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Macroeconomic modelling and the policy of restraint in the Netherlands

F.A.G. den Butter

On two occasions a major change in the structure of Dutch macroeconomic policy models has contributed to a broad political consensus on the policy of restraint pursued by the Dutch government. The first change occurred in the mid-1970s, when a clay-clay vintage model which endogenizes productive capacity and labour demand was added to the traditional Keynesian demand oriented short-term policy model. This new model provided the argument for wage restraint as a remedy for the unemployment problem. At the beginning of the 1980s the second change was the addition of a fully fledged monetary block to the models, which was intended to support the crowding out argument for the policy of cutting government expenditure. This paper investigates the validity of the above arguments by simulating the policy of restraint with three stylized representations of the three generations of Dutch policy models. These simulations and a sensitivity analysis on the crucial parameters of the models show that the models provide more support for a policy of wage restraint than for a policy of reducing government expenditure.

Keywords: Macroeconomic models; Dutch policy analysis; History of economic modelling

In the past one and a half decades the Netherlands has followed a policy of restraint in order to cure its two main economic problems: the high unemployment rate and the high government deficit. A policy of wage restraint has been regarded as the proper medicine to reduce unemployment, while cuts in government expenditure have been aimed at reducing the government deficit. A combination of both medicines is considered to be more effective than either on its own. In spite of differing shades of opinion, especially with regard to the reduction in expenditure, a fairly general consensus has emerged about the need for these policies. The relative ease with which they have been accepted in the Netherlands could be ascribed to the Dutch

character, which considers parsimony and not living above one's means to be virtues. A more probable explanation, however, is that economic arguments justifying the policy of restraint have been instrumental in its acceptance.

This paper evaluates these arguments. It looks especially at the influence of the policy simulations carried out using macroeconomic models on the public debate over the policy of restraint. The argument that wage restraint leads to a longer economic life for labour intensive vintages of capital goods, which become, for that reason, more profitable is crucial. Such restraint induces a growing demand for labour which, according to this argument, more than offsets the reduction in demand arising from lower wages and lower disposable income. In short the argument is that more profit means more work. An additional argument is that wage restraint enhances the competitive position of firms which also causes employment and demand to rise.

The crowding out argument has played a major role in gaining acceptance for the policy of reducing government expenditure. According to this mechanism

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an increasing government financial deficit which is financed on the capital market will cause a rise in the long-term interest rate and hence crowd out private sector expenditure and especially investment by enterprises. Cuts in government expenditure which reduce the government deficit will reverse this process. According to the same line of thought the fall in demand will, in the short run, lead to some decrease in economic activity and increase in unemployment, but in the long run positive effects on growth and employment will dominate. Interest payments by the government increase the government deficit, and therefore growing deficits and higher interest rates become self sustaining.

This paper investigates the above arguments against the background of three generations of Dutch macroeconomic policy models. The main question is whether the models used in the past in policy preparation do indeed support the policy of restraint. The effects of the policy of wage restraint and a reduction in government expenditure on the key economic indicators are computed by means of three stylized models, the working and structure of which imitates the three consecutive generations of Dutch policy models. These calculations show to what degree the mechanisms mentioned above have been at work in the various models and versions of the models. It provides insight into the validity of the arguments which have been put forward in support of the policy of restraint. A sensitivity analysis with respect to the parameters and specifications of the model equations plays a crucial part in the argumentation.

The next section summarizes the three models used in the simulation and surveys the interaction between policy and modelling in the Netherlands. The third section discusses the effects of a policy of wage restraint according to the three models and some variants and the subsequent section gives the results of these models for a reduction in government expenditure. The last section summarizes the results. The main finding is that the models convincingly support the policy of wage restraint. This is not, however, the case for the policy of reducing government expenditure. Other arguments offer better quantitative support for this policy.

Three generations of Dutch policy models

The Netherlands have a long standing tradition in the use of macroeconomic models for policy analysis. The results of policy simulations made with models are not only discussed by government experts and by academics but also in Parliament and by the press. These results carry weight in the design of macroeconomic policy. Three generations of policy models may be distinguished

(see Chapter 2 of den Butter [6]). Model based macroeconomic policy analysis was for a long time virtually the monopoly of the Dutch Central Planning Bureau. In the 1950s and 1960s, which were years of prosperous economic growth and nearly full employment, this Bureau used short-term demand determined Keynesian models for cyclical analysis. At the beginning of the 1970s a second generation of models replaced the first generation. This new generation endogenized the supply side of the economy, using a vintage approach for modelling productive capacity and labour demand. The third generation of models was built at the beginning of the 1980s. These models offer a fully fledged description of the monetary sector. A proliferation of the use of macromodels for policy purposes has also taken place. The Central Planning Bureau has lost its monopoly in this field as other government agencies, the Central Bank and research institutes at universities have started to use their own models for policy advice.

The changing generations of models have played an important part in model based support for the policy of restraint. The first turning point was at about 1975 when the Central Planning Bureau started to use the VINTAF model. The clay-clay vintage approach by den Hartog and Tjan [18], [19] in this model showed that a rise in real wages exceeding the rate of technical progress causes increased scrapping of capital goods and hence increased unemployment. In 1977 the Central Economic Commission, a commission of civil servants directly involved in economic policy preparation, based its projections and policy advice for the medium term on the results of the VINTAF model. This evoked a unique and vivid discussion on the merits and shortcomings of the model among academics and government specialists (see Driehuis and van der Zwan [10]). In spite of critical comments on the model raised in this discussion it is nowadays clear that the vintage model and the mechanisms it describes have been instrumental in the general political acceptance of the policy of wage restraint in the Netherlands.

