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Article

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The deposit financing gap: another Dutch disease

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In the last 2 decades, the Netherlands has experienced an increase in real-estate prices, accompanied by an increase in mortgages and a marked decline in household savings. As a consequence, banks are faced with a large retail funding gap: outstanding mortgage debt is insufficiently matched by retail deposits, whereas other funding possibilities of banks have increasingly been constrained – also due to their large foreign exposures.

Traditional macroeconomic models cannot analyse this phenomenon appropriately as they lack a proper model of the financial sector and underestimate the potential for interactions between the monetary and the real sphere. We present a stock-flow consistent approach developed by Godley and Lavoie as a valuable alternative to traditional and New Keynesian macroeconomic models, enabling us to analyse the deposit financing gap for the Netherlands.

Keywords: *stock-flow consistent modelling, retail funding gap, mortgage financing*

JEL codes: *E44, B5, E6, G21*

1 INTRODUCTION

In the years leading up to the financial crisis, the Netherlands has experienced an increase in real-estate prices, partly due to government-induced tax incentives, which was accompanied by an increase in mortgages. In addition, the Netherlands is characterized by well-developed funded pension schemes that have resulted in substantial accrued compulsory savings. However, during the last two decades household savings have shown a marked decline, probably due to increasing wealth accumulation and the increasing importance

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of wealth effects on consumption over time. After the financial crisis, economic growth in the Netherlands, which is strongly dependent on export growth, has faltered. Moreover, owing to the open nature of the Dutch economy, the banking sector has a large foreign exposure and also Dutch compulsory savings are largely invested abroad. As a consequence of these developments, banks are faced with a relatively large so-called retail funding gap or deposit financing gap: outstanding mortgage debt is insufficiently matched by retail deposits, whereas other funding possibilities of banks have increasingly been constrained.

The financial sector, which traditionally has a large foreign exposure, has become excessively vulnerable as a result of the financial crisis. This has contributed to a decline in consumer confidence and a large strain on public debt as some banks had to be bailed out. Moreover, the public has become increasingly aware of the fact that the Dutch economy was suffering from a housing bubble and house prices started to decline in the aftermath of the financial crisis and have only recently stabilized again. As a consequence, consumption growth has become negative, fuelled by decreasing consumer confidence, drawing the economy into the double dip of the recession. These developments might characterize a second Dutch disease, as we elaborate below.

To analyse these phenomena in a coherent framework, one needs a model which (i) shows the importance of wealth effects in consumption and a related model of wealth accumulation; (ii) integrates the financial sector in the model, also showing its role in wealth accumulation; (iii) integrates the housing market, also in relation to wealth accumulation; and (iv) allows for the relevant open economy characteristics of both export-led growth and an exposed financial sector.

Traditional macroeconomic models, including the New Keynesian varieties, neglect the interaction of the real economy with the financial sector and the housing market, with the emphasis on wealth accumulation. However, the recent stock-flow consistent approach, summarized in Godley/Lavoie (2007a), promises a very interesting alternative way to model these features in a coherent framework. In this paper we develop a model in this tradition that accounts for the stylized facts presented above. We also show how some relevant developments (like a further decline in house prices) or policy measures (like a decrease in mortgage tax reduction, increased capital requirements for the banking sector, or expansionary government budget measures) affect the economy.

As a starting point, we use the model developed by Zezza/Dos Santos (2006). They present a complete operational model in the stock-flow consistent tradition that shows the importance of wealth effects in consumption, in relation to wealth accumulation, and takes into account the role of the financial sector. Zezza (2008) extended this model to include the interaction with the housing market. In our model, we will elaborate on these models by including relevant open economy characteristics and modelling the financial sector in a more elaborate way. We will show that the more elaborate modelling of the financial sector, also in an open economy context, is a necessary ingredient to explain the vulnerability of the financial sector and the importance of its interaction with the real economy – this appears, for instance, from the deposit financing gap. The interaction should also be analysed in relation to the development of government expenditures.

A detailed version of our analysis is presented in Meijers et al. (2014), from hereon denoted as MMS. Here we focus on the main elements. In Section 2, we summarize the relevant stylized facts about the Dutch economy to provide the background of our model specification. We present the model in Section 3, with an emphasis on the elements which we add to the model developed by Zezza/Dos Santos (2006) by introducing the foreign sector, extending the model of the banking sector and including housing and mortgages in the household sector. The simulation results of the model are presented in Section 4. We first show how the increase in house prices has led to the growth of

the deposit financing gap and the strenuous situation of the financial sector, with negative spillovers to the real economy. A simulation with decreasing house prices then shows the impact of the bursting housing bubble and the decline in economic growth. We also show that imposing a strict 3 per cent budget deficit rule may impede the recovery process under some circumstances. Section 5 concludes this paper.

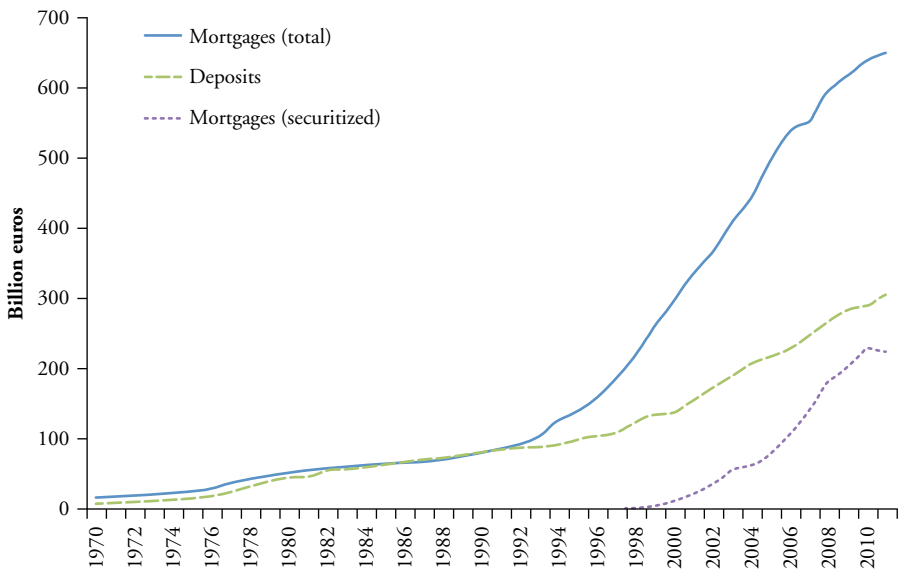
2 STYLIZED FACTS ABOUT THE DUTCH ECONOMY

