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312/2008

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WIFO Working Papers, No. 312
February 2008

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2008/043/W/0

Competition-oriented wage policy and its effects on aggregate demand in the Netherlands[†]

Version 1.0

February 28, 2008

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Abstract

This paper aims at empirically assessing the demand effects of changes in functional income distribution for the Netherlands. Based on a Neo-Kaleckian theoretical macroeconomic model, equations for the main demand aggregates (consumption, investment, exports and imports) are estimated. The effect of an increase in the wage share on these aggregates is calculated from comparative static. Alternatively, a simulation of this effect is run by means of a small macroeconomic model. An increase in the wage share would have positive effects on consumption and affects investment and net exports negatively. The overall effect is still positive; the demand regime is wage-led. A shift in income distribution in from profits to wages would therefore stimulate aggregate demand. The Dutch wage policy since 1982 which aimed at restraining real wages seems to have increased international competitiveness but not aggregate demand.

Keywords: consumption, distribution, demand, foreign trade, investment, Keynesian economics, macroeconomics

JEL code: E12, E21, E22, E24, E25, E64

[†] I would like to thank Thomas Bernhardt, Markus Marterbauer, Engelbert Stockhammer and Ewald Walterskirchen for helpful comments and critical remarks. The paper was kindly funded by the Theodor-Körner-Fonds.

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1 Introduction

Like most European countries, the Netherlands experienced a trend reversal in wage policy during the 1980s. Before the first oil price shock in 1973, nominal wages were linked to inflation rates and the average growth rate of national productivity. As a consequence, real wages grew to at the same pace as productivity – therefore this kind of wage policy is usually called *productivity-oriented* (Schulten 2004) – and the wage share was fairly constant. This kind of policy aimed at keeping domestic demand in line with output. At the beginning of the 1970s, rising gas exports led to a strong appreciation of the Dutch guilder. Moreover, productivity growth in the gas sector exceeded the rise of productivity in the rest of the economy which led to a deterioration of competitiveness of the exposed sectors. Governmental efforts to restore international competitiveness were annihilated during the second oil price shock in 1979. In 1982, in the famous 'Wassenaar agreement' real wage moderation was stipulated in order to re-establish the competitiveness of the export sector. This agreement laid the cornerstone of a *competition-oriented* wage policy which became customary for the 1980s and 1990s. From then on, real wages were primarily seen as costs which are the main determinants of international competitiveness; firms aimed at improving their competitive position by restraining real wage growth below productivity growth. Consequently, the wage share has been falling continuously since then.

Table 1 provides an overview of the main economic indicators of income distribution and economic development in the Netherlands. In the 1960s and early 1970s, real wage growth was above productivity growth, thus real unit labour costs were rising. The wage share was also rising continuously during this period. Private consumption expenditures and investment were growing in line with production; growth rates of GDP were high. During the 1970s, real unit labour costs were more or less unchanging; the wage share stagnated at a high level. Declining international competitiveness and lower profitability led to a decrease of growth rates of exports and investment. Since 1982 real unit labour costs and the wage share have been falling dramatically. Growth rates of exports and imports as well as investment were restored to a higher level, although not as high as before the first oil price shock. These developments however were accompanied by a considerable decrease of consumption growth. On the average, private consumption expenditures grew below GDP during the 1980s and the first half of the 1990s. Recently, this trend was still ongoing, although in a slightly attenuated manner.

Table 1: Economic indicators for the Netherlands

Period	Wage share	ΔRULC	ΔY	ΔC	ΔI	ΔX	ΔM
60/73	54.39%	1.20%	4.74%	5.46%	5.57%	8.55%	8.83%
74/82	56.98%	-0.03%	1.69%	1.95%	-1.40%	2.30%	1.47%
83/94	52.00%	-0.67%	2.61%	1.77%	3.19%	5.28%	4.67%
95/05	50.68%	-0.09%	2.28%	2.22%	2.18%	5.54%	5.71%

Notes: Wage share: Wage income in relation to nominal GDP. ΔRULC, ΔY, ΔC, ΔI, ΔX, ΔM: Growth rates of real unit labour costs, GDP, real private consumption, real private investment, real exports and real imports, respectively. Source: OECD economic outlook data (2006), own calculations.

From the stylized facts and also from economic theory, it is evident that the reduction of real unit labour costs since 1982 has brought about higher international competitiveness and thus net exports increased, at least in the period of strong wage moderation. Investment expenditures developed only slightly above average. On the other hand, these developments were accompanied by a considerable decrease of consumption growth. The overall effect on GDP is not unambiguous from the data. GDP growth since the 1980s is somewhat higher than during the 1970s but stayed clearly below the growth rates of the 1960s. Although employment grew considerably in the 1980s and 1990s ('the Dutch employment miracle'), the effect on aggregate demand and growth is not so clear.[3] In order to determine the effect on the overall development of the economy, the effects of wage moderation on all components of aggregate demand have to be considered, not only on exports.

The aim of this paper is to evaluate the effects of a change in income distribution[4] on aggregate demand in the Netherlands. The basis for the empirical investigation is a neo-Kaleckian model first developed by Bhaduri and Marglin (1990), which allows for wage-led as well as profit-led demand regimes depending on the size of the partial effects on consumption, investment, exports and imports. The empirical part consists of two different strategies. First, the total effect of a change in functional income distribution on aggregate demand is calculated by deriving partial effects on the different demand components. The effects are summed up and augmented through a multiplier in order to get the overall demand effect. The interaction of the demand aggregates, e.g. the feedback of higher investment via higher GDP on consumption expenditures is incorporated through the multiplier mechanism. The second approach applies a simulation based on a small macroeconomic model which

[3] Naastepad (2006) argues that the Dutch employment miracle is due to a sharp decrease in productivity growth rather than an increase in economic growth.

[4] Income distribution and its measure, the wage share, are treated synonymously in this paper.

consists of equations for the various demand components. The dynamic interaction of the partial effects thus can be evaluated and compared with the static long-run calculations of the first approach.

The paper is organized in the following way: Section 2 provides an overview of the theoretical model which is the basis for the empirical part. In section 3, the related empirical literature is discussed. Section 4 presents the empirical results for the single equation approach; in section 5 simulation results are summarizes. Section 6 concludes and discusses the main implications of the findings.