The formation of the Lubbers I cabinet in 1982 marked a second turning point in the use of macroeconomic models for policy analysis in the Netherlands. On 15 September, on behalf of the cabinet, the Presidium of the Central Economic Commission (CEC) published a memorandum which surveyed economic developments and the consequences of a number of policy measures for the next period of government. The various scenarios in this memorandum were calculated by the Central Planning Bureau's new FREIA model which was making its first public appearance. Chart 1 in this memorandum has had a particularly large impact on the economic policy proposals in the so called government agreement of

the Lubbers I cabinet. This chart gives a graphic representation of the mechanism already mentioned in the introduction, that a policy of reducing the government deficit by reducing government expenditure will in the short run lead to less private expenditure and employment but in the long run have favourable effects on the economy. Quite remarkably, nobody outside the Central Planning Bureau knew about the FREIA model at the time when the CEC memorandum was published. It is true that an annex to the memorandum contained a short description of the new model. However, this annex provided insufficient information on the working of the model. It was more than a year later, in November 1983, that the Central Planning Bureau published a monograph with an extensive description of the FREIA model. However, according to the simulations in this monograph a reduction in government expenditure does not lead to the same complete turnaround as is implied by the simulations in the CEC memorandum. (The simulations of the CEC memorandum are probably based on a number of supplementary assumptions.)

The simulations of the policy of restraint in the next sections are made with stylized versions of a quarterly model for the Netherlands (based on den Butter [6]), which incorporate as far as possible the main characteristics and mechanisms of the three generations of Dutch policy models. The first model, named Mod C (C = cycle), represents the first generation demand determined Keynesian models. The second model, Mod CS (S = structure), adds a supply side block determining productive capacity and labour demand to Mod C. This block closely resembles the vintage approach of the second generation of policy models. The third model, Mod CSM (M = monetary), extends Mod CS with a number of behavioural equations and identities from the monetary sector. As such this model represents the third generation of Dutch policy models.

Instead of comparing the results of existing models we use these stylized versions of the models, for a number of reasons. First, the models used by us do not contain as much detail as the proper policy models. This allows us to concentrate on those changes in the model specifications which lead to a major change in the working of the models. Second, all our models use the same data, whereas in practice in policy analysis the comparison of simulation results is obscured by a frequent changing and updating of the data. Moreover some of the policy models are quarterly models while others are yearly models. Third, in comparing actual policy models the selection of models to represent the respective generations would be very difficult. The three generations distinguished by us comprise several models which show considerable differences within each generation.

Table 1. Content of the models.

Model	Equations
Mod C	Consumption function Investment equation Export equation Import equation Stockbuilding Definition of income Demand for money function Wage and price equations Inflationary expectations formation (Income related labour demand)
Mod CS	Mod C plus Productive capacity and labour demand determined by quasivintage approach Labour supply equation
Mod CSM	Mod CS plus Equation for net foreign capital market transactions of the private sector Balance of payments identity Technical equation for interest payments by the government Government budget restriction Demand for credit equation Macroeconomic budget restriction Interest equation

Table 1 summarizes the main characteristics of the three stylized models used here: Mod C, Mod CS and Mod CSM. Mod C mainly consists of the usual macroeconomic expenditure equations. This model also includes a demand for money equation which, in combination with the expenditure equations, constitutes the empirical counterpart of the traditional IS-LM model. Finally, Mod C comprises two equations determining wages and prices and an equation for the formation of inflationary expectations. In order to be able to simulate effects on employment this model has a very simple equation relating labour demand to income.

As well as incorporating Mod C, Mod CS describes productive capacity and labour demand by means of a quasivintage approach. Although this approach does not relate full capacity labour demand directly to the respective vintages of capital goods but instead to total productive capacity, its working is very similar to that of the various versions of the vintage approach in the policy models. In these policy models the specification of the vintage model (clay-clay or putty-clay) and the assumptions about scrapping fully determine the relationship between labour costs and scrapping. The advantage of our approach over the traditional vintage model is that our approach describes the influence of labour costs on scrapping by means of a coefficient which is to be determined empirically and can therefore be subjected to a sensitivity analysis. In addition to the vintage block Mod CS comprises a simple equation

determining labour supply. In view of the actual labour market situation in the Netherlands in the 1970s and 1980s we have assumed no supply constraints in our modelling of labour demand and hence have not used Kooiman's [21] more sophisticated disequilibrium approach according to which actual employment is a weighted sum of effective labour supply and demand.

Mod CSM extends Mod CS with a monetary submodel which comprises three behavioural equations, for net private sector foreign capital transactions, for private sector total demand for credit – both short- and long-term – and for long-term interest rate formation. This model also relates government interest payments, which play an important role in the argument supporting the reduction of the deficit, to the interest rate level and the cumulated deficit. Finally, this model comprises three macroeconomic identities: the balance of payment identity, the government budget constraint and the macroeconomic budget constraint. These formally close the model.

The specifications of the models' equations and the selected values of their coefficients are, for the most part, based on the empirical literature. In this selection process the outcomes of the Dutch policy models have played a prominent part. Hence the coefficients are deliberately not determined by estimation. Our procedure aims to exploit as much as possible the empirical knowledge on the Dutch economy obtained in the course of time. Of course, selecting equation specifications and coefficient values from the literature is rather arbitrary. Yet, in our opinion, such a compilation of empirical knowledge exploits much more information than a mere respecification and re-estimation of behavioural relationships that have been studied extensively before. Moreover, experience tells us that a re-estimation of traditional macroeconomic behavioural equations always needs a look at other empirical evidence in order to obtain plausible estimates. This makes the estimation procedure about equally, or even more, arbitrary.

After the selection of the equation specifications and the coefficient values, the performance of the models is tested by a dynamic simulation over the period 1973–86. The results of these dynamic simulations appear to be most satisfactory, the more so as none of these models contains dummy variables which comply with specific events (a common feature of actual policy models). Most equations from the real sector and the demand for money function have a log linear specification, the values of the coefficients representing elasticities. Moreover, most equations comprise a partial adjustment mechanism in order to describe lagged reactions.

