0,00	-0,01	-0,06	0,00	0,02	0,03	0,04	0,04	0,04	0,04	0,03	0,03	0,02	0,02	0,01	0,01	0,01	0,00	0,00	0,00	-0,01	-0,01	-0,02
Household Accounts	*Levels, percentage deviations from baseline, except the savings rate: percentage points, absolute deviations from baseline*																									
Disposable income	0,05	0,08	0,06	0,03	0,03	0,08	0,02	0,05	0,06	0,07	0,08	0,08	0,08	0,08	0,07	0,06	0,05	0,04	0,04	0,03	0,03	0,03	0,03	0,03	0,03	0,03
Saving rate	-0,05	-0,09	-0,13	-0,15	-0,15	-0,09	-0,03	-0,04	-0,06	-0,07	-0,08	-0,08	-0,09	-0,11	-0,11	-0,12	-0,13	-0,14	-0,15	-0,15	-0,15	-0,15	-0,15	-0,15	-0,15	-0,15
Fiscal Ratios	*Percentage of GDP, absolute deviations from baseline*																									
Total Receipts	0,04	0,03	0,02	0,01	-0,01	-0,06	0,04	0,04	0,04	0,04	0,03	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,01	0,01	0,00	0,00	-0,01	-0,02	-0,02
Total Expenditure	-0,03	-0,05	-0,05	-0,05	-0,05	-0,06	-0,01	-0,03	-0,03	-0,04	-0,04	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05	-0,05
Budget surplus	0,07	0,08	0,08	0,06	0,04	0,02	0,05	0,07	0,08	0,09	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,07	0,07	0,06	0,05	0,05	0,04	0,03	0,03
Government debt	-0,07	-0,15	-0,23	-0,30	-0,33	-0,45																				
Financial Variables	*Percentage points, absolute deviations from baseline*																									
Short-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Demand	*Levels, percentage deviations from baseline*																									
World Demand	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices	*Levels, percentage deviations from baseline*																									
Effective Exchange Rate	3,54	3,56	3,58	3,58	3,59	3,59	3,53	3,54	3,55	3,55	3,55	3,56	3,56	3,56	3,58	3,58	3,59	3,59	3,58	3,59	3,58	3,58	3,59	3,59	3,58	3,58
Foreign Prices (euro)	-3,42	-3,43	-3,45	-3,45	-3,45	-3,45	-3,41	-3,42	-3,43	-3,43	-3,43	-3,43	-3,43	-3,44	-3,45	-3,45	-3,46	-3,46	-3,45	-3,46	-3,45	-3,45	-3,46	-3,46	-3,45	-3,45
Price of oil (euro)	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00	-10,00

Table 4. A permanent increase in real public investment by 1% of real GDP

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4	Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4
Prices	*Levels, percentage deviations from baseline*																									
HICP	0,09	0,63	1,43	2,39	3,40	6,40	0,00	0,03	0,11	0,23	0,38	0,53	0,71	0,89	1,10	1,31	1,53	1,77	2,01	2,26	2,52	2,76	3,02	3,27	3,52	3,77
Consumption Deflator	0,10	0,66	1,48	2,46	3,48	6,50	0,00	0,03	0,12	0,25	0,40	0,57	0,74	0,93	1,14	1,36	1,59	1,83	2,07	2,33	2,58	2,84	3,10	3,35	3,60	3,85
GDP Deflator	0,16	0,89	1,86	2,98	4,11	7,16	0,01	0,06	0,19	0,36	0,56	0,77	0,99	1,22	1,47	1,72	1,99	2,27	2,55	2,84	3,12	3,41	3,70	3,97	4,25	4,52
ULC	-0,52	0,39	1,57	2,85	4,06	7,06	-0,63	-0,65	-0,50	-0,29	-0,03	0,26	0,53	0,80	1,11	1,40	1,72	2,04	2,36	2,69	3,01	3,33	3,63	3,93	4,21	4,48
Compensation per employee	0,20	1,03	2,10	3,28	4,40	7,00	0,00	0,09	0,25	0,45	0,67	0,90	1,14	1,40	1,67	1,95	2,24	2,54	2,83	3,13	3,43	3,72	4,00	4,27	4,54	4,79
Productivity	0,72	0,63	0,52	0,42	0,32	-0,06	0,63	0,74	0,75	0,74	0,69	0,64	0,61	0,59	0,55	0,54	0,52	0,48	0,46	0,43	0,41	0,37	0,35	0,33	0,31	0,30
Export Deflator	0,06	0,55	1,33	2,23	3,12	5,33	0,00	0,02	0,07	0,17	0,30	0,45	0,63	0,81	1,01	1,22	1,44	1,66	1,89	2,11	2,34	2,57	2,80	3,02	3,23	3,44
Import Deflator	0,03	0,11	0,33	0,68	1,09	2,57	0,01	0,03	0,03	0,04	0,06	0,08	0,12	0,17	0,22	0,29	0,37	0,45	0,54	0,63	0,72	0,83	0,93	1,03	1,15	1,27
GDP and Components	*Levels, percentage deviations from baseline*																									
GDP	0,90	1,05	0,99	0,88	0,74	0,07	0,67	0,88	0,98	1,05	1,06	1,05	1,05	1,04	1,02	1,01	0,99	0,95	0,93	0,90	0,86	0,82	0,78	0,75	0,72	0,69
Consumption	0,16	0,40	0,48	0,51	0,50	0,31	0,03	0,13	0,20	0,28	0,34	0,38	0,42	0,44	0,46	0,48	0,49	0,50	0,51	0,51	0,51	0,51	0,51	0,50	0,50	0,50
Investment	5,58	6,18	6,43	6,22	5,93	4,62	5,24	5,48	5,67	5,93	6,04	6,15	6,24	6,29	6,33	6,46	6,49	6,46	6,38	6,26	6,15	6,09	5,99	5,97	5,93	5,83
Of which: Residential Inv.	0,21	0,52	0,54	0,45	0,31	-0,41	0,00	0,18	0,27	0,39	0,47	0,52	0,54	0,55	0,56	0,55	0,54	0,52	0,50	0,47	0,44	0,40	0,36	0,33	0,29	0,25
Gov. Consumption	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exports	-0,01	-0,12	-0,31	-0,54	-0,78	-1,61	0,00	0,00	-0,02	-0,04	-0,07	-0,10	-0,14	-0,19	-0,23	-0,29	-0,34	-0,40	-0,46	-0,51	-0,57	-0,63	-0,69	-0,75	-0,81	-0,87
Imports	2,48	2,56	2,02	1,89	1,89	2,02	1,36	2,51	2,97	3,06	2,93	2,62	2,41	2,25	2,13	2,04	1,98	1,94	1,91	1,90	1,89	1,87	1,87	1,88	1,89	1,92
Contributions to Shock	*Percentage of GDP, absolute deviations from baseline*																									
Domestic Demand	1,24	1,45	1,48	1,45	1,39	1,12	1,10	1,20	1,28	1,36	1,42	1,45	1,47	1,48	1,48	1,48	1,48	1,48	1,47	1,46	1,45	1,43	1,41	1,40	1,38	1,37
Inventories	0,14	0,11	-0,05	-0,08	-0,08	-0,03	-0,26	-0,48	-0,58	-0,59	-0,59	-0,53	-0,49	-0,46	-0,45	-0,43	-0,43	-0,45	-0,46	-0,48	-0,50	-0,53	-0,54	-0,56	-0,58	-0,60
Trade Balance	-0,48	-0,52	-0,44	-0,49	-0,57	-1,02	-0,17	0,16	0,28	0,28	0,23	0,13	0,07	0,02	-0,01	-0,04	-0,06	-0,07	-0,08	-0,08	-0,08	-0,08	-0,09	-0,09	-0,08	-0,08
Labour Market	*Levels, percentage deviations from baseline, except unemployment: percentage points, absolute deviations from baseline*																									
Total employment	0,18	0,41	0,47	0,46	0,41	0,13	0,04	0,13	0,23	0,30	0,36	0,40	0,43	0,45	0,46	0,47	0,47	0,47	0,47	0,46	0,45	0,44	0,43	0,42	0,40	0,39
Employees in employment	0,20	0,47	0,53	0,52	0,46	0,14	0,05	0,15	0,26	0,34	0,41	0,46	0,49	0,51	0,53	0,53	0,54	0,53	0,53	0,52	0,51	0,50	0,48	0,47	0,45	0,44
Unemployment rate	-0,11	-0,28	-0,26	-0,20	-0,14	0,03	-0,02	-0,08	-0,14	-0,20	-0,25	-0,28	-0,29	-0,29	-0,28	-0,27	-0,26	-0,24	-0,23	-0,21	-0,20	-0,18	-0,16	-0,15	-0,13	-0,12
Household Accounts	*Levels, percentage deviations from baseline, except the savings rate: percentage points, absolute deviations from baseline*																									
Disposable income	0,63	0,87	0,96	1,00	0,98	0,34	0,42	0,58	0,70	0,81	0,83	0,86	0,88	0,91	0,93	0,95	0,97	0,99	1,00	1,01	1,01	1,00	1,00	0,98	0,97	0,96
Saving rate	0,40	0,40	0,40	0,41	0,39	0,02	0,33	0,39	0,42	0,45	0,41	0,40	0,39	0,39	0,39	0,39	0,40	0,41	0,42	0,42	0,42	0,40	0,40	0,40	0,39	0,38
Fiscal Ratios	*Percentage of GDP, absolute deviations from baseline*																									
Total Receipts	0,01	0,14	0,23	0,27	0,32	0,33	-0,01	0,00	0,02	0,03	0,10	0,13	0,16	0,18	0,20	0,22	0,24	0,24	0,25	0,26	0,27	0,28	0,30	0,32	0,33	0,34