2 Theoretical background: Wage-led and profit-led demand regimes

This section presents the theoretical model which is the basis for the subsequent empirical analysis. The model was first developed by Bhaduri and Marglin (1990), and is a neo-Kaleckian model which allows for wage-led as well as profit-led demand regimes. In the classical Kaleckian model for a closed economy (Kalecki 1954, Rowthorn 1982, Dutt 1984), an increase in the wage share will always lead to an increase in aggregate demand. In the model presented by Bhaduri and Marglin (1990), this is not necessarily the case. A redistribution of income in favour of wages will reduce profits and thereby investment. The question whether the positive effect on consumption is larger than the negative effect on investment becomes an empirical one. In the open economy version of the model by Blecker (1999, 2002), additional negative effects will operate through net exports.

Aggregate demand (Y) is the sum of consumption (C), investment (I), net exports (NX) and government expenditures (G). All variables are in real terms. In a general notation, consumption, investment and net exports are written as functions of income (Y), the wage share (Ω) and some other exogenous variables (summarized as z) where required. The exogenous variables are supposed to be independent of income and the wage share. Government expenditures are considered a function of income only. Aggregate demand then is expressed as:

$$Y = C(Y,\Omega) + I(Y,\Omega,z_I) + NX(Y,P,z_{NX}) + G(Y,z_G) \quad (1)$$

$$\text{where } P = P(\Omega,z_P) \quad (2)$$

Compared to a standard short-run Keynesian model, this model is rather general. Assuming that $\partial C/\partial \Omega$ and $\partial I/\partial \Omega$ are zero, the model is reduced to the standard one. The important attribute of the model thus is the sensitivity of consumption and investment expenditures with respect to income distribution. This characteristic shall be motivated briefly: Consumption usually depends on income. Here, income is separated into wages and profits, where the different forms of income are associated with different propensities to consume. The Kaleckian assumption is that the propensity to consume out of wage income is higher than that out of profit income. When income is redistributed from profits to wages and the wage share rises, consumption therefore is expected to increase. Standard investment functions normally depend on output and some measure of the costs of capital such as the real interest rate. Kalecki (1954) argued that retained earnings are an important source for financing investment expenditures; thus, profits have a main influence on investment. Moreover, current profits are usually the benchmark for expectations about future profits, which in turn are the main determinant of investment expenditures. A rise in the wage share reduces profitability and should therefore also have a negative effect on investment.

Net exports depend (negatively) on domestic demand, (positively) on foreign demand and on relative prices between domestic and foreign goods. Taken the foreign price level as exogenous (the small open economy assumption), a rise in domestic prices reduces international competitiveness and thus net exports.[5] This interrelation usually is also considered in standard short-run Keynesian models. However, it directly implies that net exports are related to changes in income distribution: Domestic prices mainly depend on unit labour costs. The price equation specifies the change in the price level as a reaction to a change in nominal unit labour costs. Thus, it is also expressing the effect of a change in real unit labour costs on prices.[6] As real unit labour costs are related to the wage share by definition, domestic prices are specified as a function of the wage share (as in equation 2).[7]

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[5] Supposed that the Marshall-Lerner-condition holds.

[6] Suppose a price equation of the form $\ln P = f(\ln ULC, z_P)$, e_{PULC} is the estimated elasticity of prices with respect to nominal unit labour costs (ULC). As real unit labour costs (RULC) are defined as ULC/P, the elasticity of prices with respect to real unit labour costs (e_{PRULC}) can be calculated as $e_{PRULC} = e_{PULC} / (1 - e_{PULC})$.

[7] In the OECD data set, which is used for the empirical analysis, nominal unit labour costs are defined as nominal wages per employee divided by productivity. Real unit labour costs are defined as nominal unit labour

Government expenditures can be affected by income as well as distribution. In this paper, which focuses on the private sector, both effects are neglected. A serious treatment of the public sector is beyond the scope of this analysis. In a complete macroeconomic model, the goods market is complemented by a distribution function which specifies the effect of a change in economic activity on income distribution. However, the focus of this paper is on the demand effects of a change in the income distribution. Feedbacks, e.g. from higher demand on distribution via lower unemployment and a better bargaining position of workers are neglected. The wage share is treated as exogenous.

So far we have only referred to the direct (partial) effects of a change in income distribution on the components of aggregate demand. As consumption, investment and net exports also depend on the level of income, every change of a one of the components will change income and therefore affect the other aggregates. This effect is incorporated via a multiplier. Differentiating Y with respect to Ω gives

$$\frac{dY^*}{d\Omega} = \frac{h_1}{1-h_2} \tag{3}$$

where $h_1 = \left(\frac{\partial C}{\partial \Omega} + \frac{\partial I}{\partial \Omega} + \frac{\partial NX}{\partial \Omega} \right)$ and $h_2 = \left(\frac{\partial C}{\partial Y} + \frac{\partial I}{\partial Y} + \frac{\partial NX}{\partial Y} + \frac{\partial G}{\partial Y} \right)$.

The denominator of equation 3 (h_2) is the standard Keynesian multiplier and has to be positive for stability. The sign of the total derivate therefore depends on the sign of the numerator. h_1 is the sum of the partial derivatives of the components of aggregate demand with respect to the wage share. That sum is the direct (or partial) effect of a change in income distribution on demand given a certain level of income. The multiplier in turn adjusts the sum of the partial effects in order to incorporate impacts of changes in income on the demand aggregates.

In accordance with the considerations about the distributional effects on the particular aggregates asserted above, we hypothesize that $\partial C/\partial \Omega > 0$, $\partial I/\partial \Omega < 0$, and $\partial NX/\partial \Omega < 0$. The sign of h_1 therefore cannot be determined a priori but depends on the magnitudes of the partial effects on consumption, investment and net exports. The sum of these effects and therefore the direction of the total effect can be determined only empirically. Augmenting the sum of

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costs divided by the GDP deflator. In this definition therefore real unit labour costs are identical to the wage share.

the partial effects by the multiplier, the interaction of the demand components is accounted for. Thus, the total demand effect can be calculated. If the total effect is positive ($\partial Y^*/\partial \Omega > 0$), the demand regime is called *wage-led*. If the effect is negative ($\partial Y^*/\partial \Omega < 0$), it is called *profit-led*.

The approach that we have explained so far constitutes an evaluation of distributional effects on demand through comparative static. A second approach presented in this paper is to build a small macroeconomic model which includes equations for the demand components as well as the accounting identity. This model more or less represents the theoretical model presented above. Within this model, the effects of changes in the wage share on demand and its components can be simulated directly. Moreover, the dynamics of the effects over a certain period can be evaluated.

3 Related literature

The Bhaduri and Marglin (1990) model is a flexible model that allows for wage-led as well as profit-led demand regimes. The question whether a rise in the wage share is followed by an increase or a decrease of aggregate demand therefore is an empirical one. The model has recently inspired the empirical literature, which will be briefly surveyed here.