Table 2 gives the explanatory variables for each behavioural equation, the selected long-run elasticities

or, in case calculation of an elasticity does not make sense, the relevant long-run effects, and the selected mean lags. The appendix contains a formal definition of the models and their equations. It also comprises a list of symbols. For more detail and information on the selected models and for references to the literature we refer to den Butter [6]. Barten [3] and d'Alcantara [2] give a survey of, respectively, the history of macroeconomic modelling in the Netherlands and of the working of the actual policy models (see van den Berg *et al* [4] and van Erp *et al* [11] for the Central Planning Bureau's recent FREIA–KOMPAS model).

Simulations of a wage restraint

This section investigates the differences in working of the three generations of Dutch policy models with respect to wage restraint. The policy of wage restraint is simulated by means of a permanent and autonomous 2% reduction of the wage rate over a period of 24 quarters (6 years). In this simulation the wage rate remains endogenously determined by the wage equation. The baseline projection is based on the values of the exogenous variables in the fourth quarter of 1986. The autonomous reduction in the wage rate starts in the first quarter of the simulation period. The effects of the reduction of wages are measured as differences from the baseline projections. In each behavioural equation the constant term is set equal to its mean value in the reference period, given the selected values of the coefficients.

The first part of Table 3 shows the effects of the autonomous reduction in wages according to Mod C. The initial wage reduction by 2% appears to result in a final nominal reduction in wages of more than 4% because of the working of the wage–price spiral. Apart from some second order effects the final reduction of real wages is, indeed, about 2%. The results of this simulation illustrate that the fall in demand – the Keynesian demand effect of the wage restraint – brings about a fall of real income in the first quarter only. After this first quarter the influence of the enhanced competitive position, which leads to a rise in exports and therefore in total expenditure, by and large dominates the Keynesian demand effect. According to this model the reduction in wages finally leads to a rise in the demand for labour of 1.2%, which corresponds to a reduction in unemployment of 44 000 labour years. The government deficit decreases as a result of the wage restraint because in this model government expenditure is exogenous and tax revenue increases in line with the rise of income. Remarkably, according to this model, the policy of wage restraint causes a worsening of the current account of the balance of payments. It is true that the increase in the volume of

Table 2. Selected values of long-run elasticities and/or size of long-run effects and mean lags.

Dependent variable	Explanatory variables	Elasticity/ long-run effect ^a	Mean lag (in quarters)
Consumption	Disposable income	0.8	0.25
	Real interest rate	-0.025	1.25
	Broadly defined money stock	0.15	0.25
Investment	Income	1.0	0.25
	Real interest rate	-0.1	1.25
	Broadly defined money stock	0.15	0.25
	Profitability	-0.2 (with respect to 10% wage increase)	0.25
	Utilization rate of capital stock	-0.5	0.25
Exports	World trade	1.0	None
	Ratio of foreign and domestic price level	2.0	1.5
Imports	Income	1.0	None
	Ratio of foreign and domestic price level	-0.75	1.5
	Utilization rate of capital stock	1.0	1.5
Stockbuilding	Income	0.5% _y	None
Money stock	Income	1.0	4
	Long-term interest rate	-0.2	4
	Short-term interest rate	0.2	4
	Inflation	-0.2	4
	Utilization rate of labour	-1.0	4
Price level	Wage level	0.6	4
	Utilization rate of capital stock	0.25	4
	Labour productivity	-0.8	4
	Burden of taxation	0.5	4
	Price of imports	0.4	4
Wage level	Price level	1.0	1
	Utilization rate of labour	0.5	1
	Labour productivity	1.0	1
	Burden of taxation	0.25	1
Inflationary expectations	Actual inflation	Identical	1
Labour demand (by quasivintage approach)	Investment	0.15	---
	Utilization rate of capital stock	0.5	2
	Real wages	-0.5	---
	Costs of capital	0.05	---
	Hours worked	-0.5	None
	Life of equipment on average	15 years	---
	Labour saving technical progress	5% per year	---
	Capital saving technical progress	-0.9% per year	---
Labour supply	Working age population	1.0	1
	Utilization rate of labour	0.3	1
Net foreign capital transactions of private sector	Change in foreign and domestic interest rate difference	600 million guilders per percentage point interest rate difference	1
	Exchange rate expectations	200 million guilders per percentage point appreciation expectation	1
	Balance of payments' current account	50% of surplus goes abroad	1
Demand for credit by private sector	Change in nominal income	2.5 times change in income	4
	Financial surplus of private sector	50% of surplus for internal financing	4
	Long-term interest rate	-0.5	4
Long-term interest rate	Inflationary expectations	0.15 × percentage change	None
	Short-term interest rate	0.15 × percentage change	None
	Foreign interest rate	0.70 × percentage change	None
	Exchange rate expectations	0.10 × percentage change	None
	Net long demand for credit private sector	0.25 percentage point per 1% <i>Y</i>	None
	Net capital market financing of government	0.25 percentage point per 1% <i>Y</i>	None

^a In cases where the specification of the equation does not allow the interpretation of the selected value of the coefficient as an elasticity, the long-run effect is given, as indicated, in another way.

Mod CSM (third generation)	quarter				1 year				3 years				6 years			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	-0.5	1.2	2.1	2.5												
	-1.5	1.0	1.8	2.2												
	-0.4	4.2	2.0	3.1												
	-0.2	-0.8	-1.5	-1.6												
	-2.1	-4.2	-4.9	-4.2												
	0.0	1.3	2.6	2.6												
	-0.1	0.6	1.0	1.0												
	-1	-41	-73	-70												
	0.4	-0.3	-0.1	-0.3												
	0.2	-0.2	-0.4	-0.5												
	0.1	-0.1	-0.1	-0.1												

exports is stronger than that of imports, but the domestic price deflation leads to a fall in the terms of trade which is large enough to result in a balance of payments deficit in terms of value.