In MMS, we identified four stylized facts about the Dutch economy over the past decades, which we briefly mention here:

1. Economic growth is strongly dependent on export growth – exports are almost 90 per cent of GDP – and the Netherlands traditionally has a large current account surplus – it was 9 per cent of GDP in 2013.
2. There has been a structural decline in household savings relative to disposable income since the early 1990s, from 16 per cent in 1990 to below 6 per cent in 2012. This is related to the large increase in house prices – the average house price more than doubled in the decade between 1995 and 2005 and reached a peak in late 2008, after which house prices started to decline. Related to that, mortgages increased from 50 per cent of disposable household income in 1990 to almost 250 per cent in 2010.
3. The large banking sector, which traditionally has an enormous foreign exposure, has become excessively vulnerable, partly due to its huge mortgage exposure.¹ The acceleration in mortgage debt since the early 1990s could no longer be financed by deposits (the deposit funding gap) and since the mid 1990s debt securitization became an increasingly important source of financing. We elaborate the implications for the deposit funding gap below.
4. The Netherlands, like most other European countries, has a relatively high share of government expenditures: the ‘collective expenditures’, including transfers for social security, are about 50 per cent of GDP, whereas the ‘pure’ government expenditures, which are counted as value added in the national accounts, are about 30 per cent of GDP. Government debt in 2013 was about 70 per cent of GDP.

The combination of increased mortgages and a moderate development of deposits resulted in an enhanced vulnerability of the banking system to the vagaries of the international financial markets. Whereas deposits are generally seen as a secure and stable source of funds, the increasing gap between long-term commitments and funds has been recognized as the deposit financing gap (Vandevyvere/Zenthöfer 2012), which is depicted for the Netherlands in Figure 1. The figure illustrates how until 1992 mortgage financing was mainly through deposits, but the acceleration in mortgage debt since the early 1990s could no longer be financed by deposits, and since the mid 1990s debt securitization became an increasingly important source of financing. In its 2013 assessment of the Dutch economy, the IMF recognizes this as the most important vulnerability of the Dutch economy (IMF 2013) and the OECD also pays special attention to this phenomenon in a recent assessment of the Dutch economy (OECD 2012: box 2). The increasing

1. It should be noted that defaults with respect to mortgage exposure have so far been very limited. The vulnerability referred to is the impact of the large mortgage exposure on funding of the banking sector. The financial crisis affected Dutch banks mainly through their exposure to the international financial system.



Source: Bijlsma et al. (2012: fig. 5).

Figure 1 The deposit financing gap

awareness of the mortgage-related problems in the public debate in the Netherlands has resulted in a decline in consumer confidence. Moreover, the fourth-largest bank of the Netherlands (SNS) had to be nationalized owing to funding problems in 2013; the second-largest bank (ABN/AMRO) had already been nationalized in 2008.² Obviously this has put a strain on government debt.

3 A STOCK-FLOW CONSISTENT MODEL FOR THE DUTCH ECONOMY

Our analysis takes as a starting point the model developed by Zezza/Dos Santos (2006), indicated henceforward as ZDS. They present an operational model in the stock-flow consistent tradition which shows the importance of wealth effects in consumption, in relation to wealth accumulation, and takes into account the role of the financial sector. Zezza (2008), referred to as Zezza in the remainder of this paper, extends this model to include the interaction with the housing market, which is highly relevant for our analysis.³ In our model, we will expand these models by including relevant open economy characteristics and modelling the financial sector in a more elaborate way. However, we model the housing market differently, with endogenous house prices while keeping the stock of housing exogenous. We show that the more elaborate modelling of the financial sector, also in an open economy context, is a necessary ingredient to explain the vulnerability of the financial sector, as appears for instance from the deposit financing gap.

2. The third-largest bank (ING) was also bailed out in 2008, but repaid its last debts in 2014.

3. Zezza also pays considerable attention to including the role of the distribution of income between wages and profits in his model. We ignore that aspect here.

In this section, we present the elements which we add to the model developed by ZDS by introducing the foreign sector, extending the model of the banking sector and including housing and mortgages in the household sector. Next, we briefly summarize the models of firm behaviour and government, which are identical to those of ZDS. The full model is presented in the Appendix of MMS and the balances presented for each sector are summarized in the balance sheet for the total economy at the end of this section, together with the social accounting matrix which summarizes all transactions – see Tables 1 and 2, respectively.

3.1 The foreign sector and the Central Bank

The foreign sector is introduced in a simple way, following Godley/Lavoie (2007b). Next to consumption, investment and government goods, firms also produce net exports ($X - IM$). This does not affect their balance sheet, however, nor does it affect their flow of funds. We assume exports X to be exogenous and imports IM to be proportional to GDP. In line with the initial approach of Godley and Lavoie we ignore terms of trade and exchange-rate issues – also motivated by the knowledge that a lot of trade by the Netherlands is within the euro area.

Since foreigners hold both bank equity $p_e E_{ba}$ and bonds B_{ba} issued by banks, as we discuss in the next section, these appear as assets in the balance sheet of the foreign sector. The liabilities of the foreign sector consist of foreign reserves R held by the Central Bank. Changes in these foreign reserves occur because of net exports and financial transfers due to dividend payments out of bank equity and interest payments on bonds, as we discuss in Section 3.6. The balance sheet of the foreign sector is given in Table 1.