In the present paper, the Bhaduri and Marglin (1990) model is estimated by means of single equations for consumption, investment, exports and imports. The first paper along this line was by Bowles and Boyer (1995). They estimate functions for savings, investment and net exports dependent on the profit share (among other variables). While this paper has become an important reference point for a range of similar studies, the econometric methods are not up-to-date. In particular, the fact that they do not deal with the time series properties of the variables and thus fail to apply error-correction or difference models is now rather old-fashioned.

Naastepad and Storm (2007) estimate a similar model for eight OECD countries. The equations employed in their paper as well as the applied econometric techniques are consistent with those of Bowles and Boyer (1995). Naastepad (2006) applies the same approach to the Netherlands, complemented by the estimation of a productivity regime. The findings for the demand regime are in the same line as in Naastepad and Storm (2007).

Compared to the results of the present paper, their effects on consumption and investment are high but those on net exports rather small (see section 4).

Ederer and Stockhammer (2007) estimate single equations for the components of aggregate demand for France. Contrary to Bowles and Boyer (1995) as well as Naastepad and Storm (2007), they estimate a consumption function instead of a savings function and apply modern time series econometrics to their estimations. Hein and Vogel (2007a) build on Ederer and Stockhammer (2007) and estimate a similar model for Austria, France, Germany, the Netherlands, the UK and the USA. Hein and Vogel (2007b) incorporate the single equations into a small macroeconomic model and simulate the effects of a change in the wage share on aggregate demand for France and Germany. The treatment of international trade in all these papers is rather simple and corresponds to the estimations of Bowles and Boyer (1995) and Naastepad and Storm (2007). As a consequence, the effect on net exports is very small in all of these studies.

This paper applies two strategies. First, single equations for consumption, investment, exports and imports are estimated, supplemented by estimations of a price equation. This approach is the same as applied in Stockhammer, Onaran and Ederer (2007) for the Euro area as well as in Stockhammer and Ederer (2007) for Austria. It differs from the other papers mentioned above in so far as it adopts a more sophisticated treatment of international trade. Instead of a simple net export function depending directly on income distribution, functions for exports and imports as well as for export and domestic prices are estimated and the distributional effect on international trade works via price reactions. Second, a simulation approach similar to Hein and Vogel (2007b) is applied. However, the macroeconomic model which is used for the simulations is built on the single equations from the first part. Thus, the model equations for international trade are more elaborated and similar to standard short-run Keynesian models.

The empirical literature on the Netherlands based on a Bhaduri and Marglin (1990) model mainly applies econometric specifications to their estimations which are different from ours; as a consequence some results are not directly comparable. For the purpose of an assessment of the plausibility of our results, we additionally use an analysis which is not based on the same theoretical model but employs estimation functions for international trade than similar to ours. This paper presents a macroeconomic model for the Netherlands that was elaborated by the German Institute for Economic Research (DIW – Logeay, Rietzler, Stephan and Zwiener 2005).

4 Empirical results

This section presents the empirical results of the investigation. The model is estimated by means of single equations for consumption, investment, exports and imports which are supplemented by the estimation of price equations. As far as possible, the specifications were chosen as to be consistent with standard short-run Keynesian models like the DIW model (Logeay, Rietzler, Stephan and Zwiener 2005) amplified by a distributional variable. The econometric specifications follow the standard practice in modern econometric modelling. Error correction models (ECM) were estimated whenever feasible. If the results were unsatisfactory and/or there was no indication of cointegration, an unrestricted autoregressive distributed lag model (ADL) was estimated. ADL models are general in the sense that various specifications can be derived from an ADL model with certain restrictions. In all cases where ECM specifications did not work, the ADL model suggested the application of a difference model.

All data is taken form the OECD economic outlook database (download 2006). The estimation range is from 1960 to 2005. Consumption, investment, exports, imports and GDP were taken in real terms. Wages and profits were deflated by the GDP deflator. In the OECD database, the wage share and real unit labour costs are identical by definition. Variable definitions and unit root tests for all variables can be found in the appendix (Table A.1 and A.2).

4.1 Consumption

Private consumption is usually estimated as a function of income. In order to include a distributional variable, two different strategies were applied. First, consumption was estimated depending on wage income and profit income. This function is similar to a standard consumption function with the exception that total income is split into wage income and profit income. When estimated separately, the difference between the marginal propensities to consume out of wages and profits gives the effect of a shift in functional income distribution. Second, the wage share was directly included as explanatory variable. As there are no appropriate data, taxes cannot be assigned to wage and profit incomes. Hence, functional income distribution can only be calculated on the basis of total income instead of disposable income. Thus, in the estimations GDP was used as the variable for income. Table 2 reports the results for both estimations.

Table 2: Regression results for the consumption function

Dependent variable: ΔIn C			Dependent variable: ΔIn C		
Variable	**Coeff.**	***Prob.***	**Variable**	**Coeff.**	***Prob.***
c	1.37	*0.01*	c	0.11	*0.46*
ΔIn W	0.43	*0.02*	ΔIn Ω	0.15	*0.36*
ΔIn R	0.18	*0.01*	ΔIn Y	0.75	*0.00*
In C (-1)	-0.27	*0.01*	In C (-1)	-0.24	*0.02*
In W (-1)	0.22	*0.03*	In Ω (-1)	0.16	*0.09*
In R (-1)	0.04	*0.15*	In Y (-1)	0.23	*0.02*
ΔIn C (-1)	0.36	*0.03*	ΔIn C (-1)	0.29	*0.05*
Adj. R^2	0.71		Adj. R^2	0.75	
DW stat.	1.69		DW stat.	1.83	
Elasticities:			*Elasticities:*		
e_{CW}	0.80		$e_{C\Omega}$	0.69	
e_{CR}	0.15				
e_{CY}	0.95		e_{CY}	0.94	
Partial effects:			*Partial effects:*		
$\partial C/\partial W$	0.79				
$\partial C/\partial R$	0.21				
$\partial(C/Y)/\partial\Omega$	0.58		$\partial(C/Y)/\partial\Omega$	0.67	

Notes: C…real private consumption expenditures, W…wage incomes, adjusted by GDP deflator, R…profit incomes, adjusted by GDP deflator, Ω…wage share, e_{CW}…wage elasticity of consumption, e_{CR}…profit elasticity of consumption, e_{CY}…income elasticity of consumption, $e_{C\Omega}$…wage share elasticity of consumption, $\partial(C/Y)/\partial\Omega$…partial effect of a change in the wage share on consumption

ADF tests suggested unit roots for all the variables including the wage share. Moreover, the ADF tests rejected cointegration at the 10% level. Given that consumption functions usually are modelled as ECM, this fact is rather surprising. The test results nevertheless were close to the critical values, thus ECMs were applied for both estimations. For econometric reasons, all variables were estimated in logarithmic form.[8] The relevant coefficients of both estimations are meaningful and statistically significant (with the exception of profits in the first) at least at the 10% level.