Total Expenditure	-0,20	-0,25	-0,25	-0,22	-0,18	-0,02	-0,15	-0,20	-0,22	-0,24	-0,24	-0,24	-0,25	-0,25	-0,25	-0,25	-0,25	-0,24	-0,24	-0,22	-0,21	-0,20	-0,19	-0,19	-0,18	-0,17
Budget surplus	-0,80	-0,60	-0,51	-0,49	-0,46	-0,65	-0,88	-0,82	-0,78	-0,74	-0,66	-0,62	-0,58	-0,55	-0,53	-0,52	-0,50	-0,51	-0,49	-0,50	-0,49	-0,49	-0,48	-0,47	-0,45	-0,45
Government debt	0,80	1,41	1,92	2,41	2,87	5,73																				
Financial Variables	*Percentage points, absolute deviations from baseline*																									
Short-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Demand	*Levels, percentage deviations from baseline*																									
World Demand	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices	*Levels, percentage deviations from baseline*																									
Effective Exchange Rate	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Price of oil (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Table 5. A permanent increase in real imports of non-euro countries by 1%

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4	Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4
Prices	*Levels, percentage deviations from baseline*																									
HICP	0,01	0,05	0,12	0,22	0,32	0,76	0,00	0,00	0,01	0,02	0,03	0,04	0,06	0,07	0,09	0,11	0,13	0,16	0,18	0,20	0,23	0,25	0,28	0,31	0,34	0,36
Consumption Deflator	0,01	0,05	0,13	0,22	0,33	0,77	0,00	0,00	0,01	0,02	0,03	0,04	0,06	0,08	0,10	0,12	0,14	0,16	0,19	0,21	0,24	0,26	0,29	0,32	0,34	0,37
GDP Deflator	0,01	0,07	0,16	0,27	0,39	0,86	0,00	0,00	0,01	0,03	0,04	0,06	0,08	0,10	0,12	0,15	0,17	0,20	0,23	0,26	0,29	0,32	0,35	0,38	0,41	0,44
ULC	-0,04	0,03	0,13	0,26	0,39	0,85	-0,04	-0,04	-0,04	-0,03	-0,01	0,01	0,04	0,06	0,09	0,12	0,15	0,18	0,21	0,24	0,27	0,30	0,34	0,37	0,40	0,43
Compensation per employee	0,01	0,08	0,18	0,30	0,42	0,86	0,00	0,01	0,02	0,03	0,05	0,07	0,09	0,12	0,14	0,17	0,20	0,23	0,26	0,29	0,32	0,35	0,38	0,41	0,44	0,47
Productivity	0,05	0,06	0,05	0,04	0,04	0,00	0,04	0,05	0,06	0,06	0,06	0,06	0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,04	0,04	0,04	0,04	0,04	0,03
Export Deflator	0,01	0,05	0,12	0,20	0,30	0,65	0,01	0,00	0,01	0,01	0,02	0,04	0,05	0,07	0,09	0,10	0,13	0,15	0,17	0,19	0,21	0,24	0,26	0,29	0,31	0,33
Import Deflator	0,00	0,01	0,03	0,06	0,10	0,30	0,00	0,00	0,00	0,00	0,01	0,01	0,01	0,01	0,02	0,02	0,03	0,04	0,05	0,06	0,06	0,07	0,08	0,10	0,11	0,12
GDP and Components	*Levels, percentage deviations from baseline*																									
GDP	0,06	0,09	0,10	0,09	0,09	0,04	0,04	0,06	0,07	0,08	0,09	0,09	0,10	0,10	0,10	0,10	0,10	0,10	0,09	0,09	0,09	0,09	0,09	0,09	0,09	0,08
Consumption	0,01	0,04	0,05	0,06	0,06	0,06	0,00	0,01	0,02	0,02	0,03	0,03	0,04	0,04	0,05	0,05	0,05	0,05	0,05	0,05	0,06	0,06	0,06	0,06	0,06	0,06
Investment	0,05	0,11	0,12	0,11	0,09	0,01	0,03	0,05	0,06	0,08	0,10	0,11	0,11	0,12	0,12	0,12	0,12	0,12	0,11	0,11	0,10	0,10	0,10	0,09	0,09	0,08
Of which: Residential Inv.	0,02	0,05	0,06	0,05	0,04	-0,02	0,00	0,01	0,02	0,03	0,04	0,05	0,05	0,05	0,06	0,06	0,06	0,06	0,06	0,05	0,05	0,05	0,05	0,05	0,04	0,04
Gov. Consumption	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exports	0,35	0,42	0,43	0,41	0,40	0,28	0,30	0,34	0,37	0,39	0,41	0,42	0,42	0,43	0,43	0,43	0,42	0,42	0,42	0,42	0,41	0,41	0,40	0,40	0,39	0,39
Imports	0,16	0,23	0,20	0,20	0,22	0,28	0,07	0,15	0,20	0,23	0,24	0,23	0,23	0,21	0,21	0,20	0,20	0,20	0,19	0,20	0,20	0,21	0,21	0,22	0,22	0,21
Contributions to Shock	*Percentage of GDP, absolute deviations from baseline*																									
Domestic Demand	0,02	0,04	0,05	0,05	0,05	0,03	0,01	0,01	0,02	0,03	0,04	0,04	0,04	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
Inventories	0,01	0,01	0,00	-0,01	-0,01	0,00	0,04	0,04	0,04	0,03	0,04	0,04	0,04	0,04	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,04	0,04
Trade Balance	0,04	0,04	0,05	0,05	0,04	0,01	-0,01	0,01	0,02	0,02	0,02	0,01	0,01	0,01	0,00	0,00	0,00	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01
Labour Market	*Levels, percentage deviations from baseline, except unemployment: percentage points, absolute deviations from baseline*																									
Total employment	0,01	0,04	0,05	0,05	0,05	0,03	0,00	0,01	0,02	0,02	0,03	0,04	0,04	0,04	0,04	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
Employees in employment	0,02	0,04	0,05	0,06	0,06	0,04	0,00	0,01	0,02	0,03	0,03	0,04	0,04	0,05	0,05	0,05	0,05	0,05	0,05	0,06	0,06	0,06	0,06	0,06	0,06	0,05
Unemployment rate	-0,01	-0,02	-0,03	-0,02	-0,02	-0,01	0,00	-0,01	-0,01	-0,02	-0,02	-0,02	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02
Household Accounts	*Levels, percentage deviations from baseline, except the savings rate: percentage points, absolute deviations from baseline*																									
Disposable income	0,05	0,08	0,10	0,11	0,11	0,08	0,03	0,04	0,06	0,07	0,08	0,08	0,09	0,09	0,09	0,10	0,10	0,10	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11
Saving rate	0,03	0,04	0,04	0,05	0,05	0,02	0,02	0,03	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,05	0,05	0,05	0,05	0,05	0,05	0,05
Fiscal Ratios	*Percentage of GDP, absolute deviations from baseline*																									
Total Receipts	0,00	0,01	0,02	0,03	0,04	0,05	0,00	0,00	0,00	0,00	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,03	0,03	0,03	0,03	0,03	0,04	0,04	0,04	0,04
Total Expenditure	-0,01	-0,02	-0,02	-0,02	-0,02	-0,01	-0,01	-0,01	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02
Budget surplus	0,02	0,04	0,05	0,06	0,07	0,06	0,01	0,01	0,02	0,02	0,03	0,04	0,04	0,04	0,05	0,05	0,05	0,05	0,06	0,06	0,06	0,06	0,06	0,07	0,07	0,07
Government debt	-0,02	-0,05	-0,10	-0,16	-0,22	-0,55																				
Financial Variables	*Percentage points, absolute deviations from baseline*																									
Short-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Demand	*Levels, percentage deviations from baseline*																									
World Demand	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48
Foreign Prices	*Levels, percentage deviations from baseline*																									
Effective Exchange Rate	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Price of oil (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Table 6. A permanent ex ante increase in nominal wages by 1 %

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4	Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4
Prices	*Levels, percentage deviations from baseline*																									
HICP	0,53	1,23	1,95	2,59	3,12	3,77	0,20	0,50	0,65	0,78	0,93	1,12	1,34	1,52	1,68	1,86	2,03	2,22	2,37	2,53	2,67	2,81	2,94	3,07	3,18	3,29