Foreign reserves are assets in the balance sheet of the Central Bank. In the present analysis we ignore the complications which follow from the fact that the euro area, including the Netherlands, is controlled by the European Central Bank and not by a National Central Bank – but including a Central Bank balance sheet is necessary for a proper modelling

Table 1 Balance sheets

	Households	Firms	Banks	Central Bank	Government	Foreign	Total
High powered money	$+H_b$		$+H_b$	$-H$			0
Central Bank advances			$-A$	$+A$			0
Bank deposits	$+M$		$-M$				0
Loans		$-L$	$+L$				0
Bills	$+B_b$			$+B_c$	$-B$		0
Capital		$+p \cdot K$					$+p \cdot K$
Bonds			$-B_{ba}$			$+B_{ba}$	0
Equities	$p_e E_b$	$-p_e E_b$	$-p_e E_{ba}$			$+p_e E_{ba}$	0
Mortgages	$-MO$		$+MO$				0
Houses	$+p_h HS$						$+p_h HS$
Foreign reserves				$+R$		$-R$	0
Total (net worth)	$+V$	$+V_f$	0	0	$-B$	$+V_a$	$+V_t$

Table 2 Social accounting matrix

	Prod.	Households	Firms	Banks	Central Bank	Government	Capital account	Foreign	Total
1. Production		$+p \cdot C$				$p \cdot G$	$p \cdot \Delta K$ $+ph, \Delta HS$	$X - IM$	$p \cdot Y$
2. Households	$+WB$		$+FD$	$+iM + Fb$		$+iB_h$			$+Y_h$
3. Firms	$+FT$								$+FT$
4. Banks		$+i.MO$	$+iL$						$+Y_b$
5. Central Bank				$+iA$		$+iB_c$			$+Y_c$
6. Government	$+Ti$	$+Td$	$+Tf$		$+Fc$				$+Y_g$
7. Capital Account		$+Sh$	$+FU$	0	0	$+Sg$		$+Sa$	0
8. Foreign				$+i_B B_{ba} + i_E E_{ba}$					$+Ya$
TOTAL	$+p \cdot Y$	$+Y_h$	$+FT$	$+Y_b$	$+Y_c$	$+Y_g$	$p \cdot \Delta K$ $+ph, \Delta HS$	$TB + Sa$	

of the financial sector and the consistency of our analysis. We will use the ‘neutral’ term Central Bank in our analysis and refer to the ECB whenever appropriate.

Next to holding foreign reserves, the Central Bank provides advances A to banks and holds bills issued by the government, B_c . The liabilities are high-powered money H issued by the Central Bank, which is held by the public and banks. Since the revenues FC of the Central Bank are transferred to the government, the balance sheet of the Central Bank is closed without remaining net worth – see Table 1 (p. 36).

The revenues of the Central Bank are given by:

$$FC = i_{A,-1} \cdot A_{-1} + i_{B,-1} \cdot B_{C,-1}. \quad (1)$$

Here, i_B is the rate on government bills set by the Central Bank and i_A is the interest rate on advances. In line with ZDS, Zezza and Godley/Lavoie (2007a), the Central Bank sets i_A as a mark-up on inflation such that the real interest rate on advances is a constant. The rate on government bills, i_B , is set by the Central Bank such that supply of bills by the government is cleared.⁴ The amount of advances provided by the Central Bank is discussed in the next section. Finally, the Central Bank provides as much high-powered money as is demanded by banks and households.

As Godley/Lavoie (2007b) emphasize, there is no inherent mechanism for a country with a trade surplus to converge to a balanced current account, as long as it is willing to accumulate ever more foreign debt. This situation is quite relevant for the Netherlands. See our discussion of stylized fact 1 in Section 2.

3.2 The bank balance sheet and the deposit financing gap

The bank balance sheet in ZDS and in Zezza contains some useful simplifications, as we elaborate in MMS. However, an important omission is that the bank does not own capital. The latter seems very strange in the light of our analysis in which banks finance their assets by borrowing from the financial sector abroad, which we model by issuing equity and bonds.⁵ Hence we add to the bank balance sheet bonds B_{ba} and equity $p_e E_b$ as liabilities, which are held by the foreign sector and used by banks to finance their outstanding mortgages and loans. Here p_e is the nominal price for equity.

Equity is such that the leverage ratio, which is tier 1 capital/risk-unweighted long lending, should exceed a certain threshold. As a consequence, tightening of capital requirements forces banks to either issue equity (which they are usually reluctant to do) or reduce their outstanding loans on the asset side. In line with ZDS and Zezza, all profits of the banking sector FB are distributed to the households – we interpret these as bonus payments in excess of normal wages.⁶ However, in case of losses no profits are distributed to the households and equity is issued to compensate for these losses.

4. Obviously this is a simplifying assumption, as the ECB is not allowed to do this. However, Draghi’s famous statement that given the current situation he will do ‘everything’ to protect the Eurosystem against speculation comes close to this notion.

5. Bonds represent here all sources of outside financing. That banks borrow exclusively abroad is a simplifying assumption, which however emphasizes the stylized fact of strong foreign exposure of the Dutch financial sector.

6. The profits are given by $[(1 - \text{tax rate}) \cdot (\text{income from lending} - \text{costs of borrowing}) - \text{dividends on equity}]$. We ignore retained profits which can contribute to internal funds; as a consequence net worth of banking is zero.

For issuing deposits M banks need to meet the reserve requirement by holding sufficient high-powered money H_b :

$$H_b = v_{res} \cdot M. \quad (2)$$

The demand for mortgages by households and loans by firms is fully accommodated by banks. The amount of equity is a fixed proportion of the total liabilities of the banking sector, v_{bas} , determined by the Basel requirements:

$$p_e \cdot E_{ba} = v_{bas} \cdot (M + A + B_{ba}). \quad (3)$$

Bonds are available from the foreign sector at a relatively high rate i_{ba} , in principle to an unlimited amount. We assume that there is a ratio between advances and deposits, v_{CB} , implicitly imposed by the Central Bank:

$$A = v_{CB} \cdot M. \quad (4)$$

The remaining gap is financed by borrowing B_{ba} from abroad.⁷ The resulting balance sheet is presented in Table 1 (p. 36).

With respect to the pricing decisions, we assume in line with the ZDS analysis that the interest rates on loans and deposits are set as a fixed mark-up on the rate on advances set by the Central Bank. Similarly, the rates on mortgages and bonds issued are fixed mark-ups on the interest rate on treasury bills. Endogenizing these mark-ups consistent with the analysis of Godley/Lavoie (2007a: ch. 10) is left for further research.