For the first equation (the left hand side of table 2), the long run elasticities of consumption with respect to wages and profits are 0.80 and 0.15, respectively. Converted into marginal effects and building the difference, we get a direct (or partial) effect of 0.58. Holding income constant, a rise of the wage share of 1 percentage point would increase consumption expenditures by 0.58% of GDP. As the function is estimated in logarithmic form, the sum of

[8] Economic variables that are supposed to grow exponentially have to be estimated in logarithmic form in order to become stationary. See e.g. Stewart (2005: 742ff) for further discussion.

the wage and profit elasticity is the total income elasticity of consumption. Its value is 0.95 which is very close to unity, the value supposed by the permanent income hypothesis.

The result of the second estimation for the long-run partial effect of a change in income distribution is 0.67, which is higher than the value obtained through the first estimation. A rise of the wage share of 1 percentage point thus would induce additional consumption expenditures of 0.67% of GDP. The income elasticity in the second equation is 0.94, which is almost identically to the first one. Compared to the first estimation where income was split, directly including a distributional variable into the equation augments the partial effect of a change in income distribution on consumption. The higher this value, the more the demand regime is inclined to a wage-led case. Because we later include the second equation into the simulation model (see section 5), we use the higher effect (the one obtained by the second equation) for the calculation of the total effect (see section 4.4) in order to be comparable with the simulation results. However, one has to bear in mind that this could bias the overall result into the direction of a wage-led regime.

In comparison with other estimations for the Netherlands, the results seem rather plausible. Logeay, Rietzler, Stephan and Zwiener (2005) estimate a consumption function similar to our first specification and get elasticities with respect to wages and profits of 0.85 and 0.26, respectively. Converted on the basis of our data, the partial effect of a change in income distribution would be slightly smaller, yielding a value of 0.43% of GDP. Naastepad and Storm (2007) as well as Naastepad (2006) estimate a savings function instead of consumption (see section 3), getting an effect of a rise in the wage share of 0.57 and 0.35, respectively. Hein and Vogel (2007a) get elasticities of 0.77 and 0.21 for wages and profits respectively. They calculate an overall effect of 0.22, which is much smaller than ours. Nevertheless, converting their elasticities on the basis of our data, we would obtain a value of 0.47.[9] Following from this discussion, it seems that our results for wage and profit elasticities as well as the partial effect of a change in income distribution on consumption are within the same range as other authors' findings.

[9] Logeay, Rietzler, Stephan and Zwiener (2005) estimate an ECM with wages and profits as explanatory variables. Their lag-structure of the short-run variables however is different to ours. Naastepad and Storm (2007) and Naastepad (2006) both estimate the savings ratio as a function of the profit share. Hein and Vogel (2007a) estimate a difference equation with a non-significant lagged dependent variable on the right hand side.

4.2 Investment

Investment is usually modelled as a function of output (GDP) and the long-term real interest rate or some other measure of capital cost. In our estimations, the profit share is included as explanatory variable (see section 2). As the profit share is by definition directly related to the wage share, this coefficient also represents the effect of a redistribution of income on investment. Using total private investment as dependent variable, the estimations surprisingly do not yield statistically significant results for the coefficient on the profit share. One possible explanation may be that housing investment, which is part of total private investment, usually does not depend on profitability. Thus the coefficient on profits could be biased. We therefore estimated business investment (excluding housing) as a function dependent on GDP, profits and the long-term real interest rate. The ADF tests suggested unit roots for all variables but rejected cointegration at the 10% level. Just as in the case of the consumption function, the results of the tests were close to the critical values, so the function was estimated as an ECM. The results of the estimation are presented in table 3.

Table 3: Regression results for the investment function

Dpendent variable:	Δln IB	
Variable	**Coeff.**	***Prob.***
c	-2.77	*0.00*
Δln π	-2.04	*0.00*
Δln Y	3.90	*0.00*
Δi	0.00	*0.57*
ln IB (-1)	-0.71	*0.00*
ln π (-1)	0.21	*0.32*
ln Y (-1)	0.81	*0.00*
i (-1)	0.93	*0.00*
Δln IB (-1)	-0.03	*0.74*
Adj. R^2	0.82	0.07
DW stat.	1.84	0.00
Elasticities:		
$e_{Ib\pi}$	0.29	
e_{IbY}	1.14	
Partial effect:		
$\partial(I/Y)/\partial\Omega$	-0.07	

Notes: IB…real private investment (excluding housing investment), π…profit share, Y…real GDP, i…real long-term interest rate, e_{IbY}…income elasticity of investment, $e_{Ib\pi}$…profit share elasticity of investment, $\partial(I/Y)/\partial\Omega$…partial effect of a change in the wage share on investment

With the exception of the profit share, the coefficients on the long-run variables are statistically significant and have the expected sign. The long-run profit elasticity of investment is 0.29, the income elasticity 1.14. Converting the elasticity into a marginal effect,

we get a value of -0.07. A rise of the wage share of 1 percentage point would directly decrease investment at an average 0.07% of GDP. The effect therefore is very small; furthermore the result should be treated with caution because of the non-significance of the coefficient on profits.

Naastepad (2006) estimate a profit share elasticity of 0.39, Naastepad and Storm (2007) a corresponding result of 0.47. The second result however does not seem very plausible due to the estimation strategy they applied. Hein and Vogel (2007a) get a very high investment effect of -0.34. The long-run profit share (semi-) elasticity of investment is 1.45.[10] They do not include the interest rate as an explanatory variable.[11] Comparing these results, the investment effect from our estimations seems to be rather low. However, converting the elasticity of Naastepad (2006) at the basis of our data, we would yield a marginal effect of -0.09 which is similar to our result.

As for consumption, a distributional variable seems to affect investment. The effect nevertheless is very small and it is not sure whether it is statistically significant. The results therefore should be treated with caution. The small (negative) investment effect acts contrary to the large (positive) consumption effect, thus reducing the (positive) domestic effect. Treating the result of the investment estimations as reasonable instead of supposing a zero effect, we therefore get a conservative value for the overall effect.