Consumption Deflator	0,57	1,28	2,00	2,65	3,17	3,82	0,23	0,56	0,68	0,80	0,97	1,16	1,39	1,57	1,73	1,91	2,08	2,26	2,42	2,57	2,72	2,86	3,00	3,12	3,23	3,34
GDP Deflator	0,78	1,60	2,40	3,09	3,62	4,14	0,34	0,80	0,92	1,05	1,25	1,48	1,75	1,94	2,11	2,31	2,50	2,69	2,86	3,01	3,17	3,31	3,45	3,57	3,68	3,79
ULC	1,66	2,33	2,99	3,54	3,97	4,18	1,28	1,65	1,81	1,89	2,03	2,22	2,45	2,62	2,76	2,91	3,06	3,22	3,36	3,48	3,61	3,73	3,83	3,93	4,02	4,09
Compensation per employee	1,59	2,30	2,96	3,50	3,91	4,02	1,20	1,56	1,74	1,85	2,00	2,19	2,41	2,59	2,73	2,88	3,04	3,19	3,32	3,44	3,56	3,67	3,78	3,87	3,95	4,03
Productivity	-0,07	-0,03	-0,03	-0,04	-0,06	-0,15	-0,08	-0,09	-0,07	-0,04	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,03	-0,04	-0,04	-0,05	-0,05	-0,06	-0,06	-0,06
Export Deflator	0,43	1,17	1,84	2,39	2,80	3,03	0,11	0,34	0,54	0,72	0,89	1,07	1,27	1,45	1,61	1,77	1,92	2,07	2,21	2,33	2,45	2,56	2,66	2,76	2,84	2,92
Import Deflator	0,05	0,28	0,58	0,88	1,15	1,63	0,00	0,02	0,06	0,12	0,17	0,24	0,31	0,38	0,46	0,54	0,62	0,70	0,77	0,84	0,91	0,99	1,05	1,12	1,18	1,25
GDP and Components	*Levels, percentage deviations from baseline*																									
GDP	-0,10	-0,15	-0,23	-0,33	-0,42	-0,66	-0,09	-0,11	-0,11	-0,10	-0,11	-0,13	-0,16	-0,18	-0,20	-0,22	-0,24	-0,27	-0,29	-0,31	-0,34	-0,37	-0,39	-0,41	-0,43	-0,45
Consumption	-0,03	0,02	0,00	-0,04	-0,08	-0,20	-0,05	-0,06	-0,02	0,02	0,03	0,02	0,00	0,01	0,01	0,00	-0,01	-0,02	-0,02	-0,03	-0,04	-0,05	-0,06	-0,07	-0,08	-0,09
Investment	-0,07	-0,16	-0,27	-0,39	-0,50	-0,65	-0,06	-0,06	-0,08	-0,08	-0,13	-0,14	-0,17	-0,19	-0,22	-0,25	-0,28	-0,32	-0,34	-0,37	-0,40	-0,43	-0,46	-0,49	-0,51	-0,53
Of which: Residential Inv.	0,07	0,04	-0,09	-0,23	-0,37	-0,65	0,00	0,09	0,08	0,09	0,09	0,06	0,03	0,00	-0,04	-0,07	-0,11	-0,14	-0,18	-0,22	-0,25	-0,29	-0,32	-0,36	-0,39	-0,42
Gov. Consumption	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exports	-0,10	-0,27	-0,46	-0,62	-0,74	-1,01	-0,02	-0,07	-0,12	-0,16	-0,20	-0,25	-0,30	-0,34	-0,39	-0,44	-0,48	-0,52	-0,57	-0,60	-0,63	-0,66	-0,70	-0,73	-0,76	-0,80
Imports	-0,20	0,14	0,25	0,31	0,35	0,45	-0,39	-0,29	-0,14	0,01	0,09	0,14	0,16	0,18	0,22	0,24	0,26	0,27	0,28	0,30	0,32	0,33	0,34	0,35	0,36	0,37
Contributions to Shock	*Percentage of GDP, absolute deviations from baseline*																									
Domestic Demand	-0,03	-0,02	-0,05	-0,09	-0,14	-0,24	-0,04	-0,05	-0,03	-0,01	-0,01	-0,02	-0,03	-0,04	-0,04	-0,05	-0,06	-0,07	-0,08	-0,09	-0,10	-0,11	-0,12	-0,13	-0,14	-0,15
Inventories	-0,09	-0,04	-0,04	-0,04	-0,04	0,00	0,07	0,04	0,00	-0,03	-0,06	-0,08	-0,09	-0,10	-0,12	-0,13	-0,14	-0,16	-0,17	-0,19	-0,20	-0,22	-0,23	-0,24	-0,25	-0,26
Trade Balance	0,02	-0,08	-0,14	-0,19	-0,24	-0,42	-0,12	-0,11	-0,09	-0,06	-0,05	-0,04	-0,04	-0,05	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04	-0,04
Labour Market	*Levels, percentage deviations from baseline, except unemployment: percentage points, absolute deviations from baseline*																									
Total employment	-0,04	-0,12	-0,20	-0,29	-0,36	-0,51	-0,01	-0,03	-0,05	-0,07	-0,09	-0,11	-0,13	-0,15	-0,17	-0,19	-0,21	-0,24	-0,26	-0,28	-0,30	-0,32	-0,34	-0,35	-0,37	-0,39
Employees in employment	-0,04	-0,13	-0,23	-0,32	-0,41	-0,56	-0,01	-0,03	-0,05	-0,08	-0,10	-0,12	-0,15	-0,17	-0,20	-0,22	-0,24	-0,27	-0,29	-0,31	-0,33	-0,36	-0,38	-0,40	-0,42	-0,43
Unemployment rate	0,05	0,17	0,22	0,25	0,27	0,29	0,00	0,03	0,07	0,10	0,13	0,16	0,18	0,19	0,21	0,22	0,23	0,23	0,24	0,25	0,26	0,26	0,27	0,27	0,28	0,28
Household Accounts	*Levels, percentage deviations from baseline, except the savings rate: percentage points, absolute deviations from baseline*																									
Disposable income	0,36	0,35	0,31	0,22	0,12	-0,27	0,27	0,36	0,39	0,41	0,35	0,34	0,35	0,35	0,33	0,32	0,30	0,28	0,26	0,24	0,21	0,18	0,15	0,13	0,10	0,08
Saving rate	0,33	0,28	0,26	0,22	0,17	-0,06	0,27	0,36	0,36	0,34	0,27	0,27	0,30	0,29	0,27	0,27	0,26	0,26	0,24	0,23	0,21	0,19	0,18	0,17	0,16	0,15
Fiscal Ratios	*Percentage of GDP, absolute deviations from baseline*																									
Total Receipts	0,03	0,05	0,06	0,07	0,09	0,05	0,05	0,04	0,03	0,02	0,04	0,06	0,06	0,05	0,06	0,06	0,07	0,07	0,07	0,07	0,07	0,08	0,08	0,09	0,09	0,09
Total Expenditure	0,02	0,03	0,05	0,07	0,10	0,16	0,02	0,02	0,02	0,02	0,02	0,03	0,03	0,04	0,04	0,05	0,05	0,06	0,07	0,07	0,08	0,08	0,09	0,09	0,10	0,10
Budget surplus	0,01	0,01	-0,01	-0,02	-0,02	-0,13	0,03	0,02	0,00	-0,01	0,01	0,02	0,02	0,00	0,00	0,00	-0,01	-0,01	-0,01	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02
Government debt	-0,01	-0,02	-0,02	0,00	0,02	0,49																				
Financial Variables	*Percentage points, absolute deviations from baseline*																									
Short-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Demand	*Levels, percentage deviations from baseline*																									
World Demand	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices	*Levels, percentage deviations from baseline*																									
Effective Exchange Rate	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Price of oil (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Table 7. A permanent increase in employers' social contributions equivalent to an ex ante increase of 1% in wages

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4	Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4
Prices	*Levels, percentage deviations from baseline*																									
HICP	0,73	1,63	2,49	3,20	3,71	3,81	0,27	0,69	0,89	1,06	1,26	1,49	1,78	2,00	2,19	2,39	2,59	2,80	2,97	3,13	3,28	3,41	3,54	3,66	3,76	3,85
Consumption Deflator	0,78	1,69	2,55	3,25	3,76	3,85	0,32	0,77	0,93	1,09	1,31	1,56	1,84	2,05	2,24	2,45	2,65	2,85	3,03	3,18	3,33	3,48	3,60	3,72	3,81	3,90
GDP Deflator	1,07	2,12	3,05	3,77	4,26	4,14	0,47	1,10	1,26	1,43	1,68	1,97	2,31	2,53	2,72	2,95	3,16	3,37	3,55	3,70	3,85	3,99	4,11	4,22	4,31	4,39
ULC	2,09	2,98	3,67	4,17	4,46	3,89	1,51	2,07	2,31	2,45	2,63	2,85	3,12	3,32	3,45	3,60	3,75	3,89	4,02	4,12	4,21	4,31	4,38	4,44	4,49	4,52
Compensation per employee	1,92	2,80	3,50	3,99	4,28	3,68	1,38	1,89	2,13	2,27	2,45	2,66	2,93	3,13	3,27	3,43	3,58	3,72	3,84	3,94	4,04	4,13	4,20	4,26	4,31	4,35
Productivity	-0,17	-0,18	-0,17	-0,17	-0,17	-0,20	-0,12	-0,18	-0,18	-0,18	-0,18	-0,18	-0,19	-0,19	-0,18	-0,17	-0,17	-0,17	-0,17	-0,17	-0,17	-0,17	-0,17	-0,17	-0,17	-0,16
Export Deflator	0,59	1,56	2,36	2,94	3,30	2,99	0,15	0,47	0,75	0,98	1,21	1,44	1,69	1,91	2,10	2,28	2,45	2,61	2,76	2,89	3,00	3,10	3,19	3,27	3,34	3,39
Import Deflator	0,07	0,37	0,75	1,11	1,41	1,69	0,00	0,03	0,08	0,15	0,23	0,32	0,41	0,51	0,61	0,71	0,81	0,90	0,99	1,07	1,15	1,23	1,31	1,37	1,44	1,51