An important property of our extension of the ZDS/Zezza model is that it allows us to identify the deposit financing gap as the discrepancy between M and $L + MO$. As we discussed in the previous section, this gap is considered to be problematic because, the larger the gap is, the more banks have to rely on outside capital to finance their mortgages and loans. This is particularly problematic in the case of mortgages, as mortgages are outstanding long-term commitments and outside capital is of shorter duration and more risky (often foreign). This implies that the larger the deposit financing gap is, the more expensive financial resources for banks become. If financing by bonds requires a rate r_b and deposits are paid a rate r_d , the problem for banks is that holds $r_b > r_d$. This implies that the cost of capital to finance mortgages and loans ($L_{ba} = M + B_{ba}$), r_v , is given by:⁸

$$r_v = r_b \cdot B_{ba} / L_{ba} + r_d \cdot M / L_{ba}, \quad (5)$$

and one immediately sees that r_v increases with B_{ba}/L_{ba} – that is, when the deposit financing gap increases. It is obvious from our modelling of bank behaviour that an increase in mortgages issued at a given amount of deposits will automatically lead to an increase in the deposit financing gap.

3.3 Including housing and mortgages in the household model

When including housing and mortgages in the model, we follow Zezza's structure. However, we do not use his distinction between rich and poor households, but maintain one household sector. Moreover, we ignore for simplicity the renting of houses. The resulting balance sheet of households is presented in Table 1 (p. 36).

7. This was the case until recently. In the current situation, the foreign sector is rationing the available amount of credit, and the European Central Bank provides an unlimited amount of advances.

8. For simplicity we ignore here advances and equity as a source of finance. Also, as the net worth of banks is zero, mortgages cannot be financed by simply issuing more credit.

When including housing and mortgages in the model, we assume that when banks and households decide on a loan for buying a house, the affordability of the household determines the maximum loan the bank is willing to provide, as modelled in Madsen (2012). As we argue in MMS, this implies that the growth rate of the house price p_b follows from:

$$\Delta \ln p_{bt} = \psi_t + \alpha \Delta \ln Y_t^b + (1 - \alpha) \Delta \ln Y_t^e - \Delta \ln [i_{MO}(1 - \tau_b \tau_{MO}) + f_{MO}] - \Delta \ln HS_t, \quad (6)$$

where Y_t^b is disposable income (not net of mortgage payments) and Y_t^e is expected income for next year. The last-but-one term refers to the user cost of (housing) capital and includes the interest rate on mortgages i_{MO} , corrected for the fraction that is deductible for income tax, and the mortgage repayment rate f_{MO} . The fraction that is deductible from income tax is given by the income-tax rate τ_b times the fraction of mortgage interest payments that is deductible τ_{MO} . The final term in the above equation refers to the number of houses on the market, HS . We assume housing supply HS to be given, owing to the highly regulated housing market in the Netherlands. The crucial parameter in the equation, however, is the affordability ψ , which is the total amount of housing costs that the household is able to spend (as perceived by banks), relative to its disposable income. The housing bubble was caused by an increase of ψ and in reaction to overstretching their balances banks have decreased ψ .

With respect to mortgages MO we assume, in line with the affordability assumption above, that demand for mortgages is a fixed proportion ϕ of the housing value, while supply of mortgages is accommodating.⁹ Hence:

$$\Delta MO = \phi \cdot p_b \cdot \Delta HS + \phi \cdot \Delta p_b \cdot HS - \text{morc} \cdot MO_{-1}, \quad (7)$$

where *morc* is the share of mortgage repayments.

Once the share of assets to be spent on housing is determined, we assume that, in line with ZDS, the demand for money H_b is proportional to nominal consumption $p \cdot C$ and the remaining demand for assets, B_b and $p_e \cdot E_b$, follows from a Tobin-type portfolio model. Then bank deposits M are determined as a residual of household wealth. This implies that wealth net of housing and mortgages VN :¹⁰

$$VN = V - (p_b \cdot HS - MO) = H_b + M + B_b + p_e \cdot E_b \quad (8)$$

is distributed over financial assets as follows:

$$H_b = v_1 \cdot p \cdot C \quad (9)$$

$$p_e \cdot E_b / (VN^e - H_b) = \lambda_{00} - \lambda_{01} \cdot r_M^e + \lambda_{02} \cdot r_E^e - \lambda_{03} \cdot Yhd^e / V^e - \lambda_{04} \cdot r_B^e \quad (10)$$

$$B_b / (VN^e - H_b) = \lambda_{10} - \lambda_{11} \cdot r_M^e - \lambda_{12} \cdot r_E^e - \lambda_{13} \cdot Yhd^e / V^e + \lambda_{14} \cdot r_B^e \quad (11)$$

$$M = VN - H_b - B_b - p_e \cdot E_b. \quad (12)$$

9. In MMS we show how, from 1982 till 2002, mortgages were very close to 40 per cent of housing value in the Netherlands; since then they have increased gradually, to more than 50 per cent nowadays. Zezza, who also assumes that mortgage supply is accommodating, models demand for mortgages by workers (their only outlet for savings) as the difference between demand for homes and savings.

10. Surprisingly enough, Zezza ignores the role of mortgages in his definition of VN .

The expected values of variables are based on an adaptive expectations mechanism:

$$X^e = X_{-1} + \xi.(X^e - X_{-1}) \quad (13)$$

Household savings are defined as the disposable income of households Yhd minus consumption $p.C$:

$$Sh = Yhd - p.C. \quad (14)$$

We define the disposable income of households by deducting taxes paid by households Td and interest payments on mortgages from household income Yh :¹¹

$$Yhd = Yh - Td - i_{MO,-1}.MO_{-1}. \quad (15)$$

Household income consists of wages WB and dividends FD paid by firms, bonuses FB paid by banks and interest income:

$$Yh = WB + FD + FB + i_{M,-1}.M_{-1} + i_{B,-1}.B_{h,-1}. \quad (16)$$

Taxes are net of mortgage interest payments – this feature plays an important role in explaining the high incidence of mortgages in the Netherlands:

$$Td = \tau_b.(Yh - \tau_{MO}.i_{MO,-1}.MO_{-1}), \quad (17)$$

where τ_b is the tax rate on income and τ_{MO} is the tax reduction on interest payments.