4.3 International trade

Exports and Imports typically depend on international competitiveness and thus the ratio of price levels at home and abroad. The effect of a rise in the wage share on international trade operates via an increase in domestic prices relative to foreign prices. In order to calculate this effect, two steps are necessary: First, the price effects of a shift in income distribution need to

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[10] Logeay, Rietzler, Stephan and Zwiener (2005) estimate an ECM with only GDP as explanatory variable in the error correction term. Unit labour costs only enter the equation as a short-run variable. Naastepad (2006) estimate a difference function for investment with the profit share as the only explanatory variable. Naastepad and Storm (2007) in turn estimate the same function albeit in levels instead of differences. Hein and Vogel (2007a) use an ECM with GDP and the profit share as the explanatory variables in the error correction term.

[11] Similar investment functions by Ederer (2007) without the interest rate also yield high profit share elasticities, although approximately half as high as Hein and Vogel (2007a). However, from economic theory, the interest rate should be an explanatory variable for investment.

be identified. In a second step, the effect of changing prices on exports and imports will be evaluated.

4.3.1 Prices

Prices are typically explained by unit labour costs and import prices. The inclusion of nominal unit labour costs permits to calculate the price effect of a rise in the wage share (and thus in real unit labour costs).[12] Two different equations for prices are estimated. The first one estimates export prices as a function of domestic prices and import prices. The second one relates domestic prices to nominal unit labour costs and import prices. Both estimations were conducted as difference equations after ECM specifications proved unsuccessful. The coefficients of the estimations are statistically significant and have the expected signs. The results are presented in table 4.

Table 4: Regression results for price equations

Dependent variable: Δln Px			Dependent variable: Δln P		
Variable	**Coeff.**	***Prob.***	**Variable**	**Coeff.**	***Prob.***
const.	0.00	*0.14*	const.	0.00	*0.08*
Δln P	0.19	*0.00*	Δln Pm	0.06	*0.02*
Δln Pm	0.83	*0.00*	Δln ULC	0.32	*0.00*
			Δln P(-1)	0.51	*0.00*
Adj. R^2	0.97		Adj. R^2	0.90	
DW stat.	1.90		DW stat.	1.97	

Notes: Px…export price deflator, P…GDP deflator, Pm…import price deflator, ULC…nominal unit labour costs

The unit labour costs elasticity of domestic prices is 0.65 [0.32/(1-0.51)]. An increase in nominal unit labour costs of 1% goes along with an increase in domestic prices by 0.65%. This value shows up in column 1 of table 5. The difference between the rise in nominal unit labour costs and prices is by definition the resultant change in real unit labour costs. In order to get the price effect of an increase of real unit labour costs of 1%, which is of interest here, nominal unit labour costs have to rise by 2.88% [1/(1-0.65)]. At the same time prices rise by 1.88% [0.65*2.88]; the elasticity of prices with respect to real unit labour costs therefore is 1.88. This value is presented in column 2 of table 5.

The elasticity of export prices with respect to domestic prices is directly taken from the export price equation. Its value is 0.19 (column 3). Combining this elasticity with the real unit labour costs elasticity of domestic prices calculated before (combining the two values in columns 2

[12] See section 2 for further discussion.

and 3), we get an elasticity of export prices with respect to real unit labour costs of 0.35 (column 4). A rise in real unit labour costs (which is the same as a rise in the wage share)[13] of 1% would increase export prices by 0.35%.

Table 5: Price elasticities

1	2	3	4
e_{PULC}	e_{PRULC}	e_{PxP}	e_{PxRULC}
0.65	1.88	0.19	0.35

Notes: e_{PULC}…unit labour costs elasticity of prices, e_{PRULC}…real unit labour costs elasticity of prices, e_{PxP}…price elasticity of export prices, e_{PxRULC}…real unit labour costs elasticity of export prices

4.3.2 Exports and Imports

Given the price reactions to a shift in income distribution, as calculated in the previous section, we now need the changes in exports and imports following a change in relative prices. Exports are estimated depending on GDP of the trading partners and on export prices relative to an index of competitors' prices on export markets. Most of Dutch exports go into the European Union, thus foreign income is approximated by GDP of the Euro12 countries. Because both price indices are already in Euro, the exchange rate is excluded from the estimation. Imports also depend on relative prices. The relevant price index for this estimation is the export price deflator. The GDP deflator additionally contains prices for non-tradable goods and services; as these are not relevant for competition on import markets, the export price index is a more adequate representative. Foreign competitors' prices are represented through the import price deflator. The imports equation also includes domestic GDP as explanatory variable. As there is no indication of cointegration, both equations are estimated in first differences. The results are summarized in table 6.

Table 6: Regression results for export and import functions

Dependent variable: Δln X			Dependent variable: Δln M		
Variable	**Coeff.**	***Prob.***	**Variable**	**Coeff.**	***Prob.***
const.	0.02	*0.05*	const.	0.00	*0.86*
Δln Y_EU12	1.18	*0.00*	Δln Y	1.81	*0.00*
Δln Px/Pxc	-0.40	*0.03*	Δln Px/Pm	0.48	*0.13*
Adj. R^2	0.33		Adj. R^2	0.62	
DW stat.	1.59		DW stat.	1.87	

Notes: X…real exports, Y_EU12…GDP of the Euro12 countries, Px…export price deflator, Pxc…Price index for competitors in export markets, Y…real GDP, Pm…import price deflator

[13] See section 2 for further discussion.

The coefficients are (nearly) statistical significant and have the expected signs. The (export) price elasticities of exports and imports are -0.40 and 0.48, respectively.

The calculation of the effect of a shift in income distribution on exports and imports involves several steps, which are presented in table 7. The combination of the elasticity of export prices with respect to real unit labour costs (column 1) and the price elasticity of exports and imports (column 2) amount to the elasticities of exports and import with respect to real unit labour costs (column 3). These have to be transformed into a semi-elasticity of exports and imports with respect to a rise in the wage share. The values in column 5 indicate that exports and imports would react to an increase in the wage share of 1 percentage point with an increase of -0.26% and 0.31%, respectively. In order to get the partial effects, these values are multiplied by export and import shares. As export and import shares show a clear upward trend due to globalisation, the transformation yields different results depending on the point in time where the effects are evaluated. We therefore report values calculated in 1980 and 2005, which approximately represent the mean and the end of the sample (column 6). The partial effects on exports and imports for these years are presented in column 7 of the table.