According to Mod C the improvement in the competitive position appears to constitute the main channel through which the policy of wage restraint enhances employment. This is, however, the case under the assumption of fixed exchange rates. Yet most probably the decrease in domestic prices will finally

Figure 1. The effects of an autonomous reduction in the wage rate of 2% according to two variants of the first generation models and one of the third generation.

formation this model yields similar simulation results to Mod C. The main differences occur with labour demand and unemployment. At the end of the simulation period the level of employment appears to be 2.6% higher than in the baseline projection and 1.4% higher than in the simulation according to Mod C. According to Mod CS the reduction in unemployment arising from wage restraint amounts to about 70 000 labour years, whereas it amounts to 44 000 labour years according to Mod C. These differences can be completely ascribed to the extension of the model with the supply side block including the labour costs mechanism. The simulation results of Table 3 show that a reduction in wages may have a substantial supply side effect on labour demand. It neatly illustrates that building the supply side into the model by means of the vintage approach provides a convincing argument in support of the policy of wage restraint. Finally, Table 3 gives the effects of a reduction in wages according to Mod CSM. The results demonstrate that the addition of a monetary block to the model hardly changes the calculated effects of a reduction in wages. Hence such

an addition does not alter the working of the model very much in this respect.

Figure 1 graphically illustrates the effects of a reduction in wages on unemployment. Again it is shown how, according to Mod C, this impulse leads to a decrease in unemployment because of the improvement in the competitive position. According to the version of Mod C with flexible exchange rates (Mod Cw) this favourable effect appears to be fully offset by appreciation. The effects on unemployment are of about equal size in Mod CS and Mod CSM. Therefore the figure only shows the effect of Mod CSM. The difference between the effects according to Mod C and Mod CSM (Mod CS) indicates the size of the supply side effect on unemployment.

Table 4 gives the results of a sensitivity analysis of Mod CSM with respect to the coefficient representing the influence of real labour costs on scrapping in the vintage block. Where the vintages are explicitly modelled the specific shape of the vintages and the scrapping criteria largely determine this influence. In the quasi-vintage approach the respective coefficient has to be

Table 4. The effects of an autonomous reduction in the wage rate of 2% (in % of the baseline projection, unless otherwise stated).

	Mod CSM (third generation)				Mod CSMh (halving coefficient of scrapping)				Mod CSMd (doubling coefficient of scrapping)				
	After	1 quarter	1 year	3 years	6 years	1 quarter	1 year	3 years	6 years	1 quarter	1 year	3 years	6 years
Volume of income		-0.5	1.2	2.1	2.5	-0.5	1.2	2.0	2.5	-0.5	1.2	2.3	2.3
Volume of private consumption		-1.5	1.0	1.8	2.2	-1.5	0.9	1.7	2.3	-1.4	1.2	1.8	1.6
Volume of investment		-0.4	4.2	2.0	3.1	-0.3	5.0	1.6	3.4	-0.4	3.1	1.9	1.6
Price level		-0.2	-0.8	-1.5	-1.6	-0.2	-0.8	-1.6	-1.7	-0.2	-0.7	-1.2	-1.2
Wage level		-2.1	-4.2	-4.9	-4.2	-2.2	-4.2	-4.5	-3.8	-2.1	-4.2	-5.9	-6.0
Demand for labour		0.0	1.3	2.6	2.6	-0.0	0.8	1.7	2.2	0.1	2.4	5.5	5.8
Money stock (deflated)		-0.1	0.6	1.0	1.0	-0.1	0.7	1.5	1.3	-0.1	0.3	-0.7	-1.4
Unemployment (in thousand labour years)		-1.0	-4.1	-7.3	-7.0	1	-2.3	-4.6	-5.5	-5	-9.1	-21.0	-22.1
Surplus current account		0.4	-0.3	-0.1	-0.3	0.4	-0.4	-0.2	-0.5	0.4	-0.2	0.4	0.5
(in % national income													
Government financial deficit		0.2	-0.2	-0.4	-0.5	0.2	-0.2	-0.4	-0.5	0.2	-0.2	-0.5	-0.6
(in % national income)													
Interest rate (percentage points)		0.1	-0.1	-0.1	-0.1	0.1	-0.2	-0.1	-0.1	0.1	-0.1	-0.0	-0.1

determined empirically. This coefficient is set to a value of 0.4 in the central variant, which corresponds to a long-run demand for labour elasticity of real labour costs of about -0.5 when the vintage block is simulated in isolation from the rest of the model. The first part of Table 4 copies the effects of a reduction of wages according to the central variant of Mod CSM from Table 3.

The sensitivity analysis compares the central variant with two alternatives. It first considers a variant in which the value of the coefficient is set to 0.2, which is half its value in the central variant. The second variant represents the case of a large influence of labour costs on scrapping. The value of the coefficient is doubled and is set equal to 0.8. Halving the coefficient of scrapping has, as the second part of Table 4 shows, relatively little influence on the effects of a reduction in wages on expenditure and on wage and price formation. The influence on unemployment is, as expected, somewhat lower than in the central variant. Hence the favourable effect on labour demand is also somewhat lower in this variant.

Doubling the value of the respective coefficient appears to affect the working of the model considerably. This is illustrated by the results in the righthand side of Table 4, which show a remarkable endogenous decrease in real wages. The large gap between the wage and price level is due to a decrease in labour productivity induced by less scrapping than in the baseline projection. As the model assumes exogenous labour saving technical progress and scrapping is determined by the difference between real wage growth and technical progress, second order effects magnify the real labour cost mechanism. Therefore, according to this variant, the reduction in wages results in huge effects on employment. Both the increase in labour demand and the reduction in unemployment are more than twice as large as in the central variant.

Figure 2 shows the effect of a reduction in wages on unemployment according to the three variants of Mod CSM. The figure again illustrates the sensitivity of the model to the size of the influence of labour costs on scrapping. It underwrites the importance of an empirical analysis of this influence in model based support for the policy of wage restraint.

Simulating a reduction in government expenditure

The large increase in the government deficit at the beginning of the 1980s has somewhat deflected the attention from the policy of wage restraint to the policy of reducing government expenditure. Table 5 gives the effects of such a policy of reduction of public spending according to the three representations of the three

Figure 2. The effects on unemployment of an autonomous reduction in the wage rate of 2% according to three variants of the third generation model.

generations of Dutch policy models in this paper. As these are stylized models, the design of the expenditure policy needs to be rather simple. The simulations consider a permanent reduction in exogenous government expenditure to the amount of 1% of national income. It is assumed that the reduction starts in the first quarter of the simulation period.