In line with ZDS we assume that households' real consumption depends on real disposable income, the opening stock of wealth V and on real capital gains. Capital gains can be obtained on the stock of equity, the only financial asset with a market price, and on housing. Contrary to Zezza, we assume the stock of housing to have a different impact on consumption compared to financial wealth, owing to its differences in liquidity – see also CPB (2013). However, in line with Zezza, capital gains on housing are assumed to have the same impact as those on equity. As a consequence, the consumption function is given by:

$$C = \alpha_1.yhd + \alpha_2.v_{-1} + \alpha_3.(p_h.HS - MO)/p + \alpha_4.(cge^e + cgh^e - [g_p^e/(1 - g_p^e)].v_{-1}), \quad (18)$$

where small letters for variables indicate real values; for instance, $yhd = Yhd/p$. The capital gains are defined by:¹²

$$CGE = \Delta p_e.E_{-1} \text{ and } CGH = \Delta p_h.HS_{-1}. \quad (19)$$

The change in household wealth then follows from:

$$\Delta V = Sh + CGE + CGH. \quad (20)$$

Finally, the increase in housing should be included in the production of firms, which appears in the capital balance of the social accounting matrix – see Table 1 (p. 36).

3.4 Firm behaviour and wage and price formation

We follow ZDS in modelling both wage and price setting and firm behaviour – see MMS for a further elaboration. This part of the model is kept deliberately simple, as the focus is on the interaction with the financial sector. Price p , net of indirect taxes, is set as a mark-up on unit labour cost. Nominal wage growth equals expected inflation plus expected

11. Zezza does not deduct these interest payments from disposable income.

12. The term $-[g_p^e/(1 - g_p^e)].v_{-1}$ is valuation gain on wealth, with g_p^e as expected inflation.

productivity growth, although the latter might not be fully accounted for. Labour productivity is determined exogenously.¹³ We ignore in this version of the model the determination of unemployment and its potential interaction with wage determination and social security expenditures.¹⁴ That is left for further research.

Investment of firms is an important ingredient of the model because of its impact on both aggregate demand and on productive capacity. The sources of financing investment are retained profits, loans and equity. This is also consistent with the balance sheet of firms as presented in Table 1 (p. 36). Retained earnings FU is a fixed proportion of profits FT net of interest payments and taxes Tf and Ti ; the other part of net profits is paid out as dividends FD to households – see also Table 2 (p. 37). With respect to equity, we assume that new equities are issued as a fixed proportion of the amount of external funds required to finance investment, and bank loans are then used to close the remaining financing gap. The price of equity is determined endogenously.

3.5 The government

Growth in government expenditures is modelled in line with ZDS to equal expected output growth

$$g_G = g_K \quad (21)$$

and taxes are proportional to the relevant bases. Hence we have:

$$Td = \tau_b \cdot (Yb - \tau_{MO} \cdot i_{M,-1} \cdot MO_{-1}) \quad (22)$$

$$Ti = t_i \cdot p \cdot Y \quad (23)$$

$$Tf = t_f \cdot FT \quad (24)$$

for income, value added and profit taxes, respectively. As a consequence, government savings, which constitute the budget balance, are given by:

$$Sg = Ti + Td + Tf + FC - p \cdot G - i_B \cdot B. \quad (25)$$

These savings constitute the supply of bills by the government:

$$\Delta B = -Sg. \quad (26)$$

The market for bills is cleared by the Central Bank as discussed in Section 3.1.

3.6 The structure of the full model

The full model is presented in MMS. One aspect of the model is to present the consolidated balance sheet for the economy – see Table 1 (p. 36). The closure of the balance sheets of households, banks, firms and government is guaranteed by realized bank deposits M by households, bonds B_{ba} by banks, loans L by firms and treasury bills B_c by the government, respectively. Finally, the balance sheets of the Central Bank and the foreign

13. Zezza assumes that the growth of labour productivity is negatively influenced by capacity utilization.

14. This is in line with ZDS. Zezza recognizes the potential impact of unemployment on wage formation by relating the parameter χ in the wage equation negatively to unemployment. However, he ignores the interaction with social security contributions and unemployment benefits.

sector are closed by foreign reserves. To understand this latter point better and to look at the structure of the model in a different way, one should consider the social accounting matrix – see Table 2 (p. 37). This matrix presents a consistent schedule of all flows between sectors.

Value added in the production sector is obtained by producing consumption goods, government goods, accumulation of capital and the housing stock and net exports. The proceedings are paid to households as wages, to firms as profits and to the government as indirect taxes. The profits of the firms, net of interest payments on loans to banks and taxes on profits, is either retained or distributed to households as dividends.

Next to income from wages and dividends, households obtain interest on their deposits and government bills and get the remaining profits from banks. They use their income for consumption, income tax and interest payments on mortgages (using the reduced rate due to tax deductibility). The remaining part of their income is saved.

Banks obtain interest income from mortgages and loans to firms and pay next to dividends on equity interest on advances from the Central Bank, deposits held by households and bonds issued abroad. The remaining profits are presented to households in the form of bonus payments.

The social accounting matrix shows that

$$p.\Delta K + ph.\Delta HS + TB + Sa = Ya, \quad (27)$$

where the trade balance is $TB = Ex - Im$ and Sa represents savings from the foreign sector. Hence holds:

$$p.\Delta K + ph.\Delta HS = Ya - TB - Sa = Sh + FU + Sg + i_B.B_{ba} + i_E.E_{ba} - TB, \quad (28)$$

where $Sh + FU + Sg$ represents domestic savings and $i_B.B_{ba} + i_E.E_{ba} - TB$ represents net capital inflow. Thus capital and housing accumulation is financed by domestic savings and net capital inflow from abroad.

Finally, the change in foreign reserves is given by:

$$\Delta R = \Delta B_{ba} + \Delta(p_e.E_{ba}) - \Delta Va = \Delta B_{ba} + TB + \Delta(p_e.E_{ba}) - i_B.B_{ba} - i_E.E_{ba}. \quad (29)$$

4 SIMULATION RESULTS OF THE MODEL

The model as described above is used to analyse two scenarios as depicted in the stylized facts. To obtain a baseline solution, the model is first ‘calibrated’ using a plausible set of parameters.¹⁵ The stylized facts to be reproduced as baseline are export-led growth, a slight government budget deficit, a trade surplus and fiscal parameters that reflect the Dutch situation regarding tax rates in general and the fiscal policy of deducting mortgage interest payments from income tax. As export grows at 1 per cent exogenously, the baseline solution shows a slight positive annual growth rate of real GDP of 1 per cent, even though labour productivity is kept constant. The government deficit stabilizes at around 2.5 per cent of GDP, whereas the trade surplus remains positive at around 5 per cent of GDP.