Table 7: Export and import effects

	1	2	3	4	5	6	7
Exports	e_{PxRULC}	e_{XPx}	e_{XRULC}	**1/RULC**	$e_{X\Omega}$	**X/Y**	**∂(X/Y)/$\partial\Omega$**
X/Y 2005	0.35	-0.40	-0.14	1.88	-0.26	0.77	-0.20
X/Y 1980	0.35	-0.40	-0.14	1.88	-0.26	0.38	-0.10
Imports	e_{PxRULC}	e_{MPx}	e_{MRULC}	**1/RULC**	$e_{M\Omega}$	**M/Y**	**∂(M/Y)/$\partial\Omega$**
M/Y 2005	0.35	0.48	0.17	1.88	0.31	0.69	0.21
M/Y 1980	0.35	0.48	0.17	1.88	0.31	0.38	0.12

Notes: ePxRULC…real unit labour costs elasticity of export prices, eXPx…export price elasticity of exports, eXRULC…real unit labour costs of exports, RULC…real unit labour costs, eXΩ…elasticity of exports with respect to the wage sharea, X…real exports, Y…real GDP, ∂(X/Y)/$\partial\Omega$…partial effect of a change in the wage share on exports, eMPx…export price elasticity of imports, eMRULC…real unit labour costs elasticity of imports, eMΩ…elasticity of imports with respect to the wage share, M…real imports, ∂(M/Y)/$\partial\Omega$…partial effect of a change in the wage share on imports.

For the year 2005, the end of our sample, the exports effect is -0.20. This means that an increase in the wage share of 1 percentage point would decrease exports by 0.20% of GDP. Imports in turn would rise by 0.21% of GDP. As net exports are exports minus imports, the partial effect on net exports if calculated for the year 2005 amounts to -0.41% of GDP. In 1980, a rise in the wage share of 1 percentage point would reduce exports by 0.10% of GDP and induce additional imports of 0.12% of GDP. The net exports effect adds up to -0.22% of GDP. The partial effect on international trade in 1980 is approximately half of the effect in

2005. This result is not surprising given that the shares of exports and imports are much higher in 2005.

Logeay, Rietzler, Stephan and Zwiener (2005) get much higher price elasticities for exports than here (between -0.61 and -1.22).[14] The unit labour costs elasticity is close to ours (0.59). Hein and Vogel (2007a) estimate a net exports effect at the average of -0.20 which is very close to our effect evaluated for the year 1980. However their function was estimated without any variable representing foreign demand; their result therefore does not seem entirely convincing.[15] Naastepad (2006) yields a real unit labour costs elasticity of exports of -0.19 which is similar to ours. Although the results of the various estimations sometimes differ from the ones obtained here, our values do not seem implausible. Moreover, the evaluation of the effects of shifts in income distribution on international trade via price reactions is more consistent with economic theory and the typical modelling strategy of standard short-run Keynesian models.

4.4 Total effects

Table 8 puts together the partial effects identified in the previous sections. Adding up these effects gives the partial effect on aggregate demand resulting from an increase of 1 percentage point in the wage share. As we have calculated the net exports effects at different points in time, the demand effect will also vary whether calculated at the middle or the end of the sample. For consistency, the consumption and investment effects are now also evaluated at the two different years, although their values almost do not change at all due to the constancy of consumption and investment shares over the relevant period.

[14] They estimate various export functions, all with prices and foreign demand as explanatory variables. They also estimate several price equations, albeit only the equation for the price deflator of investment and government expenditures is explained by unit labour costs.

[15] Naastepad and Storm (2007) as well as Naastepad (2006) only estimate exports as a function of exports of the OECD countries and real unit labour costs relative to the OECD countries. They do not estimate any import function. Hein and Vogel (2007a) estimate the net export share in GDP directly as a function of the profit share. All these papers therefore apply a much simpler treatment of international trade than here.

Table 8: Demand effects

	Effect 2005	Effect 1980
Consumption	0.67	0.67
Investment	-0.06	-0.07
Domestic effect	*0.60*	*0.60*
Net exports effect	-0.41	-0.22
Demand effect	**0.19**	**0.38**

Notes: Consumption effect from table 2, investment effect from table 3, net exports effect from table 7.

The positive consumption effect is substantially larger than the investment effect. The domestic sector of the economy, calculated as the sum of these two, is clearly wage-led. The effect of a rise in the wage share on net exports for 2005 is much higher than for 1980. Both effects are negative and therefore partly offset the positive domestic effect. Nevertheless, for both years the net exports effect is smaller than the domestic effect; the demand effect therefore is positive and the demand regime is found to be wage-led. In 1980, the demand effect adds up to 0.38; an increase in the wage share of 1 percentage point would directly increase GDP by 0.38%. At the year 2005, the demand effect is smaller due to the higher net exports effect but still clearly positive (0.19). A rise in the wage share of 1 percentage point would induce additional demand of 0.19% of GDP.

So far we have ignored the interaction of the demand aggregates in our analysis. According to equation 3 (see section 2), the sum of the partial effects on the individual demand components (what we have named here the 'demand effect') have to be adjusted by the multiplier. The multiplier is calculated from the partial effect of changes in income on consumption, investment and imports. Tables 2, 3 and 6 contain the corresponding coefficient estimates. The income elasticities of consumption and investment are close to 1, those of imports 1.80. Again, these coefficients have to be converted into partial effects. The points in time at which the elasticities are converted therefore make a big difference. For the year 2005 we get a multiplier of 0.61, in 1980 its value is 0.96. Due to the high income elasticity of imports the increasing openness of the economy over the period results in a smaller multiplier.

Because the focus of this paper is on the effects of a shift in functional income distribution, the econometric specifications have to be chosen such that the distributional effects are plausible. The income elasticities have not received similar attention. The income elasticities for consumption and investment are consistent with economic theory and empirical

experience; the income elasticity of imports however is rather high and probably picks up the effect of an increase in the international division of labour. The multipliers therefore should be treated with caution. In combination with the corresponding demand effects, we get a total effect of a rise in the wage share by 1 percentage point on GDP of 0.12% and 0.37% for 2005 and 1980, respectively.

Table 9: Total effects

	Effect 2005	Effect 1980
Demand effect	0.19	0.38
Multiplier	0.61	0.96
Total effect	**0.12**	**0.37**

Notes: Demand effect from table 8.

Summing up, the demand regime in the Netherlands is clearly wage-led. Both in the years 1980 and 2005, the total effect is positive. Due to the more intensive international trade the effect for 2005 is much smaller than for 1980.

5 Simulation

In the previous section, the total effect of a change in functional income distribution on aggregate demand was calculated by deriving and summing up the partial effects on the demand components. The overall partial effect was adjusted by a multiplier in order to get the total demand effect. Thus, the interaction of the demand aggregates, e.g. the feedback of higher total demand on consumption expenditures was incorporated via the multiplier mechanism. This calculation is a static analysis, which (because of the application of ECM) gives long-term results for the effect of a rise in the wage share. In this section, a simulation approach is applied. The dynamic developments over a certain period can be evaluated and compared with the static calculations from the previous section.