The results for Mod C presented in the first part of Table 5 illustrate that the expenditure policy indeed leads to the desired reduction in the government deficit. However, over the whole simulation period total expenditure remains below the baseline level. Demand for labour decreases somewhat and hence unemployment increases. The Phillips curve effect induces a slight reduction of wages. Prices do not deviate much from baseline level because the opposite effects of the decrease in the utilization rate of capital goods and of the decrease in labour productivity almost compensate for each other in the price equation. The reduction in

unaltered the expenditure policy causes a surplus on the current account of the balance of payments.

The effects of the expenditure policy according to Mod CS hardly differ from those according to Mod C. This is shown by the second part of Table 5. The fall in labour demand is somewhat less in Mod CS than in Mod C because the decrease in real labour costs somewhat enhances labour demand via the supply side block and this partly counterbalances the decrease in labour demand induced by the fall in total demand.

The third part of Table 5 shows that the effects of the expenditure policy in Mod CSM hardly differ from the effects in both models discussed above. This is remarkable as no substantial crowding in of private expenditure appears to result from this policy. As a matter of fact the simulations with Mod CSM show no switch from unfavourable to favourable effects even in the long run. In conformity with the crowding in

Table 5. The effects of an autonomous reduction in government expenditure of 1% of national income (in % of the baseline projection, unless otherwise stated).

	Mod C (first generation)				Mod CS (second generation)				Mod CSM (third generation)				
	After	1 quarter	1 year	3 years	6 years	1 quarter	1 year	3 years	6 years	1 quarter	1 year	3 years	6 years
Volume of income		-0.9	-0.9	-0.7	-0.6	-0.9	-1.0	-0.7	-0.7	-0.9	-0.9	-0.7	-0.6
Volume of private consumption		-0.8	-1.1	-0.6	-0.5	-0.8	-1.0	-0.7	-0.6	-0.8	-1.0	-0.6	-0.4
Volume of investment		-1.5	-2.2	-1.7	-0.9	-1.5	-2.2	-1.5	-0.9	-1.4	-2.0	-1.2	-0.5
Price level		-0.0	-0.0	-0.1	-0.2	-0.0	-0.0	-0.1	-0.1	-0.0	-0.0	-0.1	-0.1
Wage level		-0.1	-0.8	-0.6	-0.6	-0.1	-0.7	-0.7	-0.6	-0.1	-0.7	-0.6	0.5
Demand for labour		-0.1	-0.5	-0.3	-0.3	-0.1	-0.4	-0.2	-0.3	-0.1	-0.4	-0.2	0.3
Money stock (deflated)		-0.2	-0.4	-0.3	-0.3	-0.2	-0.4	-0.5	-0.5	-0.1	-0.3	-0.2	-0.1
Unemployment (in thousand labour years)	5	19	12	12	12	4	13	6	8	4	13	6	8
Surplus current account (in % national income)	0.8	1.0	0.9	0.8	0.8	0.7	1.0	0.9	0.8	0.7	1.0	0.8	0.7
Government financial deficit (in % national income)	-0.8	-0.8	-0.8	-0.8	-0.9	-0.8	-0.8	-0.8	-0.7	-0.8	-0.8	-1.0	-1.2
Interest rate (percentage points)										-0.1	-0.1	-0.1	-0.2

rate. Investment is hardly affected by this decrease. In this respect we note that the reduction in the government deficit results in a decrease in the financial surplus of the private sector as well. The improvement to the balance of payments appears not to be sufficient to neutralize this effect. Therefore capital market financing by the private sector increases, which somewhat reduces the downward pressure on the interest rate caused by the decreased capital financing of the government. Yet the effect of the policy of reducing government expenditure on the government deficit appears in the end to be somewhat larger in Mod CSM than in either of the other models. This is due to government interest payments, which are endogenous in Mod CSM. This part of government expenditure reduces somewhat as a result of the decrease in the deficit and the fall in the interest rate.

These simulations clearly show that according to Mod CSM the crowding in effect is of no quantitative importance. Hence the extension of Dutch policy models by a monetary sector submodel appears not to provide a strong argument for the policy of reducing government expenditure. The two chains in the crowding out mechanism, namely the interest rate sensitivity of investment and the influence of government capital market financing on the long-term interest rate, are too weak to make this argument of quantitative importance. This is not only true for the stylized third generation model, Mod CSM, used here but for most of the Dutch third generation models which are actually used in policy analysis (see eg Table 6.8 in De Nederlandsche Bank [26]; Table 5.6 in Kuipers *et al* [22]; Table 5.4 in Centraal Planbureau [8]; Table 4 in Okker [27]; and Table 9 in den Butter [7]).

This raises the interesting question of how to quantify what degree of influence of the interest rate on investment, and what degree of influence of capital market financing on the interest rate (the crowding in mechanism), in fact sets in motion the alleged switch from an unfavourable to a favourable effect. Table 6 presents the results of such a sensitivity analysis. Although the interest rate and/or capital costs appear as explanatory variables in the expenditure equations in almost all macroeconomic models, the estimated negative influence of these variables proves to be rather small. The basic variant of the models used here assumes a long-run elasticity of the real interest rate with respect to investment of -0.1 (see Table 2). The influence of capital financing, and especially of the government deficit on the long-term interest rate, has recently attracted much empirical attention (see eg Acx and de Vijlder [1], Bovenberg [5], Evans [12], [13], Feldstein [15], Hoelscher [20], Naudts and Schokkaert [25], van Sinderen [28], Zahid [34], Tanzi [30], with a reaction by Spiro [29], and a reply

Table 6. The effects of an autonomous reduction in government expenditure of 1% of national income (in % of the baseline projection, unless otherwise stated).