GDP and Components	*Levels, percentage deviations from baseline*																									
GDP	-0,23	-0,41	-0,55	-0,67	-0,76	-0,92	-0,13	-0,22	-0,26	-0,30	-0,34	-0,38	-0,44	-0,47	-0,50	-0,53	-0,56	-0,59	-0,62	-0,65	-0,68	-0,71	-0,73	-0,76	-0,78	-0,79
Consumption	-0,22	-0,37	-0,47	-0,54	-0,60	-0,71	-0,10	-0,24	-0,26	-0,28	-0,31	-0,35	-0,40	-0,42	-0,43	-0,46	-0,48	-0,50	-0,52	-0,53	-0,55	-0,57	-0,58	-0,60	-0,61	-0,62
Investment	-0,21	-0,51	-0,72	-0,86	-0,96	-0,92	-0,09	-0,18	-0,24	-0,32	-0,42	-0,47	-0,55	-0,60	-0,65	-0,70	-0,75	-0,80	-0,82	-0,85	-0,87	-0,90	-0,93	-0,95	-0,97	-0,98
Of which: Residential Inv.	-0,12	-0,39	-0,63	-0,82	-0,99	-1,18	0,00	-0,09	-0,15	-0,24	-0,29	-0,36	-0,42	-0,48	-0,55	-0,60	-0,65	-0,70	-0,75	-0,80	-0,85	-0,89	-0,93	-0,97	-1,01	-1,04
Gov. Consumption	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exports	-0,13	-0,36	-0,59	-0,76	-0,89	-1,04	-0,03	-0,10	-0,16	-0,22	-0,27	-0,33	-0,39	-0,45	-0,50	-0,56	-0,62	-0,66	-0,71	-0,75	-0,78	-0,81	-0,84	-0,87	-0,90	-0,94
Imports	-0,50	-0,35	-0,18	-0,03	0,06	0,19	-0,56	-0,55	-0,48	-0,41	-0,39	-0,36	-0,34	-0,31	-0,24	-0,20	-0,16	-0,12	-0,09	-0,05	-0,02	0,01	0,04	0,05	0,06	0,08
Contributions to Shock	*Percentage of GDP, absolute deviations from baseline*																									
Domestic Demand	-0,17	-0,31	-0,40	-0,46	-0,51	-0,58	-0,07	-0,17	-0,20	-0,22	-0,26	-0,29	-0,33	-0,35	-0,37	-0,39	-0,41	-0,43	-0,44	-0,46	-0,47	-0,48	-0,50	-0,51	-0,52	-0,53
Inventories	-0,14	-0,09	-0,06	-0,05	-0,04	0,01	0,10	0,09	0,06	0,04	0,02	0,00	-0,01	-0,03	-0,06	-0,07	-0,09	-0,11	-0,13	-0,15	-0,17	-0,18	-0,20	-0,21	-0,22	-0,23
Trade Balance	0,07	-0,01	-0,08	-0,16	-0,21	-0,35	-0,16	-0,14	-0,13	-0,11	-0,10	-0,10	-0,09	-0,09	-0,08	-0,07	-0,06	-0,05	-0,05	-0,05	-0,05	-0,05	-0,04	-0,04	-0,04	-0,03
Labour Market	*Levels, percentage deviations from baseline, except unemployment: percentage points, absolute deviations from baseline*																									
Total employment	-0,06	-0,23	-0,38	-0,50	-0,60	-0,73	-0,01	-0,04	-0,08	-0,12	-0,16	-0,20	-0,25	-0,29	-0,33	-0,36	-0,39	-0,43	-0,46	-0,49	-0,51	-0,54	-0,57	-0,59	-0,61	-0,63
Employees in employment	-0,07	-0,26	-0,43	-0,56	-0,67	-0,80	-0,01	-0,05	-0,09	-0,14	-0,19	-0,23	-0,28	-0,33	-0,37	-0,41	-0,45	-0,48	-0,52	-0,55	-0,58	-0,61	-0,64	-0,66	-0,68	-0,70
Unemployment rate	0,08	0,27	0,37	0,40	0,42	0,39	0,00	0,05	0,10	0,16	0,21	0,26	0,29	0,32	0,34	0,36	0,37	0,38	0,39	0,40	0,41	0,41	0,42	0,42	0,42	0,42
Household Accounts	*Levels, percentage deviations from baseline, except the savings rate: percentage points, absolute deviations from baseline*																									
Disposable income	-0,06	-0,08	-0,17	-0,30	-0,45	-0,84	-0,13	-0,04	-0,03	-0,04	-0,06	-0,09	-0,09	-0,10	-0,13	-0,16	-0,19	-0,22	-0,25	-0,28	-0,32	-0,36	-0,40	-0,43	-0,47	-0,50
Saving rate	0,14	0,25	0,25	0,21	0,14	-0,11	-0,03	0,17	0,20	0,21	0,22	0,23	0,27	0,27	0,26	0,26	0,25	0,25	0,23	0,22	0,20	0,18	0,16	0,14	0,13	0,11
Fiscal Ratios	*Percentage of GDP, absolute deviations from baseline*																									
Total Receipts	0,37	0,33	0,32	0,30	0,31	0,24	0,39	0,38	0,36	0,34	0,32	0,34	0,33	0,32	0,32	0,32	0,32	0,31	0,30	0,30	0,30	0,31	0,31	0,31	0,31	0,31
Total Expenditure	0,05	0,09	0,13	0,16	0,18	0,22	0,03	0,05	0,05	0,06	0,07	0,08	0,09	0,11	0,11	0,12	0,13	0,14	0,15	0,15	0,16	0,17	0,17	0,18	0,18	0,19
Budget surplus	0,31	0,22	0,15	0,12	0,11	0,00	0,36	0,33	0,30	0,26	0,23	0,24	0,21	0,19	0,17	0,16	0,15	0,13	0,13	0,12	0,11	0,11	0,11	0,11	0,11	0,10
Government debt	-0,31	-0,53	-0,68	-0,80	-0,91	-1,04																				
Financial Variables	*Percentage points, absolute deviations from baseline*																									
Short-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Demand	*Levels, percentage deviations from baseline*																									
World Demand	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices	*Levels, percentage deviations from baseline*																									
Effective Exchange Rate	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Price of oil (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Table 8. A permanent increase in indirect taxes rate equivalent to an ex ante increase of 5% in indirect tax receipts

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4	Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4
Prices	*Levels, percentage deviations from baseline*																									
HICP	0,49	0,60	0,69	0,78	0,86	1,06	0,38	0,49	0,53	0,55	0,56	0,59	0,62	0,64	0,66	0,68	0,70	0,73	0,75	0,78	0,80	0,81	0,82	0,84	0,87	0,90
Consumption Deflator	0,51	0,62	0,70	0,79	0,87	1,08	0,44	0,50	0,54	0,56	0,58	0,60	0,63	0,65	0,67	0,69	0,71	0,74	0,76	0,79	0,81	0,82	0,83	0,84	0,88	0,91
GDP Deflator	0,55	0,67	0,76	0,85	0,92	1,14	0,46	0,54	0,59	0,61	0,63	0,65	0,68	0,71	0,72	0,75	0,77	0,80	0,82	0,84	0,86	0,87	0,89	0,90	0,93	0,96
ULC	0,40	0,56	0,63	0,69	0,73	0,85	0,21	0,41	0,48	0,51	0,53	0,55	0,57	0,60	0,61	0,62	0,64	0,65	0,67	0,68	0,69	0,70	0,71	0,72	0,73	0,75
Compensation per employee	0,30	0,44	0,52	0,59	0,64	0,79	0,15	0,30	0,36	0,39	0,41	0,43	0,45	0,48	0,50	0,51	0,53	0,55	0,57	0,58	0,60	0,61	0,62	0,63	0,64	0,66
Productivity	-0,10	-0,12	-0,11	-0,10	-0,09	-0,06	-0,06	-0,10	-0,11	-0,12	-0,12	-0,12	-0,12	-0,12	-0,11	-0,11	-0,11	-0,10	-0,10	-0,10	-0,10	-0,09	-0,09	-0,09	-0,09	-0,09
Export Deflator	0,07	0,20	0,29	0,35	0,39	0,54	0,01	0,05	0,10	0,13	0,16	0,19	0,22	0,24	0,26	0,28	0,30	0,31	0,33	0,34	0,36	0,37	0,38	0,39	0,40	0,41
Import Deflator	0,00	0,05	0,09	0,14	0,17	0,27	0,00	0,00	0,00	0,01	0,03	0,04	0,05	0,06	0,08	0,09	0,10	0,11	0,12	0,13	0,14	0,15	0,16	0,17	0,17	0,18
GDP and Components	*Levels, percentage deviations from baseline*																									
GDP	-0,12	-0,20	-0,24	-0,26	-0,28	-0,34	-0,06	-0,12	-0,15	-0,17	-0,18	-0,20	-0,21	-0,22	-0,23	-0,23	-0,24	-0,24	-0,25	-0,26	-0,26	-0,26	-0,27	-0,27	-0,28	-0,29
Consumption	-0,22	-0,32	-0,36	-0,38	-0,40	-0,45	-0,14	-0,22	-0,25	-0,27	-0,29	-0,31	-0,33	-0,34	-0,34	-0,35	-0,36	-0,37	-0,37	-0,38	-0,39	-0,39	-0,39	-0,39	-0,40	-0,42
Investment	-0,13	-0,29	-0,37	-0,40	-0,42	-0,46	-0,04	-0,11	-0,15	-0,20	-0,24	-0,28	-0,30	-0,33	-0,34	-0,36	-0,38	-0,39	-0,39	-0,40	-0,40	-0,40	-0,41	-0,41	-0,42	-0,43
Of which: Residential Inv.	-0,12	-0,29	-0,37	-0,41	-0,44	-0,53	0,00	-0,13	-0,15	-0,22	-0,25	-0,29	-0,31	-0,33	-0,35	-0,37	-0,38	-0,39	-0,40	-0,41	-0,42	-0,43	-0,43	-0,44	-0,45	-0,46
Gov. Consumption	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exports	-0,02	-0,05	-0,07	-0,09	-0,11	-0,17	0,00	-0,01	-0,02	-0,03	-0,04	-0,04	-0,05	-0,06	-0,06	-0,07	-0,08	-0,08	-0,09	-0,09	-0,10	-0,10	-0,10	-0,11	-0,11	-0,12