The simulation model consists of the equations already used for the previous calculations, namely the equations for consumption, investment, exports, imports and prices. This guarantees that the results of the simulation are comparable with the ones presented in section 4. The behavioural equations for aggregate demand components are supplemented by the accounting equation for GDP and several identity equations. Real unit labour costs (or the wage share, which is directly linked to them) are exogenous and can be shocked in order to get an effect on the endogenous variables. The interaction between wages and prices therefore

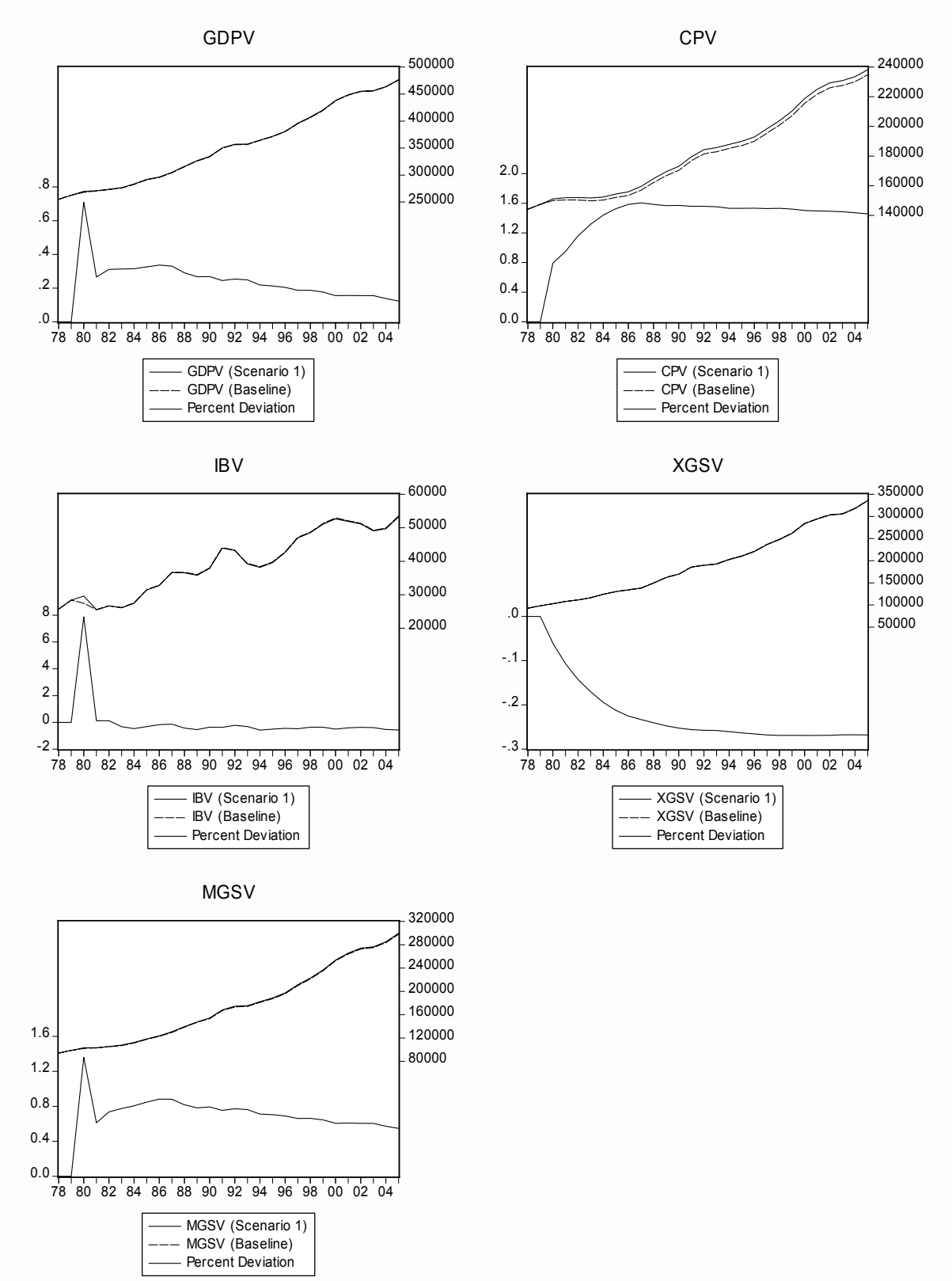
is only one-way, reactions of nominal wages to an increase in prices are not considered. For the simulation it is assumed that real wages can be increased directly. Furthermore, the model is strictly demand-sided and does not include any supply-side variables. For instance, effects of investment on productive capacities, technological progress and productivity and the resulting limitations for long-term economic growth are not considered.

In a first step, the model solutions for the endogenous variables were compared with historical data in order to check the performance of the model. The model specification fits the data quite well; deviations are within a small range. After that, an increase in the wage share of one percentage point in the year 1980 was simulated. The reactions of the demand components to this increase are presented in Figure 1.

In the simulation, real GDP increases by 0.70% in the first year; this increase drops to 0.30% in the second year. After that, the effect steadily declines and reaches a value of 0.10% at the end of the sample (25 years after the shock). As expected, an increase in the wage share has an immediate positive effect on consumption. As the propensity to consume out of wages is higher than out of profits, rising wage incomes stimulate consumption expenditures more than they are reduced because of lower profit incomes. This effect is slowing down and stagnating after five years. The positive overall effect on GDP is wearing off and thus reduces the effect on consumption, which cannot be compensated by the additional consumption expenditures due to the higher wage share. The consumption effect is declining slightly until the end of the sample. Because of the accelerator effect an increase in the wage share has also an immediate strong positive effect on investment in the first year. In the second year, the negative effect of lower profitability kicks in and reduces the investment effect. From the third year on until the end of the sample, the investment effect is fairly stable and slightly negative.

A rise in the wage share und consequently also in real unit labour costs coincides with a rise in nominal unit labour costs and prices. The price increase comes to a halt after ten years, and stagnates thereafter. International competitiveness deteriorates in the first ten years and exports decrease steadily. After that period, the negative effect on exports stabilizes. Imports increase sharply in the first year due to the strong GDP effect, and go down afterwards. As there is a continuous loss in international competitiveness during the first ten years, imports rise in this period. After that, the effect of rising prices diminishes and imports develop in line with real GDP.

Figure 1: Simulation results



Notes: The Baseline scenario is without any shocks in the exogenous variables. In scenario 1, the wage share is shocked by one percentage point in 1980. The basis for the percent deviation is the baseline scenario for each variable.