	According to Mod CSM40 (third generation, quadrupling interest rate elasticity of investment)					Mod CSM04 (quadrupling influence of capital market financing on interest rate)					Mod CSM44 (quadrupling of both coefficients)					Mod CSM44 (exogenous interest payments of government)				
	After	1 quarter	1 year	3 years	6 years	1 quarter	1 year	3 years	6 years	1 quarter	1 year	3 years	6 years	1 quarter	1 year	3 years	6 years			
Volume of income		-0.9	-0.7	-0.4	-0.1	-0.9	-0.9	-0.5	-0.3	-0.9	-0.8	-0.3	0.2	-0.9	-0.8	-0.4	-0.2			
Volume of private consumption		-0.7	-0.5	0.0	0.4	-0.8	-0.9	-0.3	0.2	-0.7	-0.8	-0.1	0.8	-0.7	-0.8	-0.3	0.1			
Volume of investment		-1.3	-0.7	0.5	1.3	-1.4	-1.8	-0.6	0.8	-1.4	-1.0	1.5	5.2	-1.4	-1.1	0.5	1.9			
Price level		-0.0	-0.0	-0.1	-0.1	-0.0	-0.0	-0.1	-0.1	-0.0	-0.0	-0.1	-0.1	-0.0	-0.0	-0.1	-0.1			
Wage level		-0.1	-0.6	-0.4	-0.2	-0.1	-0.7	-0.2	-0.3	-0.1	-0.7	-0.5	0.0	-0.1	-0.7	-0.5	-0.3			
Demand for labour		-0.1	-0.3	-0.0	0.0	-0.1	-0.4	-0.2	-0.3	-0.1	-0.4	-0.0	0.2	-0.1	-0.4	-0.1	-0.0			
Money stock (deflated)		0.3	0.9	1.8	2.6	-0.1	-0.1	0.3	1.2	-0.1	-0.1	0.4	1.7	-0.1	-0.1	0.2	0.6			
Unemployment (in thousand labour years)	4	10	2	0	0	4	13	6	8	4	11	1	-5	4	11	2	1			
Surplus current account (in % national income)	0.7	0.8	0.6	0.4	0.4	0.7	0.9	0.7	0.4	0.7	0.9	0.6	0.1	0.7	0.8	0.8	0.4			
Government financial deficit (in % national income)	-0.9	-1.0	-1.2	-1.4	-1.4	-0.8	-0.9	-1.2	-1.6	-0.8	-1.0	-1.3	-2.1	-0.8	-0.9	-0.9	-0.9			
Interest rate (percentage points)	-0.2	-0.2	-0.2	-0.2	-0.2	-0.1	-0.2	-0.4	-0.7	-0.1	-0.2	-0.5	-0.9	-0.1	-0.2	-0.3	-0.4			

by Tanzi [31]). None of these studies indicates that the deficit has a large influence on the interest rate and it most certainly does not in small open economies such as the Netherlands where domestic interest rates are, to a large extent, determined by foreign interest rates. Van Loo [23] surveys a number of empirical results for the Netherlands. With reference to this survey the basic variant of the models used here assumes that a reduction in capital market financing by the government by the amount of 1% of national income leads to a fall in interest rates of 0.25 percentage points. The corresponding coefficient with respect to private sector capital market financing is set to the same value.

The sensitivity analysis investigates a quadrupling of these coefficients, first one by one, and then together. The first part of Table 6 gives the effects of the expenditure policy according to the variant of Mod CSM in which the real interest rate elasticity of investment has been quadrupled and hence has reached a long-run value of -0.4. The outcomes of this simulation appear to be hardly different from those of the basic variant in the short run. As in the basic variant the reduction in expenditure leads to a fall in demand in the first year of the shock and the negative effect on employment is almost as large as in the basic variant. However, in the long run the decreased real interest rate induces a considerable increase in consumption and investment, so that total income and employment are almost on a par with the baseline values in the sixth year, in spite of the fall in demand.

The next variant has the influence of capital market financing on the interest rate quadrupled. This variant assumes that a reduction in capital market financing to the amount of 1% of national income causes the interest rate to fall by 1 percentage point; this influence is notably larger than that measured in the empirical studies surveyed by van Loo. The simulation results in the second part of Table 6 show that in this case the reduction in government expenditure leads to a substantial decrease in the interest rate in the long run. Yet the effect of this decrease on total expenditure and on demand for labour appears to be rather small. In this case the initial fall in income is not fully compensated for by the higher volumes of consumption and investment at the end of the simulation period.

The third part of Table 6 gives the simulation results for the variant of Mod CSM in which the size of both chains in the crowding out mechanism has been quadrupled. In this case, with government interest rates acting as a transmission mechanism, the falling of the interest rate and the reduction in the government deficit appear to interfere in such a way that at the end of the simulation period of six years total expenditure and labour demand are above baseline

Figure 3. The effects of an autonomous reduction in government expenditure of 1% of national income on the financial deficit of the government according to four variants of the third generation model.

level. Investment provides the motor for this turnaround. Yet even according to this variant in which the relevant coefficients have values which are hardly realistic, the reduction in government expenditure does not lead to a substantial increase in labour demand after six years. This corroborates the conclusion drawn above that the crowding in mechanism does not, in this respect, provide empirical support for the policy of reducing public expenditure.

The alleged influence of government interest payments has played a major role in discussion of government expenditure policy in the Netherlands (see eg Wellink [33], and for a different opinion, van Muiswinkel [24]). In order to investigate this influence the last part of Table 6 gives the results of the expenditure policy according to a variant of Mod CSM in which the relevant coefficients are quadrupled, as in the previous variant, but in which the interest payments by the government are assumed to be exogenous. A comparison of the results from this and the previous variant shows that the interaction between the fall in interest rates and the size of interest payments is of such an order of magnitude that the final effect of a

reduction in expenditure on the financial deficit and on the long-term interest rate is more than doubled. In this case crowding in via the interest rate mechanism would be of quantitative importance and interest payments by the government would be an important chain in this mechanism.

Figure 3 illustrates the above sensitivity analysis graphically. The figure again shows that the largest reduction in the deficit occurs when both the influence of the interest rate on investment and the influence of capital market financing on the interest rate are quadrupled. The link between capital market financing and the interest rate appears to be somewhat more important than the link between the interest rate and investment.