Imports	-0,33	-0,41	-0,34	-0,29	-0,27	-0,20	-0,15	-0,32	-0,40	-0,43	-0,44	-0,42	-0,40	-0,39	-0,37	-0,35	-0,33	-0,32	-0,31	-0,30	-0,29	-0,28	-0,27	-0,26	-0,26	-0,27
Contributions to Shock	*Percentage of GDP, absolute deviations from baseline*																									
Domestic Demand	-0,15	-0,23	-0,27	-0,29	-0,30	-0,34	-0,09	-0,15	-0,17	-0,19	-0,21	-0,23	-0,24	-0,25	-0,26	-0,27	-0,27	-0,28	-0,28	-0,29	-0,29	-0,29	-0,29	-0,30	-0,30	-0,31
Inventories	-0,03	-0,04	-0,02	-0,01	-0,01	0,00	0,03	0,06	0,07	0,08	0,08	0,07	0,07	0,06	0,06	0,05	0,05	0,04	0,04	0,04	0,04	0,04	0,03	0,03	0,03	0,03
Trade Balance	0,06	0,07	0,05	0,04	0,03	0,00	0,00	-0,03	-0,05	-0,05	-0,05	-0,04	-0,03	-0,03	-0,02	-0,02	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01	-0,01
Labour Market	*Levels, percentage deviations from baseline, except unemployment: percentage points, absolute deviations from baseline*																									
Total employment	-0,03	-0,08	-0,13	-0,16	-0,19	-0,28	0,00	-0,02	-0,03	-0,05	-0,06	-0,08	-0,09	-0,10	-0,11	-0,12	-0,13	-0,14	-0,15	-0,16	-0,16	-0,17	-0,18	-0,18	-0,19	-0,20
Employees in employment	-0,03	-0,10	-0,14	-0,18	-0,21	-0,30	-0,01	-0,02	-0,04	-0,06	-0,07	-0,09	-0,10	-0,12	-0,13	-0,14	-0,15	-0,16	-0,17	-0,18	-0,18	-0,19	-0,20	-0,21	-0,21	-0,22
Unemployment rate	0,01	0,04	0,06	0,07	0,08	0,10	0,00	0,00	0,01	0,02	0,03	0,03	0,04	0,05	0,05	0,06	0,06	0,06	0,06	0,07	0,07	0,07	0,07	0,07	0,08	0,08
Household Accounts	*Levels, percentage deviations from baseline, except the savings rate: percentage points, absolute deviations from baseline*																									
Disposable income	-0,29	-0,33	-0,34	-0,37	-0,39	-0,45	-0,29	-0,28	-0,29	-0,30	-0,32	-0,32	-0,33	-0,33	-0,33	-0,34	-0,34	-0,35	-0,36	-0,37	-0,37	-0,38	-0,38	-0,38	-0,40	-0,41
Saving rate	-0,06	-0,01	0,01	0,02	0,01	0,01	-0,13	-0,05	-0,03	-0,02	-0,02	-0,01	0,00	0,01	0,01	0,01	0,02	0,02	0,02	0,02	0,02	0,02	0,01	0,01	0,01	0,01
Fiscal Ratios	*Percentage of GDP, absolute deviations from baseline*																									
Total Receipts	0,21	0,20	0,19	0,18	0,18	0,17	0,21	0,21	0,21	0,20	0,20	0,20	0,20	0,19	0,19	0,19	0,19	0,19	0,18	0,18	0,18	0,18	0,18	0,18	0,19	0,19
Total Expenditure	0,03	0,05	0,06	0,06	0,07	0,08	0,01	0,03	0,03	0,04	0,04	0,05	0,05	0,05	0,05	0,06	0,06	0,06	0,06	0,06	0,06	0,06	0,07	0,07	0,07	0,07
Budget surplus	0,18	0,14	0,12	0,11	0,11	0,08	0,20	0,18	0,17	0,16	0,15	0,15	0,14	0,13	0,13	0,12	0,12	0,12	0,11	0,11	0,11	0,11	0,11	0,11	0,11	0,11
Government debt	-0,18	-0,32	-0,44	-0,55	-0,66	-1,12																				
Financial Variables	*Percentage points, absolute deviations from baseline*																									
Short-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Demand	*Levels, percentage deviations from baseline*																									
World Demand	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices	*Levels, percentage deviations from baseline*																									
Effective Exchange Rate	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Price of oil (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Table 9. A permanent increase in productivity by 1%

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4	Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4
Prices	*Levels, percentage deviations from baseline*																									
HICP	-0,54	-1,23	-1,92	-2,54	-3,04	-3,79	-0,20	-0,50	-0,65	-0,79	-0,94	-1,12	-1,34	-1,51	-1,67	-1,84	-2,00	-2,18	-2,32	-2,47	-2,61	-2,74	-2,87	-2,99	-3,10	-3,21
Consumption Deflator	-0,57	-1,27	-1,97	-2,59	-3,09	-3,84	-0,23	-0,56	-0,68	-0,81	-0,98	-1,17	-1,39	-1,55	-1,71	-1,88	-2,05	-2,22	-2,37	-2,52	-2,66	-2,79	-2,92	-3,04	-3,15	-3,26
GDP Deflator	-0,78	-1,60	-2,35	-3,00	-3,52	-4,16	-0,34	-0,80	-0,93	-1,06	-1,26	-1,47	-1,74	-1,91	-2,07	-2,26	-2,44	-2,62	-2,79	-2,93	-3,08	-3,22	-3,35	-3,47	-3,58	-3,68
ULC	-0,70	-1,49	-2,21	-2,82	-3,30	-3,79	-0,24	-0,65	-0,88	-1,01	-1,18	-1,38	-1,61	-1,81	-1,96	-2,13	-2,30	-2,47	-2,62	-2,76	-2,89	-3,02	-3,14	-3,25	-3,35	-3,44
Compensation per employee	-0,60	-1,31	-1,96	-2,50	-2,91	-3,15	-0,20	-0,55	-0,76	-0,88	-1,03	-1,21	-1,42	-1,60	-1,74	-1,89	-2,04	-2,19	-2,32	-2,44	-2,56	-2,67	-2,77	-2,87	-2,95	-3,03
Productivity	0,10	0,18	0,26	0,33	0,40	0,67	0,04	0,10	0,12	0,13	0,15	0,17	0,20	0,22	0,23	0,25	0,26	0,29	0,30	0,32	0,34	0,36	0,38	0,40	0,41	0,42
Export Deflator	-0,43	-1,17	-1,82	-2,34	-2,74	-3,08	-0,11	-0,34	-0,55	-0,73	-0,90	-1,08	-1,27	-1,44	-1,60	-1,75	-1,89	-2,03	-2,17	-2,29	-2,40	-2,51	-2,61	-2,70	-2,78	-2,86
Import Deflator	-0,05	-0,28	-0,58	-0,87	-1,14	-1,66	-0,01	-0,03	-0,06	-0,11	-0,17	-0,24	-0,31	-0,39	-0,46	-0,54	-0,62	-0,70	-0,77	-0,84	-0,91	-0,98	-1,05	-1,11	-1,17	-1,24
GDP and Components	*Levels, percentage deviations from baseline*																									
GDP	0,12	0,25	0,36	0,47	0,56	0,82	0,04	0,11	0,15	0,17	0,20	0,23	0,27	0,30	0,32	0,35	0,37	0,40	0,43	0,46	0,48	0,51	0,53	0,55	0,57	0,59
Consumption	0,12	0,18	0,24	0,29	0,33	0,45	0,06	0,13	0,13	0,13	0,15	0,17	0,20	0,21	0,22	0,23	0,25	0,26	0,27	0,28	0,29	0,31	0,32	0,33	0,34	0,35
Investment	0,10	0,27	0,45	0,58	0,69	0,83	0,03	0,08	0,12	0,16	0,20	0,24	0,30	0,34	0,38	0,43	0,47	0,51	0,54	0,57	0,60	0,63	0,65	0,68	0,71	0,72
Of which: Residential Inv.	0,03	0,17	0,34	0,50	0,63	0,93	0,00	0,00	0,04	0,09	0,11	0,15	0,20	0,24	0,29	0,32	0,36	0,40	0,44	0,48	0,51	0,55	0,58	0,61	0,65	0,67
Gov. Consumption	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exports	0,10	0,28	0,46	0,62	0,76	1,07	0,02	0,07	0,12	0,16	0,21	0,25	0,30	0,35	0,39	0,44	0,49	0,53	0,57	0,61	0,64	0,67	0,71	0,74	0,77	0,81
Imports	0,18	0,14	0,05	-0,06	-0,15	-0,31	0,08	0,21	0,23	0,19	0,16	0,14	0,14	0,12	0,08	0,06	0,03	0,01	-0,02	-0,05	-0,07	-0,10	-0,12	-0,14	-0,15	-0,17
Contributions to Shock	*Percentage of GDP, absolute deviations from baseline*																									
Domestic Demand	0,09	0,15	0,22	0,27	0,31	0,42	0,04	0,09	0,10	0,11	0,12	0,14	0,17	0,18	0,20	0,21	0,23	0,24	0,25	0,26	0,28	0,29	0,30	0,31	0,32	0,33
Inventories	0,05	0,07	0,06	0,05	0,05	0,01	-0,01	-0,03	-0,02	0,00	0,01	0,02	0,03	0,05	0,06	0,08	0,09	0,11	0,12	0,14	0,15	0,17	0,18	0,20	0,21	0,22
Trade Balance	-0,02	0,03	0,08	0,15	0,20	0,40	0,01	0,05	0,07	0,07	0,07	0,06	0,07	0,07	0,06	0,06	0,06	0,05	0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,04
Labour Market	*Levels, percentage deviations from baseline, except unemployment: percentage points, absolute deviations from baseline*																									