Table 9 presents the simulation results at two different points in time, 10 and 25 years after the shock in the wage share and compares them with the results of the econometric analysis of the previous section. The overall outcome is that the simulation results conform very well to the static calculation for all demand aggregates. After 10 years, the consumption effect due to a rise in the wage share of one percentage point is 0.80% of GDP, after a period of 25 years it declines to 0.72%. The static calculations yield exactly the same values in the corresponding years. The investment effect is stable for the whole period and also matches with the static calculations (approximately -0.05% of GDP). The exports effect is rising over the period from -0.13% (after 10 years) to -0.19% (after 25 years) of GDP. The constant percent deviation of exports from the baseline scenario is transformed into an increasing effect in relation to GDP because of a constantly rising export share. The effect on imports is fairly stable over the period, approximately 0.35. All the numbers correspond to the results of the static calculation.

Table 10: Comparison of results

	Simulation results		**Static result**	
	After 10 years	**After 25 years**	**Total effect 1990**	**Total effect 2005**
Consumption	0.80	0.72	0.80	0.72
Investment	-0.04	-0.06	-0.05	-0.04
Domestic effect	*0.76*	*0.65*	*0.76*	*0.68*
Exports	-0.13	-0.19	-0.12	-0.20
Imports	0.36	0.34	0.32	0.36
Net exports	*-0.49*	*-0.53*	*-0.45*	*-0.56*
Total effect	**0.27**	**0.12**	**0.31**	**0.12**

Notes: Simulation results are evaluated 10 and 25 years after the shock in the wage share which is implemented in 1980. The static results are calculated from the estimations of the previous sections and evaluated at the same points in time in order to be comparable.

Whereas the dynamic developments of the variables over time can only be observed by means of the simulation, the long-run effects calculated in the static analysis are confirmed by the simulation and seem to be highly accurate. The previous results that the demand regime in the Netherlands is clearly wage-led are strongly supported by the simulation.

6 Conclusion

This paper has investigated how changes in functional income distribution affect aggregate demand in the Netherlands. Behavioural equations for consumption, investment and international trade, which included variables for income distribution, have been estimated.

From these equations, the effects of a rise in the wage share on the respective components of demand have been evaluated and summed up. Furthermore, the equations have been incorporated into a small macroeconomic model. On the basis of this model, a simulation of the effects of a shift in income distribution has been run. Both strategies produced similar results. The key finding is that the demand regime in the Netherlands is wage-led. Increasing economic integration over time has reduced the positive impact on demand decisively; demand however still would be increased by a rise in the wage share. This is a rather surprising result for a small open economy. The restrained increases in real wages in the Netherlands since the 1980s therefore raised international competitiveness and stimulated exports but did not increase total aggregate demand. The findings of the paper thus support the results of Naastepad (2006) who argues that the Dutch 'job miracle' was mainly due to slower productivity growth than to the stimulation of the demand side of the economy. A re-orientation towards a productivity-oriented wage policy on the other hand would increase domestic demand more than it would affect adversely net exports; total demand would be increased.

Furthermore, a competitive-oriented wage policy, such as it has been conducted in the Netherlands since the 1980s is a 'beggar-thy-neighbour' policy. Increasing exports due to higher international competitiveness arise at the cost of the trade partners. If the other countries react by also restraining wages, increases in competitiveness will disappear. This is a typical prisoners' dilemma situation, where only the coordination of wage policy would lead the way out.

The analysis undertaken in this paper nevertheless has several limitations which should be addressed in further research. First, income distribution has been taken as exogenously given. Second, the paper has focused on the private sector, excluding the public sector. Third, the paper has only analyzed the demand side of the economy. Supply factors such as impacts on productivity and capital accumulation and thus long-run economic perspectives for growth have not been considered. A full macroeconomic model could possibly address all three limitations of the present investigation.

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Appendix

Table A.1: Variable definitions

Notation	OECD Notation	Description
Ω	-	Wage share
C	CPV	Private consumption, real
I	IPV	Private investment, real
i	IRLR	Long-term real interest rate, deflated by GDP deflator
M	MGSV	Imports, real
P	PGDP	GDP deflator
P_M	PMGS	Import price deflator
P_X	PXGS	Export price deflator
P_{XC}	PXC	Competitors prices on export market
R	-	Gross operating surplus, real, deflated by GDP deflator
RULC	-	Real unit labor costs
ULC	ULC	Nominal unit labor costs
W	-	Compensation of employees real, deflated by GDP deflator
X	XGSV	Exports, real
Y	GDPV	GDP, real
Y_EU12	GDPV	GDP, Euro 12-countries, real

Table A.2: Unit root tests

	Levels				First Differences			
Variable	Constant/ Trend	Lags	Test stat.	Significance	Constant/ Trend	Lags	Test stat.	Significance
ln C	c, t	1	-2.679	-	c	0	-2.247	**
ln W	c, t	1	-2.885	-	c	1	-3.235	***
ln R	c, t	0	-1.775	-	c	0	-5.927	***
ln I	c, t	1	-2.805	-	c	0	-5.035	***
ln IB	c, t	1	-2.926	-	c	0	-5.398	***
ln Y	c, t	1	-2.444	-	c	0	-3.271	***
ln LQ	c	2	-0.914	-	c	1	-4.596	***
ln PQ	c	1	-1.560	-	c	0	-4.947	***
i	c	0	-1.793	-	c	0	-7.283	***
ln X	c, t	0	-1.544	-	c	0	-4.803	***
ln Y_EU12	c, t	1	-2.362	-	c	0	-3.796	***
ln Px/Pxc	c	0	-1.629	-	c	1	-4.965	***
ln M	c, t	1	-2.559	-	c	0	-4.406	***
ln P/Pm	c	0	-1.642	-	c	0	-5.877	***
ln ULC	c, t	0	-3.535	**	c	1	-2.062	**
ln Px	c, t	1	-1.279	-	c	0	-4.296	***
ln P	c, t	1	-1.946	-	c	0	-1.706	*
ln Pm	c, t	0	-0.678	-	c	0	-4.671	***

Notes: * denotes statistical significance at the 10% level, ** at the 5% level, * at the 1% level. Critical values according to Charemza and Deadman (1997).

Table A.3: Cointegration tests

Consumption function			
Dep. Variable	Expl. Variable	Test Stat.	Signifikanz
C	W, R	-3.187	-
C	Y, Ω	-3.162	-
Investment function			
Dep. Variable	Expl. Variable	Test Stat.	Signifikanz
IB	Y,π	-3.701	*

Notes: * denotes statistical significance at the 10% level, ** at the 5% level, * at the 1% level. Critical values according to Charemza and Deadman (1997).

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