Concluding remarks

This paper investigates the quantitative importance in the Netherlands of a number of arguments in support of the policy of restraint by means of representations of three generations of Dutch policy models. Den Hartog and Tjan's [18], [19] vintage approach has

undoubtedly led to a consensus in the Netherlands on the need for a policy of wage restraint in order to reduce unemployment. Indeed, the exercises with the models show that wage restraint and the consequent

the degree to which the long-term interest rate affects expenditure, and investment in particular. Only in a case where the respective coefficients are set to implausibly high values do the favourable effects of

reduction in labour costs enhances employment as it lengthens the economic life of capital goods. The working of this mechanism appears to be much stronger than that of the Keynesian mechanism according to which a wage restraint leads to a fall in demand and therefore to a decrease in employment. Besides, the competitive position, improved by wage restraint, exerts a stimulating influence on total expenditure and labour demand, even in the case where appreciation of the guilder mitigates the improvement in the competitive position.

In short, the extension of the macroeconomic policy models with a vintage approach describing the supply side has indeed provided major support for the policy of wage restraint. Yet sensitivity analysis shows that the influence of wage restraint on employment strongly depends on the specification of the vintage model and of the screening condition. In the Netherlands many

the reduction in government expenditure, according to this mechanism, appear to offset the fall in demand induced by the policy of restraint. We therefore conclude that, from this point of view, the use of a third generation of policy models with a fully fledged monetary sector does not support the expenditure restraint policy.

This is certainly not to say that no economic arguments can be put forward in support of that policy. Experiments with the models only show that it has not been correct to focus the presentation of the policy of reducing government expenditure on the crowding out argument, with government interest payments as a supplementary argument. The normative arguments such as, for instance, those given in the report of the Commission of Economic Experts (Commissie Economische Deskundigen [9]), provide sufficient support for the expenditure policy since undoubtedly

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Appendix

Equations

Expenditure

$$\ln c = \text{const} + 0.2 \ln c_{-1} + 0.64 \ln y_b - 0.3 \{ \ln (r + 100) / \ln (\dot{p}^e + 100) \}_{-1} + 0.12 \ln m2 \quad (1)$$

$$\begin{aligned} \ln i = \text{const} + 0.2 \ln i_{-1} + 0.8 \ln y - 1.2 \{ \ln (r + 100) / \ln (\dot{p}^e + 100) \}_{-1} + 0.12 \ln m2 \\ - 1.6 \ln (\dot{w} - \dot{p} - \dot{a}_g + 100) + 0.4 \ln q_k \end{aligned} \quad (2)$$

$$i_{gem} = \frac{1}{4} \sum_{j=0}^3 i_{-j} \quad (3)$$

$$i_{wo} = (i_{gem} / i_{gem-1}) i_{wo-1} \quad (4)$$

$$\ln b = \text{const} + 0.6 \ln b_{-1} + 1.0 (\ln m_w - 0.6 \ln m_{w-1}) + 0.8 \ln p_m / p_v \quad (5)$$

$$\ln m = \text{const} + 0.6 \ln m_{-1} + 1.0 (\ln y - 0.6 \ln y_{-1}) - 0.3 \ln p_m / p_v + 0.4 \ln q_k \quad (6)$$

$$n = 0.005 \cdot y \quad (7)$$

$$y = c + i + i_{wo} + g + b - m + n + y_{aut} \quad (8)$$

$$y_b = (y - ty) \frac{(w/p)(a + a_{ov})}{(w/p)_{-1}(a + a_{ov})_{-1}} \quad (9)$$

$$q_k = y / y^n \quad (10)$$

$$ty = t \cdot y \quad (11)$$

Money demand

$$\begin{aligned} \ln m2 = \text{const} + 0.8 \ln m2_{-1} + 0.2 \ln y - 0.48 \ln (r + 100) - 0.2 \ln (\dot{p} + 100) \\ - 0.2 \ln q_L + 0.48 \ln (r_k + 100) \end{aligned} \quad (12)$$

Wage and price formation

$$\ln p = \text{const} + 0.8 \ln p_{-1} + 0.12 \ln w + 0.05 \ln q_k - 0.16 \ln a_g + 0.1 \ln (1 + t) + 0.08 \ln p_m \quad (13)$$

$$\ln w = \text{const} + 0.5 \ln w_{-1} + 0.5 \ln p_v + 0.25 \ln q_L + 0.5 \ln a_g + 0.125 \ln (1 + t) \quad (14)$$

$$\dot{p} = \Delta^4 \ln p \times 100 \quad (15)$$

$$\dot{w} = \Delta^4 \ln w \times 100 \quad (16)$$

$$\ln p_v = \{ 1 / (1 + m_q) \} \ln p + \{ m_q / (1 + m_q) \} \ln p_m \quad (17)$$

Inflationary expectations

$$\dot{p}^e = \dot{p}_{-1} \quad (18)$$

$$\dot{w}^e = \dot{w}_{-1} \quad (19)$$

Labour demand (by quasivintage approach)

$$a = \text{const} + a^* - 0.5 \left(1 - \frac{1}{4} \sum_{j=0}^3 [y / y^n]_{-j} \right) a^* \quad (20)$$

$$a^* = 0.018 \{1 + 0.5(1 - h)\} k e^{-\Sigma \mu / 100} \cdot e^{-0.01 \Sigma (c_{inf} - 1)} \quad (21)$$

$$y^{nr} = y^{nb} \cdot y / y_{bn} \quad (22)$$

$$y^{nb} = (1/\kappa) k e^{\Sigma \mu' / 100} \quad (23)$$

$$k = k_{-1} + i - k_a \quad (24)$$

$$k_a = 0.015(1 + 0.25[\mu - 1.25])c_{af}k_{-1} \quad (25)$$

$$(\dot{w} - \dot{p})_{gem} = \frac{1}{4} \sum_{j=0}^3 (\dot{w} - \dot{p})_{-j} \quad (26)$$

$$(r - \dot{p}^e)_{gem} = \frac{1}{4} \sum_{j=0}^3 (r - \dot{p}^e)_{-j} \quad (27)$$

$$c_{af} = \left\{ 1 + 0.4 \left[\frac{(\dot{w} - \dot{p})_{gem} - 4\mu}{4\mu} \right] \right\} \{ 1 - 0.015[(r - \dot{p}^e)_{gem} - (r - \dot{p}^e)_0] \} \quad (28)$$