Total employment	0,02	0,06	0,10	0,13	0,16	0,15	0,00	0,01	0,02	0,04	0,05	0,06	0,07	0,08	0,09	0,10	0,11	0,12	0,12	0,13	0,14	0,15	0,15	0,16	0,16	0,17
Employees in employment	0,02	0,07	0,12	0,15	0,18	0,17	0,00	0,01	0,03	0,04	0,05	0,07	0,08	0,09	0,10	0,11	0,12	0,13	0,14	0,15	0,16	0,16	0,17	0,18	0,18	0,19
Unemployment rate	-0,01	-0,05	-0,08	-0,10	-0,11	-0,08	0,00	-0,01	-0,01	-0,03	-0,04	-0,05	-0,06	-0,07	-0,07	-0,08	-0,09	-0,09	-0,09	-0,10	-0,10	-0,11	-0,11	-0,11	-0,11	-0,12
Household Accounts	*Levels, percentage deviations from baseline, except the savings rate: percentage points, absolute deviations from baseline*																									
Disposable income	-0,10	-0,09	-0,04	0,04	0,13	0,52	-0,05	-0,11	-0,12	-0,12	-0,10	-0,08	-0,08	-0,08	-0,06	-0,04	-0,03	-0,01	0,01	0,03	0,05	0,08	0,10	0,12	0,14	0,16
Saving rate	-0,18	-0,23	-0,24	-0,21	-0,17	0,05	-0,09	-0,21	-0,22	-0,22	-0,22	-0,21	-0,24	-0,25	-0,24	-0,23	-0,23	-0,24	-0,23	-0,22	-0,21	-0,20	-0,19	-0,18	-0,17	-0,16
Fiscal Ratios	*Percentage of GDP, absolute deviations from baseline*																									
Total Receipts	0,01	-0,01	-0,04	-0,06	-0,09	-0,10	0,01	0,01	0,01	0,02	0,01	-0,01	-0,02	-0,02	-0,03	-0,03	-0,04	-0,05	-0,05	-0,05	-0,06	-0,07	-0,08	-0,09	-0,09	-0,10
Total Expenditure	-0,02	-0,05	-0,08	-0,11	-0,13	-0,19	-0,01	-0,02	-0,03	-0,03	-0,04	-0,05	-0,06	-0,06	-0,07	-0,08	-0,09	-0,09	-0,10	-0,10	-0,11	-0,12	-0,12	-0,13	-0,13	-0,14
Budget surplus	0,04	0,06	0,07	0,07	0,06	0,12	0,01	0,03	0,05	0,07	0,06	0,05	0,05	0,06	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,07	0,06	0,06	0,05	0,05
Government debt	-0,04	-0,10	-0,17	-0,24	-0,29	-0,78																				
Financial Variables	*Percentage points, absolute deviations from baseline*																									
Short-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Demand	*Levels, percentage deviations from baseline*																									
World Demand	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices	*Levels, percentage deviations from baseline*																									
Effective Exchange Rate	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Price of oil (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Table 10. A permanent ex ante increase in labour force by 1%

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4	Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4
Prices	*Levels, percentage deviations from baseline*																									
HICP	-0,16	-0,49	-1,13	-2,02	-3,05	-7,60	0,00	-0,16	-0,27	-0,21	-0,28	-0,40	-0,55	-0,72	-0,85	-1,01	-1,22	-1,44	-1,66	-1,89	-2,13	-2,38	-2,64	-2,91	-3,18	-3,45
Consumption Deflator	-0,17	-0,51	-1,17	-2,08	-3,12	-7,74	0,00	-0,18	-0,28	-0,20	-0,29	-0,43	-0,58	-0,75	-0,88	-1,05	-1,27	-1,48	-1,71	-1,95	-2,19	-2,45	-2,72	-2,99	-3,26	-3,53
GDP Deflator	-0,23	-0,67	-1,47	-2,53	-3,71	-8,61	0,00	-0,27	-0,40	-0,24	-0,38	-0,57	-0,75	-0,97	-1,11	-1,32	-1,59	-1,84	-2,11	-2,38	-2,66	-2,96	-3,26	-3,56	-3,86	-4,17
ULC	-0,53	-1,24	-2,37	-3,58	-4,82	-9,33	-0,01	-1,04	-0,49	-0,58	-0,78	-1,09	-1,39	-1,69	-1,94	-2,20	-2,51	-2,82	-3,12	-3,43	-3,73	-4,05	-4,36	-4,66	-4,97	-5,27
Compensation per employee	-0,47	-1,14	-2,24	-3,45	-4,68	-9,05	0,00	-0,95	-0,43	-0,52	-0,70	-0,99	-1,27	-1,56	-1,81	-2,08	-2,38	-2,69	-2,99	-3,29	-3,59	-3,91	-4,22	-4,52	-4,83	-5,13
Productivity	0,06	0,11	0,13	0,14	0,15	0,32	0,01	0,09	0,06	0,06	0,08	0,10	0,12	0,13	0,13	0,13	0,13	0,14	0,14	0,14	0,14	0,15	0,15	0,15	0,15	0,15
Export Deflator	-0,13	-0,44	-1,04	-1,87	-2,81	-6,56	0,00	-0,09	-0,20	-0,22	-0,27	-0,36	-0,48	-0,63	-0,78	-0,94	-1,13	-1,32	-1,54	-1,75	-1,98	-2,21	-2,45	-2,69	-2,93	-3,17
Import Deflator	-0,01	-0,09	-0,27	-0,56	-0,95	-3,03	0,00	0,00	-0,02	-0,03	-0,05	-0,07	-0,10	-0,14	-0,18	-0,23	-0,29	-0,36	-0,43	-0,51	-0,60	-0,69	-0,79	-0,89	-1,00	-1,13
GDP and Components	*Levels, percentage deviations from baseline*																									
GDP	0,07	0,18	0,30	0,43	0,59	1,55	0,01	0,10	0,08	0,10	0,13	0,17	0,20	0,24	0,26	0,28	0,32	0,35	0,38	0,41	0,45	0,49	0,53	0,57	0,61	0,65
Consumption	0,09	0,21	0,27	0,31	0,35	0,70	0,02	0,11	0,13	0,12	0,16	0,20	0,23	0,25	0,25	0,26	0,28	0,29	0,30	0,30	0,31	0,32	0,34	0,35	0,36	0,37
Investment	0,07	0,22	0,38	0,54	0,72	1,67	0,00	0,09	0,07	0,12	0,15	0,22	0,23	0,29	0,32	0,36	0,41	0,45	0,48	0,52	0,55	0,60	0,64	0,69	0,75	0,79
Of which: Residential Inv.	0,08	0,20	0,27	0,36	0,51	1,55	0,00	0,10	0,05	0,17	0,16	0,19	0,22	0,22	0,24	0,26	0,27	0,29	0,31	0,34	0,37	0,40	0,44	0,48	0,53	0,58
Gov. Consumption	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exports	0,03	0,10	0,25	0,47	0,72	2,07	0,00	0,02	0,04	0,05	0,06	0,08	0,11	0,15	0,18	0,23	0,27	0,32	0,38	0,43	0,49	0,55	0,62	0,68	0,75	0,83
Imports	0,17	0,33	0,29	0,13	-0,03	-0,56	0,01	0,38	0,11	0,18	0,25	0,33	0,36	0,37	0,34	0,31	0,28	0,24	0,20	0,15	0,10	0,06	0,03	-0,01	-0,04	-0,07
Contributions to Shock	*Percentage of GDP, absolute deviations from baseline*																									
Domestic Demand	0,07	0,16	0,23	0,27	0,33	0,72	0,01	0,08	0,09	0,10	0,12	0,15	0,18	0,20	0,20	0,22	0,23	0,25	0,26	0,27	0,28	0,29	0,31	0,32	0,34	0,36
Inventories	0,03	0,07	0,08	0,09	0,09	0,08	0,00	-0,07	-0,01	-0,02	-0,04	-0,05	-0,05	-0,04	-0,03	-0,01	0,00	0,02	0,04	0,06	0,09	0,11	0,13	0,16	0,18	0,20
Trade Balance	-0,03	-0,04	0,00	0,07	0,17	0,76	0,00	0,09	0,01	0,03	0,05	0,06	0,07	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,09	0,09	0,09	0,10	0,09
Labour Market	*Levels, percentage deviations from baseline, except unemployment: percentage points, absolute deviations from baseline*																									
Total employment	0,02	0,08	0,17	0,29	0,44	1,23	0,00	0,01	0,02	0,04	0,05	0,06	0,08	0,11	0,13	0,16	0,18	0,21	0,24	0,27	0,31	0,34	0,38	0,42	0,46	0,50
Employees in employment	0,02	0,09	0,19	0,33	0,49	1,36	0,00	0,01	0,03	0,04	0,05	0,07	0,10	0,12	0,15	0,18	0,21	0,24	0,27	0,31	0,35	0,39	0,43	0,47	0,51	0,56
Unemployment rate	0,88	0,81	0,70	0,59	0,48	0,10	0,90	0,90	0,87	0,85	0,84	0,82	0,80	0,77	0,74	0,71	0,68	0,66	0,63	0,60	0,58	0,55	0,52	0,50	0,47	0,44
Household Accounts	*Levels, percentage deviations from baseline, except the savings rate: percentage points, absolute deviations from baseline*																									
Disposable income	0,15	0,10	-0,03	-0,12	-0,12	0,48	0,23	0,04	0,16	0,17	0,14	0,16	0,08	0,03	0,01	-0,02	-0,05	-0,08	-0,10	-0,12	-0,12	-0,13	-0,13	-0,13	-0,12	-0,11
Saving rate	0,05	-0,10	-0,26	-0,37	-0,41	-0,19	0,19	-0,06	0,03	0,04	-0,02	-0,04	-0,13	-0,19	-0,21	-0,24	-0,28	-0,32	-0,34	-0,37	-0,38	-0,39	-0,40	-0,40	-0,41	-0,41
Fiscal Ratios	*Percentage of GDP, absolute deviations from baseline*																									