The simulations are carried out for 250 periods and this time span is mimicked as period 1800–2050. All graphs start in 1970 to first let the model (safely) converge to a relatively stable solution. In the scenarios described below we introduce two different periods at which these scenarios are activated. The first period starts in 1980 and the

15. The parameters are listed in Appendix 2 of MMS.

second starts in 2020.¹⁶ Here we focus on two sets of scenarios, both related to an increase in house prices and their impact on (i) the financial market, in particular on the deposit financing gap; and (ii) the effects on consumption, GDP and the government deficit. In the baseline scenario, prices of houses grow by about 1 per cent per year, whereas the price of output remains stable.¹⁷ The first set of scenarios (a) follows from an increase in the real house price. In scenario a1, we change autonomous growth in house prices, represented by the parameter ψ_t in equation (6), from 0 to 0.005 from 1980 onwards, such that house prices will grow by about 1.5 per cent per year since then; as we argued in Section 3.3, this can be motivated by the increasing willingness of banks to issue mortgages. While in scenario a1 the annual increase of real house prices is kept at about 1.5 per cent until the end of the simulation, in line with the stylized facts as described in Section 2, in scenario a2 the increase in house prices will stop in 2020 by returning the value of ψ_t from 0.005 back to 0 in that year, such that the annual increase in house prices returns to about 1 per cent as in the baseline scenario. Finally, in scenario a3, the increase in real house prices is even more reduced in 2020 by setting the parameter ψ_t to -0.005 , resulting in a growth rate of house prices of about 0.5 per cent, so below the baseline scenario.

The second set of scenarios (b) is similar to the first one (a), with the main distinction that now government policy is focused on keeping the government deficit below 3 per cent of GDP, in line with European fiscal policy rules. This is implemented by decreasing the growth rate of government expenditures if last year's deficit exceeded 3 per cent of GDP.¹⁸ Under this condition, we applied the same scenarios as depicted in the first set by changing the value of ψ_t such that house prices grow by 1 per cent per year (scenario b0); by 1.5 per cent from 1980 onwards (scenario b1); by 1.5 per cent from 1980 until 2020, and back to about 1 per cent after 2020 (scenario b2); and by 1.5 per cent from 1980 until 2020 and reduced to 0.5 per cent after 2020 (scenario b3).

4.1 Increased house prices

If real house prices increase, we expect that household consumption will also increase, because total household wealth will expand, but also because households will consume part of the excess value of houses by increasing mortgages on existing properties. This is in line with the stylized facts. As a result, we expect that real consumption and real output will increase initially. Although increased output also induces employment growth, in the current version of the model this has no effect on inflation, such that wage inflation, output price inflation and thus expected inflation are all zero. As interest rates are all based on a fixed spread on treasury bills or Central Bank advances and on expected inflation, these do not change between scenarios. However, demand for mortgages by households will increase and demand for loans from firms will expand to finance increased investments as a reaction to increased production. This induces banks to adjust their liabilities to accommodate these changes.

16. These dates are added merely for presentational purposes and do not reflect, nor intend to suggest, actual calendar time.

17. The wage rate is stable and output price is a mark-up on the wage rate.

18. In the model, real government expenditures are modelled as: $g = g(-1) + (1 + grye + grg0)$, where $grye$ is the expected growth rate of real output and $grg0$ is an add factor. This add factor is zero if last year's nominal deficit is below 3 per cent, but it is equal to $grg0 = grg0(-1) - \lambda \cdot (Gdef/Y - 0.03)$, if nominal government deficit ($Gdef$) is above 3 per cent of nominal GDP (Y). Note that we let $grg0$ grow towards zero with the same speed if $grg0$ is negative and the lagged government deficit is within the bounds of 0 and 3 per cent. The adjustment parameter λ is set equal to 0.5.

In scenario a1, nominal household wealth will steadily increase, initially due to the increase in house prices (see Figure 2), whereas the distribution of its components hardly changes. The total fraction of the value of houses minus mortgages in total household wealth increases slightly from 8 per cent in 2010 in the baseline to 9 per cent in that year, while decreasing the other components only marginally. In line with the second stylized fact described in Section 2, household savings decline consistently, owing to the impact of increased wealth on consumption. This leads to a small decline in deposits from 19 per cent to 18 per cent of household wealth. At the assets side of the bank balance sheet, the amount of mortgages increases by 17 per cent in 2010 relative to the baseline scenario whereas loans increase by 8 per cent, together leading to an increase of the total balance sheet of 13 per cent. Banks have to finance that, in our model, by selling bonds abroad – because normally equity is only issued to increase tier 1 capital (or, in our model, to finance bank losses). After the increase in house prices, the share of foreign bonds increased in 2010 from 33 per cent in the base line to 41 per cent in the other scenarios. However, since the increase in household wealth is a gradual process, changes in the distribution of bank liabilities also follow a gradual process. In first years after increased house prices, bank profits will increase; but as banks will issue more and more bonds, which are more expensive than deposits or central bank advances, bank profits will slowly decline, after an initial positive impulse.¹⁹ Bank profits eventually become negative relative to the baseline in all three scenarios, although they remain positive in an absolute sense. The deposit financing gap, which is defined as the ratio of long lending (mortgages and loans) relative to household deposits, is indeed increasing as expected (see Figure 3). This is consistent with the third stylized fact discussed above.

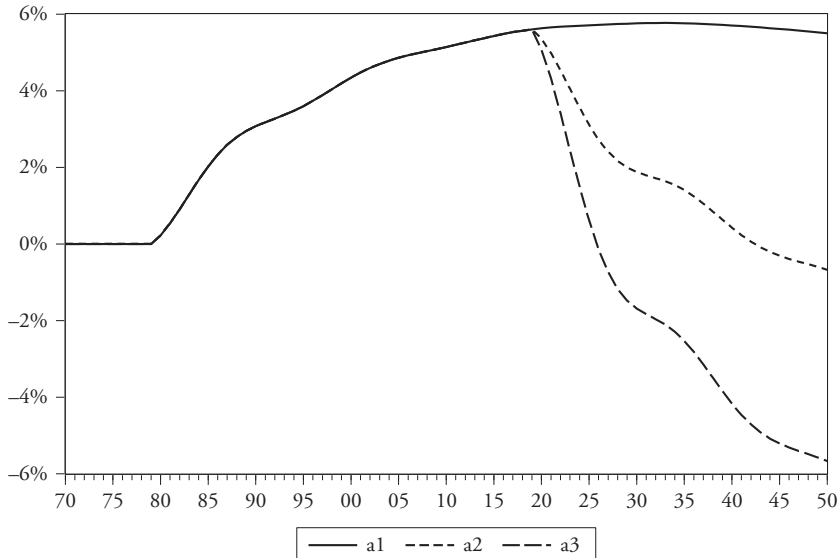


Figure 2 Nominal wealth households (% deviation from the baseline)

19. Interest on bonds is equal to 5 per cent in all scenarios, whereas the interest rate on Central Bank advances and on deposits is 2 per cent.