Labour supply

$$\ln a_a = \text{const} + 0.5 \ln a_{a-1} + 0.5 \ln a_p + 0.15 \ln q_L \quad (29)$$

$$U = a_a - a - a_{ov} \quad (30)$$

$$q_L = 1 - U/a_a \quad (31)$$

$$a_g = a_{g-1} \left\{ 1 + \frac{1}{4} \left[\frac{y/(a + a_{ov}) - y_{-4}/(a + a_{ov})_{-4}}{y_{-4}/(a + a_{ov})_{-4}} \right] \right\} \quad (32)$$

$$\dot{a}_g = \Delta^4 \ln a_g \times 100 \quad (33)$$

$$y^n = 0.975 y^{nr} \quad (34)$$

Income related labour demand

$$y_{gem} = \frac{1}{4} \sum_{j=0}^3 y_{-j} \quad (35)$$

$$a = \text{const} + a_{-1} [y_{gem}/y_{gem-1}]^{0.5} \quad (36)$$

plus Equations (30)–(33)

Current account of balance of payments

$$p_m = ep_{bu} \quad (37)$$

$$M = p_m m \quad (38)$$

$$B = p_v b \quad (39)$$

$$LR_t = B - M + D_s \quad (40)$$

Government budget restriction

$$FT_o = p(g - ty) + Re + G_{ex} \quad (41)$$

Sources of financial assets

$$\dot{e} = 100 \cdot (e - e_{-1}) / e_{-1} \quad (42)$$

$$\dot{e}^e = \dot{e}_{-1} \quad (43)$$

$$KV = const + 0.5 KV_{-1} + 0.005 \Delta(r - r_{bu})(B + M)_{-1} - 0.0016 \dot{e}^e(B + M)_{-1} - 0.25 LR_t \quad (44)$$

$$NLO = LR_t + KV + RVLR \quad (45)$$

$$rg = \frac{1}{20} \sum_{j=0}^{19} r_{-j} \quad (46)$$

$$Re = 0.95 Re_{-1} + r/100 \{0.3 FT_o - 1 + 0.05 Re_{-1} 100/rg\} \quad (47)$$

$$LC_o = \eta FT_o \quad (48)$$

$$FO_{ps} = FT_o + NLO - KV = FT_o + LR_t + RVLR \quad (49)$$

$$Y = py \quad (50)$$

$$BKV_{ps} = const + 0.8 BKV_{ps-1} + 0.5 \Delta Y - 0.1 FO_{ps} - 0.03 \Delta r Y \quad (51)$$

$$FA = FA_{-1} + BKV_{ps} + FT_o + NLO \quad (52)$$

$$M2 = p.m2 \quad (53)$$

$$NGB = \Delta M2 - NLO - LC_o - OPSV \quad (54)$$

$$fa = FA/p \quad (55)$$

Interest rate

$$r = const + 0.15 \dot{p}^e + 0.15 r_k + 0.7 r_{bu} + 0.1 \dot{e}^e + 0.25 (BKV_{ps} - NGB) \cdot 100/Y + 0.25 (FT_o - LC_o) \cdot 100/Y \quad (56)$$

Exchange rate

$$e = 0.5 e_{-1} + 0.5 p/p_{bu} \quad (57)$$

Models

Mod C: Equations (1)–(19), (30)–(33) and (35)–(41)

Mod CS: Equations (1)–(34) and (37)–(41)

Mod CSM: Equations (1)–(34) and (37)–(56)

a_p	population of working age *
a^*	full capacity labour demand by enterprises
B	value of exports
b	volume of exports
BKV_{ps}	gross domestic demand for credit by private sector
c	volume of private consumption

G_{ex}	residual net government expenditure *	p_v	expenditure price index
h	index number of hours worked in enterprises (1970 = 1) *	q_k	utilization rate of capital stock
i	volume of gross fixed investment (enterprises)	q_L	utilization rate of labour
i_{wo}	volume of gross investment in dwellings	r	(long-term) interest rate
k	volume of capital stock	r_{bu}	long-term foreign interest rate *
k_a	scrapping of capital stock	Re	interest payments of government
KV	net private sector foreign capital transactions	r_k	short term interest rate *
LC_o	government liquidity creation	$RVLR$	difference between current account on a cash and on a transactions basis *
LR_t	current account of the balance of payments (on a transactions basis)	t	burden of taxation
M	value of imports	U	unemployment
m	volume of imports	w	wage level
m_q	ratio of imports to income *	$\dot{w}$	wage inflation
m_w	world trade index (1977 = 100) *	$\dot{w}^e$	expected wage inflation
$M2$	value of broadly defined money stock	Y	value of (gross) national product
$m2$	volume of broadly defined money stock	y	volume of (gross) national product
n	volume of stockbuilding	y_{aut}	autonomous part of volume of (gross) national product *
NGB	net money creating operations	y/y_{bn}	ratio of national product and production by enterprises *
NLO	national liquidity surplus	y^n	structural or natural level of income
$OPSV$	net miscellaneous items (residual source of money supply) *	y^{nh}	productive capacity of enterprises
p	price index of gross national product (1977 = 1)	y^{nt}	total productive capacity
$\dot{p}$	rate of inflation	η	share of short-term financing of government deficit *
$\dot{p}^e$	inflationary expectations	κ	capital output ratio *
p_{bu}	index of foreign prices (1977 = 1) *	μ	labour saving technical progress *
p_m	index of import prices (1977 = 1)	μ'	capital saving technical progress *