Total Receipts	-0,16	-0,18	-0,19	-0,20	-0,22	-0,24	-0,15	-0,19	-0,14	-0,16	-0,16	-0,19	-0,19	-0,18	-0,19	-0,19	-0,19	-0,20	-0,19	-0,20	-0,20	-0,21	-0,21	-0,22	-0,23	-0,23
Total Expenditure	-0,02	-0,04	-0,07	-0,10	-0,13	-0,35	0,00	-0,02	-0,02	-0,02	-0,03	-0,04	-0,04	-0,05	-0,06	-0,07	-0,07	-0,08	-0,09	-0,09	-0,10	-0,11	-0,12	-0,13	-0,14	-0,15
Budget surplus	-0,14	-0,13	-0,11	-0,09	-0,08	0,18	-0,15	-0,17	-0,13	-0,13	-0,12	-0,15	-0,14	-0,12	-0,12	-0,11	-0,11	-0,10	-0,09	-0,09	-0,09	-0,09	-0,08	-0,08	-0,08	-0,07
Government debt	0,14	0,27	0,38	0,47	0,54	0,21																				
Financial Variables	*Percentage points, absolute deviations from baseline*																									
Short-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Demand	*Levels, percentage deviations from baseline*																									
World Demand	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices	*Levels, percentage deviations from baseline*																									
Effective Exchange Rate	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Price of oil (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Table 11. A permanent increase in working age population by 1 %

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4	Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4
Prices	*Levels, percentage deviations from baseline*																									
HICP	-0,01	-0,10	-0,31	-0,66	-1,14	-3,82	0,00	0,00	-0,01	-0,04	-0,06	-0,08	-0,11	-0,15	-0,21	-0,27	-0,33	-0,41	-0,50	-0,60	-0,70	-0,82	-0,94	-1,07	-1,20	-1,34
Consumption Deflator	-0,01	-0,11	-0,32	-0,68	-1,17	-3,90	0,00	0,00	-0,02	-0,04	-0,06	-0,09	-0,12	-0,16	-0,22	-0,28	-0,35	-0,43	-0,52	-0,62	-0,73	-0,85	-0,97	-1,10	-1,23	-1,37
GDP Deflator	-0,02	-0,14	-0,41	-0,85	-1,42	-4,38	0,00	0,00	-0,02	-0,06	-0,09	-0,12	-0,16	-0,21	-0,28	-0,36	-0,45	-0,55	-0,66	-0,78	-0,91	-1,04	-1,19	-1,34	-1,49	-1,65
ULC	-0,06	-0,30	-0,74	-1,33	-2,00	-4,86	0,00	0,00	-0,08	-0,15	-0,20	-0,26	-0,33	-0,43	-0,54	-0,67	-0,80	-0,94	-1,09	-1,25	-1,41	-1,57	-1,74	-1,91	-2,08	-2,25
Compensation per employee	-0,05	-0,27	-0,68	-1,26	-1,92	-4,71	0,00	0,00	-0,08	-0,13	-0,18	-0,23	-0,30	-0,38	-0,49	-0,61	-0,74	-0,88	-1,02	-1,18	-1,34	-1,50	-1,67	-1,83	-2,00	-2,17
Productivity	0,01	0,03	0,06	0,07	0,08	0,16	0,00	0,00	0,01	0,02	0,02	0,03	0,03	0,04	0,05	0,06	0,06	0,07	0,07	0,07	0,07	0,07	0,08	0,08	0,08	0,08
Export Deflator	-0,01	-0,09	-0,27	-0,60	-1,05	-3,34	0,00	0,00	-0,01	-0,02	-0,05	-0,07	-0,10	-0,14	-0,18	-0,24	-0,30	-0,38	-0,46	-0,55	-0,65	-0,76	-0,87	-0,99	-1,11	-1,24
Import Deflator	0,00	-0,01	-0,06	-0,16	-0,32	-1,46	0,00	0,00	0,00	0,00	0,00	-0,01	-0,02	-0,02	-0,04	-0,05	-0,07	-0,09	-0,11	-0,14	-0,17	-0,21	-0,25	-0,29	-0,34	-0,40
GDP and Components	*Levels, percentage deviations from baseline*																									
GDP	0,01	0,05	0,10	0,17	0,24	0,77	0,00	0,00	0,01	0,02	0,03	0,04	0,05	0,07	0,08	0,10	0,11	0,13	0,14	0,16	0,18	0,19	0,21	0,23	0,25	0,27
Consumption	0,01	0,06	0,11	0,15	0,17	0,35	0,00	0,00	0,01	0,02	0,04	0,05	0,06	0,08	0,10	0,11	0,12	0,13	0,14	0,14	0,15	0,16	0,16	0,17	0,17	0,18
Investment	0,01	0,05	0,13	0,21	0,30	0,84	0,00	0,00	0,01	0,02	0,03	0,04	0,06	0,08	0,10	0,12	0,15	0,17	0,19	0,20	0,22	0,24	0,27	0,29	0,31	0,34
Of which: Residential Inv.	0,01	0,05	0,11	0,15	0,20	0,75	0,00	0,00	0,01	0,01	0,03	0,04	0,06	0,08	0,09	0,10	0,11	0,12	0,13	0,14	0,15	0,16	0,18	0,19	0,21	0,23
Gov. Consumption	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exports	0,00	0,02	0,06	0,15	0,26	1,00	0,00	0,00	0,00	0,01	0,01	0,02	0,02	0,03	0,04	0,06	0,07	0,09	0,11	0,13	0,16	0,18	0,21	0,24	0,27	0,31
Imports	0,02	0,09	0,17	0,14	0,07	-0,25	0,00	0,00	0,03	0,05	0,06	0,08	0,10	0,13	0,15	0,17	0,18	0,18	0,17	0,15	0,14	0,12	0,10	0,08	0,06	0,04
Contributions to Shock	*Percentage of GDP, absolute deviations from baseline*																									
Domestic Demand	0,01	0,04	0,09	0,12	0,15	0,36	0,00	0,00	0,01	0,02	0,03	0,04	0,05	0,06	0,07	0,09	0,10	0,10	0,11	0,12	0,13	0,13	0,14	0,15	0,16	0,16
Inventories	0,00	0,02	0,03	0,04	0,05	0,05	0,00	0,00	-0,01	-0,01	-0,01	-0,01	-0,02	-0,02	-0,02	-0,02	-0,02	-0,02	-0,01	0,00	0,01	0,02	0,03	0,04	0,05	0,06
Trade Balance	0,00	-0,01	-0,02	0,00	0,04	0,36	0,00	0,00	0,01	0,01	0,01	0,02	0,02	0,02	0,03	0,03	0,04	0,04	0,04	0,04	0,04	0,05	0,05	0,05	0,05	0,05
Labour Market	*Levels, percentage deviations from baseline, except unemployment: percentage points, absolute deviations from baseline*																									
Total employment	0,00	0,01	0,05	0,10	0,17	0,61	0,00	0,00	0,00	0,00	0,01	0,01	0,02	0,02	0,03	0,04	0,05	0,06	0,08	0,09	0,10	0,12	0,14	0,16	0,17	0,19
Employees in employment	0,00	0,02	0,05	0,11	0,19	0,67	0,00	0,00	0,00	0,00	0,01	0,01	0,02	0,03	0,04	0,05	0,06	0,07	0,09	0,10	0,12	0,14	0,15	0,17	0,20	0,22
Unemployment rate	0,12	0,38	0,42	0,38	0,32	0,08	0,00	0,07	0,16	0,25	0,32	0,37	0,40	0,42	0,43	0,43	0,42	0,41	0,40	0,39	0,37	0,36	0,35	0,33	0,32	0,30
Household Accounts	*Levels, percentage deviations from baseline, except the savings rate: percentage points, absolute deviations from baseline*																									
Disposable income	0,02	0,07	0,04	-0,02	-0,05	0,19	0,00	0,02	0,03	0,04	0,06	0,06	0,07	0,07	0,07	0,05	0,04	0,02	0,00	-0,01	-0,03	-0,04	-0,05	-0,05	-0,05	-0,06
Saving rate	0,01	0,01	-0,06	-0,14	-0,19	-0,14	0,00	0,02	0,02	0,02	0,02	0,01	0,01	-0,01	-0,03	-0,05	-0,07	-0,10	-0,12	-0,14	-0,15	-0,16	-0,18	-0,19	-0,19	-0,20
Fiscal Ratios	*Percentage of GDP, absolute deviations from baseline*																									
Total Receipts	-0,02	-0,08	-0,10	-0,10	-0,11	-0,12	0,00	-0,01	-0,03	-0,05	-0,06	-0,07	-0,08	-0,09	-0,09	-0,10	-0,10	-0,10	-0,10	-0,10	-0,10	-0,10	-0,10	-0,11	-0,11	-0,11
Total Expenditure	0,00	-0,01	-0,02	-0,04	-0,05	-0,17	0,00	0,00	0,00	0,00	-0,01	-0,01	-0,01	-0,02	-0,02	-0,02	-0,03	-0,03	-0,03	-0,04	-0,04	-0,04	-0,05	-0,05	-0,06	-0,06
Budget surplus	-0,02	-0,06	-0,07	-0,06	-0,05	0,09	0,00	-0,01	-0,03	-0,04	-0,05	-0,06	-0,07	-0,07	-0,07	-0,07	-0,07	-0,06	-0,06	-0,06	-0,05	-0,05	-0,05	-0,05	-0,05	-0,04
Government debt	0,02	0,08	0,15	0,21	0,25	0,13																				
Financial Variables	*Percentage points, absolute deviations from baseline*																									
Short-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-term Int. Rates	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Demand	*Levels, percentage deviations from baseline*																									
World Demand	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices	*Levels, percentage deviations from baseline*																									