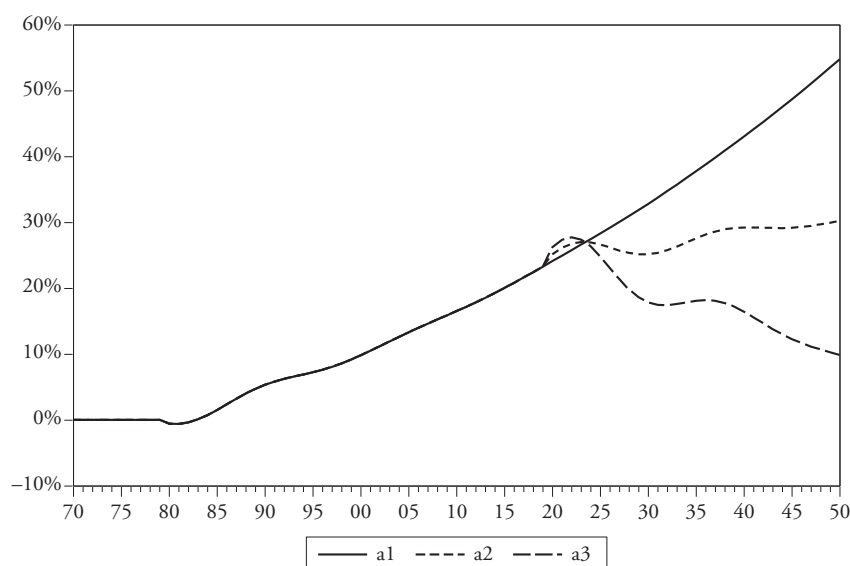


Figure 3 Deposit financing gap (% deviation from the baseline)

Finally, increased house prices will increase household consumption and thereby output – at least initially. GDP increases by nearly 1 per cent compared to the baseline (see Figure 4). However, a countervailing influence follows from the ensuing increase in mortgages, which leads to an expanding interest burden, such that the net income of households is reduced. The latter leads to a reduction of the initial impulse to GDP as can be seen in Figure 4. Eventually GDP will even fall below baseline GDP and continues to deviate from the baseline. The increased demand for mortgages together with the decreased household savings also forces banks to issue an increasing amount of bonds, enhancing the deposit financing gap.

In the baseline simulation, government expenditures are nearly stable and so is the deficit which remains about 2.5 per cent of GDP during the entire simulation period. The growth rate of real government expenditures is proportional to the growth rate of real output and thus increases at the same pace in scenario a1. Tax income also increases, but not at the same pace, as interest payments on mortgages by households is deductible from income tax. This gap will be financed by government by issuing treasury bills that are at a relative high interest rate of 4 per cent. This increasing interest burden again increases government deficit, leading to a self-sustaining process.²⁰ These developments are consistent with the fourth stylized fact discussed above.

Turning to scenarios a2 and a3, where prices of houses stabilize or even decrease after 70 periods, we observe in Figure 2 in both cases a decrease in household wealth that ultimately turns even further below the baseline. Profits of banks worsen compared even to scenario a1, but the deposit financing gap stabilizes (a2) or decreases (a3) owing to increased savings and decreased demand for mortgages. In both cases, real GDP drops

20. In our model, the deficit is financed by the Central Bank, partly because the Central Bank absorbs all bills issued by government, partly because the profits resulting from interest payments on these bills are transferred to the government.

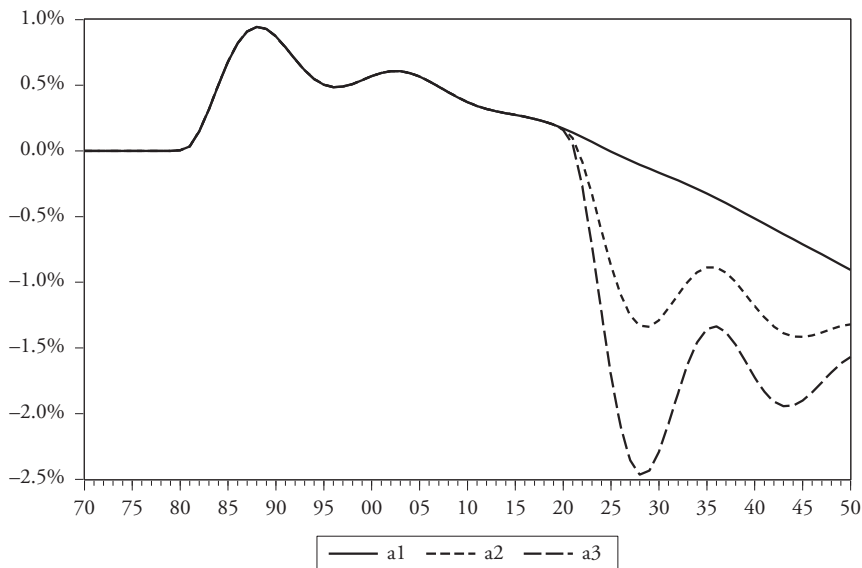


Figure 4 Real GDP in scenarios a1–a3 (% deviation from the baseline)

considerably compared to simulation a1 because of decreased household wealth and thus decreased consumption. Moreover, interest payments on mortgages remain high so that GDP does not revert to its initial level. However, also in scenarios a2 and a3 growth of real GDP remains positive. The government deficit relative to GDP initially increases and rises to above 3 per cent in all scenarios. It remains high and stays above 3 per cent in scenario a1 but drops to about 2.8 per cent and 2.3 per cent in scenarios a2 and a3 respectively, owing to decreasing government expenditures because of the decreasing growth rate of real output.