Effective Exchange Rate	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Price of oil (euro)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

Table 12. A 2 year increase in short term interest rate by 100 basis points

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10	Year 1 Q1	Year 1 Q2	Year 1 Q3	Year 1 Q4	Year 2 Q1	Year 2 Q2	Year 2 Q3	Year 2 Q4	Year 3 Q1	Year 3 Q2	Year 3 Q3	Year 3 Q4	Year 4 Q1	Year 4 Q2	Year 4 Q3	Year 4 Q4	Year 5 Q1	Year 5 Q2	Year 5 Q3	Year 5 Q4
Prices	*Levels, percentage deviations from baseline*																									
HICP	-0,06	-0,10	-0,17	-0,28	-0,40	-0,45	-0,03	-0,06	-0,07	-0,08	-0,09	-0,10	-0,11	-0,12	-0,14	-0,16	-0,18	-0,21	-0,24	-0,27	-0,30	-0,33	-0,36	-0,39	-0,42	-0,45
Consumption Deflator	-0,06	-0,11	-0,17	-0,29	-0,41	-0,45	-0,04	-0,06	-0,07	-0,08	-0,09	-0,10	-0,11	-0,12	-0,14	-0,16	-0,19	-0,21	-0,24	-0,27	-0,31	-0,34	-0,37	-0,40	-0,43	-0,45
GDP Deflator	-0,03	-0,10	-0,21	-0,35	-0,49	-0,47	-0,01	-0,02	-0,04	-0,05	-0,07	-0,09	-0,11	-0,14	-0,16	-0,19	-0,23	-0,26	-0,30	-0,33	-0,37	-0,41	-0,44	-0,47	-0,50	-0,53
ULC	-0,01	-0,05	-0,15	-0,33	-0,50	-0,46	0,01	0,01	-0,02	-0,03	-0,04	-0,05	-0,06	-0,07	-0,09	-0,14	-0,17	-0,21	-0,25	-0,30	-0,35	-0,40	-0,44	-0,49	-0,52	-0,56
Compensation per employee	-0,05	-0,13	-0,24	-0,39	-0,52	-0,43	-0,01	-0,04	-0,06	-0,08	-0,10	-0,11	-0,14	-0,16	-0,19	-0,22	-0,25	-0,29	-0,33	-0,37	-0,41	-0,44	-0,48	-0,51	-0,54	-0,56
Productivity	-0,04	-0,07	-0,09	-0,06	-0,02	0,04	-0,02	-0,05	-0,04	-0,05	-0,05	-0,07	-0,08	-0,09	-0,10	-0,08	-0,09	-0,08	-0,08	-0,07	-0,05	-0,04	-0,03	-0,02	-0,01	0,00
Export Deflator	-0,22	-0,21	-0,17	-0,26	-0,37	-0,35	-0,18	-0,22	-0,24	-0,24	-0,23	-0,22	-0,20	-0,18	-0,16	-0,16	-0,17	-0,19	-0,21	-0,24	-0,27	-0,30	-0,33	-0,36	-0,38	-0,41
Import Deflator	-0,31	-0,20	-0,08	-0,09	-0,14	-0,22	-0,29	-0,33	-0,32	-0,30	-0,25	-0,22	-0,18	-0,14	-0,09	-0,08	-0,08	-0,08	-0,08	-0,09	-0,10	-0,11	-0,12	-0,13	-0,14	-0,15
GDP and Components	*Levels, percentage deviations from baseline*																									
GDP	-0,05	-0,10	-0,14	-0,12	-0,06	0,07	-0,03	-0,05	-0,06	-0,06	-0,08	-0,09	-0,11	-0,13	-0,14	-0,13	-0,14	-0,14	-0,14	-0,13	-0,11	-0,10	-0,08	-0,07	-0,05	-0,04
Consumption	-0,02	-0,14	-0,25	-0,24	-0,17	0,01	0,01	0,00	-0,02	-0,05	-0,08	-0,12	-0,16	-0,20	-0,23	-0,25	-0,26	-0,26	-0,25	-0,24	-0,23	-0,22	-0,20	-0,18	-0,16	-0,14
Investment	-0,08	-0,25	-0,36	-0,30	-0,17	0,06	-0,02	-0,06	-0,10	-0,14	-0,19	-0,23	-0,28	-0,32	-0,35	-0,36	-0,37	-0,37	-0,35	-0,32	-0,29	-0,25	-0,22	-0,19	-0,15	-0,12
Of which: Residential Inv.	-0,09	-0,51	-0,65	-0,49	-0,28	0,08	0,00	0,01	-0,13	-0,24	-0,37	-0,48	-0,57	-0,63	-0,67	-0,68	-0,65	-0,61	-0,57	-0,52	-0,46	-0,41	-0,36	-0,30	-0,26	-0,21
Gov. Consumption	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exports	-0,10	-0,03	0,02	0,05	0,08	0,13	-0,13	-0,11	-0,09	-0,07	-0,05	-0,04	-0,02	-0,01	0,01	0,02	0,02	0,03	0,04	0,04	0,05	0,06	0,07	0,08	0,09	0,10
Imports	-0,10	-0,24	-0,31	-0,27	-0,14	-0,06	0,03	-0,17	-0,12	-0,13	-0,17	-0,22	-0,27	-0,32	-0,37	-0,22	-0,31	-0,33	-0,32	-0,29	-0,25	-0,22	-0,18	-0,15	-0,12	-0,10
Contributions to Shock	*Percentage of GDP, absolute deviations from baseline*																									
Domestic Demand	-0,03	-0,13	-0,21	-0,19	-0,13	0,02	0,00	-0,01	-0,03	-0,06	-0,08	-0,11	-0,14	-0,17	-0,20	-0,21	-0,21	-0,21	-0,21	-0,20	-0,18	-0,17	-0,15	-0,14	-0,12	-0,10
Inventories	-0,02	-0,02	0,01	0,01	0,02	0,00	-0,03	0,01	0,01	0,01	0,02	0,04	0,05	0,06	0,07	0,04	0,06	0,07	0,07	0,07	0,06	0,06	0,05	0,05	0,05	0,04
Trade Balance	0,00	0,04	0,06	0,06	0,05	0,05	0,00	-0,05	-0,03	-0,02	-0,01	-0,01	-0,02	-0,02	-0,02	0,04	0,01	0,00	0,00	0,01	0,01	0,01	0,02	0,02	0,02	0,02
Labour Market	*Levels, percentage deviations from baseline, except unemployment: percentage points, absolute deviations from baseline*																									
Total employment	-0,01	-0,03	-0,05	-0,06	-0,04	0,03	0,00	-0,01	-0,01	-0,02	-0,02	-0,03	-0,03	-0,04	-0,05	-0,05	-0,05	-0,06	-0,06	-0,06	-0,06	-0,06	-0,05	-0,05	-0,04	-0,04
Employees in employment	-0,01	-0,03	-0,06	-0,07	-0,05	0,03	0,00	-0,01	-0,02	-0,02	-0,03	-0,03	-0,04	-0,05	-0,05	-0,06	-0,06	-0,06	-0,07	-0,07	-0,07	-0,06	-0,06	-0,05	-0,05	-0,04
Unemployment rate	0,01	0,02	0,03	0,03	0,02	-0,02	0,00	0,00	0,01	0,01	0,02	0,02	0,02	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,02	0,02	0,01	0,01
Household Accounts	*Levels, percentage deviations from baseline, except the savings rate: percentage points, absolute deviations from baseline*																									
Disposable income	-0,03	-0,17	-0,26	-0,22	-0,14	0,06	0,02	-0,02	-0,04	-0,07	-0,12	-0,15	-0,19	-0,22	-0,27	-0,26	-0,26	-0,25	-0,24	-0,23	-0,21	-0,19	-0,17	-0,15	-0,13	-0,11
Saving rate	-0,01	-0,02	-0,01	0,02	0,03	0,04	0,01	-0,01	-0,02	-0,02	-0,03	-0,02	-0,03	-0,02	-0,03	-0,01	0,00	0,01	0,01	0,02	0,02	0,02	0,03	0,03	0,03	0,03
Fiscal Ratios	*Percentage of GDP, absolute deviations from baseline*																									
Total Receipts	-0,01	-0,05	-0,08	-0,07	-0,06	-0,02	0,00	-0,01	-0,02	-0,03	-0,04	-0,05	-0,06	-0,07	-0,08	-0,08	-0,08	-0,08	-0,08	-0,07	-0,07	-0,07	-0,07	-0,06	-0,06	-0,06
Total Expenditure	0,00	0,02	0,04	0,03	0,02	-0,02	0,00	0,00	0,00	0,01	0,01	0,02	0,02	0,03	0,04	0,03	0,04	0,04	0,04	0,03	0,03	0,03	0,02	0,02	0,02	0,01
Budget surplus	-0,02	-0,08	-0,12	-0,11	-0,08	0,00	0,00	-0,01	-0,02	-0,03	-0,05	-0,07	-0,09	-0,10	-0,12	-0,12	-0,12	-0,12	-0,12	-0,11	-0,10	-0,10	-0,09	-0,09	-0,08	-0,07
Government debt	0,02	0,09	0,21	0,32	0,40	0,50																				
Financial Variables	*Percentage points, absolute deviations from baseline*																									
Short-term Int. Rates	1,00	1,00	0,00	0,00	0,00	0,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Long-term Int. Rates	0,16	0,06	0,00	0,00	0,00	0,00	0,20	0,17	0,15	0,12	0,10	0,08	0,05	0,03	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Demand	*Levels, percentage deviations from baseline*																									
World Demand	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices	*Levels, percentage deviations from baseline*																									
Effective Exchange Rate	0,54	0,21	0,00	0,00	0,00	0,00	0,66	0,58	0,50	0,41	0,33	0,25	0,17	0,08	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Foreign Prices (euro)	-0,53	-0,21	0,00	0,00	0,00	0,00	-0,65	-0,57	-0,49	-0,41	-0,33	-0,25	-0,17	-0,08	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Price of oil (euro)	-1,60	-0,62	0,00	0,00	0,00	0,00	-1,97	-1,73	-1,48	-1,24	-0,99	-0,74	-0,50	-0,25	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

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