These scenarios illustrate on the one hand the link between the increasing house prices and the growth of the deposit financing gap. On the other hand, they show the strong interaction between the financial sector and the real sphere.

4.2 Government deficit is limited to 3 per cent of GDP

The second set of scenarios reflect a situation where government policy is adapted to the so-called 3 per cent rule. This rule is highly debated under the current circumstances, as it might harm recovery of the downturn as experienced by many countries after the crisis in 2008. The baseline scenario is not affected as the budget deficit remains below 3 per cent, hence all baseline results remain the same. However, in the other scenarios the deficit tends to exceed 3 per cent, hence the rule is activated that government expenditures decrease if deficit increases above 3 per cent of GDP.

In scenario b1 where the house price increases by 1 per cent per year, the deficit limit is encountered in 2015, whereas it remains below the 3 per cent limit in the baseline scenario. In 2016 a drop in government expenditures is imposed. This indeed reduces the deficit, but as a consequence real GDP also drops and turns below real GDP in scenario a1 – compare Figure 5 to Figure 4.

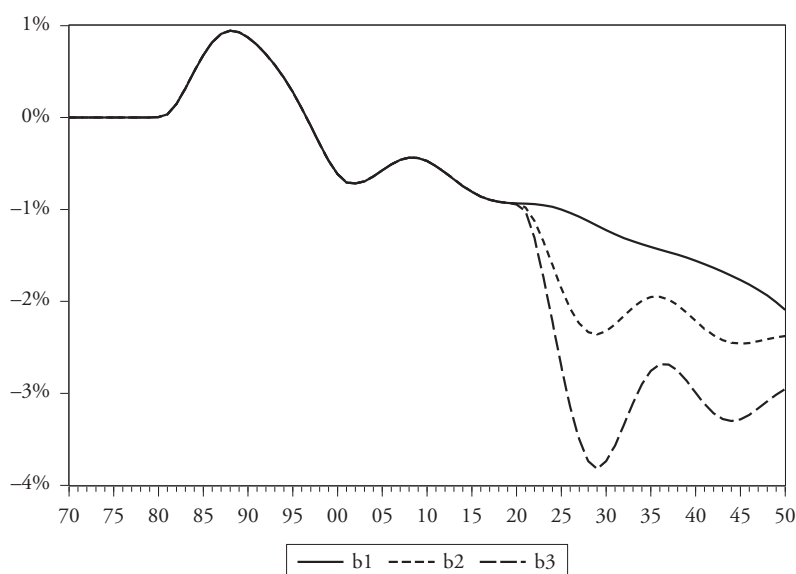


Figure 5 Real GDP in scenarios b1–b3 (% deviation from the baseline)

In case of stabilizing house prices (scenario b2) and decreasing house prices (b3), the effect becomes even larger, as decreasing consumption owing to decreased wealth effects is now coupled with cuts in government expenditure. Reduction of government expenditure now causes GDP to drop even more, to 4 per cent below the baseline in scenario b3, whereas without budgetary rule this would be about 2 per cent. Because of this development, the government deficit drops further in scenarios b2 and b3.²¹ In these latter two scenarios, the working of the automatic stabilizer is hampered by the 3 per cent rule, which is consistent with the findings of Candelon et al. (2010) for the euro area countries.

These scenarios show that too stringent a budget policy may have adverse effects.

5 CONCLUDING REMARKS

In this paper we observed some interesting stylized facts for the Netherlands, which emphasize on the one hand a strong potential for interaction between the financial and the real sphere and on the other hand point at the danger of a second Dutch disease, which might be relevant for other countries to be aware of. The core of the problem is formed by the deposit financing gap, which forces the banking sector to finance its outstanding long-term commitments, in particular mortgages, with short-term funding or bonds, mainly taken from abroad. As a consequence, the banks have to pay a relatively high interest rate and their source of financing is uncertain. This problem is aggravated by increasing house prices, which led to an explosive

21. In the last scenario where house prices drop and where government policy sticks to the 3 per cent rule we see even negative growth of GDP during three consecutive years (2023–2025), indeed mimicking the double-dip as described in the stylized facts.

growth in mortgages (also stimulated by tax deductions on mortgage interest payments) and cumulated in a housing bubble. The recent bursting of the bubble did lead to a double-dip in the recession and worsening government deficits.

In our opinion, the current macroeconomic models, including the New Keynesian models, are not able to explain the stylized facts in a satisfactory way. In particular, they do not provide a satisfactory perspective on the interaction between the real sphere and the financial sector, which is crucial in analysing the dynamics and the impact of the deposit financing gap. Nor can they explain in full the impact of the decrease in house prices on the financial sector and the real sphere (and in particular on their interaction). We therefore developed, in Section 3, a model in the stock-flow consistent tradition which shows the importance of wealth effects in consumption, in relation to wealth accumulation, and takes into account the role of the financial sector in that process. To analyse the Dutch situation we included a foreign sector in the model and elaborated the model of the banking sector considerably in order to model the emergence of the deposit financing gap.

The properties of this model were analysed in simulations in Section 4. We showed how an increase in house prices can lead to the emergence of the deposit financing gap, which then hampers economic growth because of the burden of financing that gap. Moreover, the subsequent stagnation or fall in house prices leads to a fall in GDP growth through negative wealth effects, while the burden of the deposit financing gap still weighs on the economy too. It is obvious that there is also a negative impact on the government deficit, through the working of the automatic stabilizer. Finally we showed that in some cases the working of the automatic stabilizer is hampered by strictly imposing the 3 per cent budget deficit boundary, leading to a further deterioration in economic growth.

Although the model in its current version already provides interesting insights, we plan at least two extensions to describe the Dutch situation in a more comprehensive way. First we intend to model the role of pension funds explicitly, next the banking sector in the financial sector, and to include the impact of aging on both consumption behaviour and on the funded pension system. After that we also want to pay explicit attention to the unemployment problem and the interaction of unemployment with wage formation and social security. However, these issues are left for further research. For the moment we are content to have been able to explain with a relatively simple model how the danger of a second Dutch disease in the form of the deposit financing gap has emerged, and to have shown how such a phenomenon through the interaction between the financial and the real spheres can destabilize the whole economy.

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