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Theory and measurement in SFC models: the role of the financial sector

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The overarching main purpose of this paper is to detail all data collection and data manipulation and choices to be made to come to a consistent dataset to estimate and calibrate an SFC model, for which we use the model as specified in Meijers and Muysken (2022) as reference.

This also enables us to show more in general how data collection from national accounts in a stock-flow consistent way influences the modelling of an economy. We give examples for the composition of the wealth of households by including non-traded assets, the composition of the wealth of firms by identifying direct investments – both outwards and inward, and the composition of the wealth of government by pointing out the substantial amount of assets owned by the government, which we ignore. Next, we identify the impact of pension funds on both decisions made by households, including forced savings, and on the entire financial sector. We show how the net foreign debt accumulates through a persistent trade balance surplus and is financed to a large extent by pension funds. Finally, we show that corrections in income and savings are required to retain the consistency of the model while staying close to the national accounts. All these observations have important consequences for modelling the savings and investment behaviour of the various sectors.

Keywords: *national accounts, financialisation, wealth accumulation, stock-flow consistent modelling*

JEL codes: *E01, B5, E6, F45, G21, G32, E44, E47*

1 INTRODUCTION

The focus of this paper is on the identification and collection of national account data underlying the estimation and calibration of stock-flow consistent (SFC) models, with a detailed financial sector. For that purpose of this paper, we detail all data collection and data manipulation and choices to be made to come to a consistent dataset to estimate and calibrate an SFC model, for which we use the model as specified in Meijers and Muysken (2022) as reference. The data refer to the period 1995–2022.

The reason is that in our view stock-flow consistent data should be used when estimating and calibrating SFC models. We point out that several problems arise when using

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these data, which are hardly ever discussed, but deserve attention. Examples are how to translate a category of national account data (for instance, ‘non-traded assets’) into a category of sector data used in the model (for instance, ‘participations’); how to allocate data by sector of origin (for instance ‘firms’)¹ to other sectors (for instance, ‘foreign’); identify transactions from valuation changes – the latter lead to price changes, the former should correspond to savings; identify which data are not used in the model; and identify revisions in the data. A question that then remains is whether we should include all national account data in our model, for instance, by adding correction factors to stocks and flows. We show that this complicates the data structure considerably.

We also show that a closer look at the data can have important implications for the specification of the model. Examples are including non-traded assets as a separate wealth category when we model the composition of the wealth of households, identifying direct investments – both outward and inward – in the composition of the wealth of firms, and pointing out the substantial amount of assets owned by the government in the composition of the wealth of government, which we ignore nonetheless. Next, we identify the impact of pension funds on both decisions made by households, including forced savings, and on the entire financial sector. Finally, we show how the net foreign debt accumulates through a persistent trade balance surplus and is financed to a large extent by pension funds. All these observations have important consequences for modelling the savings and investment behaviour of the various sectors.

The structure of the paper follows the composition of national accounts, where a distinction is made between financial balance sheets and current transactions. We first discuss the wealth data collected in the wealth accounts for financial and non-financial wealth in Section 2. Next to households, firms and government, we pay extra attention to the composition of the financial sector. We also discuss the impact of valuation changes on the composition of wealth and identify the wealth components that we cannot include in our model. The transaction data are discussed in Section 3. Next to expenditures, income generation and savings, we pay special attention to the way wealth income is distributed between sectors. We also identify which part of income we cannot include in our model. In Section 4, we then close the dataset by ensuring consistency for each sector between wealth accumulation and net-savings. We show that this again leads to some data corrections. Some concluding remarks are presented in Section 5.

The discussion in the paper is kept very general, to focus on the relevant questions. However, at the sectoral level, there are many details that have to be addressed. We have dealt with these points in various appendices, which are published in an accompanying working paper.

2 WEALTH DATA

In our most recent paper (Meijers and Muysken 2022), we use the balance sheet presented in Table 1, albeit with a more detailed financial sector. The model using this balance sheet has resulted from, on the one hand, developments in the literature following the financial crisis in 2008 and the more recent concerns on inequality,² and from, on the other hand, insights using data in the national accounts. What we want to show here is that when looking at the national account data on the various sectors, many choices have to be made to identify the development over time of the various components of

1. Throughout this text, we refer to ‘firms’ as equivalent to ‘non-financial corporations’.
2. Issues that are ignored are environmental issues, inflation and the labour market.

Table 1 Balance sheet with condensed financial sector

	Households	Firms	Financial sector	Government	Foreign	Total
Bank deposits	M_b		$-M_b$			
Loans		$-L_f$	L_f			
Bills	Domestic		$p_b.B_{fin}$	$-p_b.B_{fin}$		
	Abroad			$-p_b.B_a$	$p_b.B_a$	
Capital		$pk.K$		$pk.K_g$		$pk.(K + K_g)$
Participations	Traded		$-pa_b.A_b$			
	Abroad		$pa_{ab}.A_{ab} - pa_{ba}.A_{ba}$	$-pa_{ab}.A_{ab} + pa_{ba}.A_{ba}$		
	Non-traded			$-pa_{nt}.Ant$		
Equities	Firms/banks	$-pe_{ja}.E_{ja}$				
	Abroad	$pe_{af}.E_{af}$	$pe_{ajf}.E_{ajf}$	$-pe_{af}.E_{af} - pe_{ajf}.E_{ajf}$		
Mortgages			MO			
Houses	$ph.HS$					$ph.HS$
Pension claims/liabilities	$p_{cpf}.Cpf$		$-p_{cpf}.Cpf$			
Foreign Reserves			R		$-R$	
Miscellaneous	Xa_b	Xa_f	Xa_{fin}	Xa_g	Xa_a	0
Total net worth	Vb	Vf	V_{fin}	Vg	Va	Vt

the balance sheet. Fortunately, for each sector of the model national account data are presented.³

In our view, the data we use in our model should be consistent with the national accounts. The first obvious reason is that the national account data are in principle stock-flow consistent. Then, using the full set of national account data ensures the stock-flow consistency of the data used in the model. There is a problem, however, with the stock-flow consistency of the national account data since there are two different sources.

One source is the flow data, which are related to the measurement of GDP in various ways. The collection of flow data has a long tradition and has improved considerably over time. There is also a strong international harmonisation of these data. As a consequence, the flow data published by the Statistics Netherlands (CBS) are consistent with the SNA data, also published by Eurostat. Amongst others, these data include savings and investment. As we argue below, these savings data should be consistent with the accumulation of financial wealth, and the investment data should be consistent with the accumulation of non-financial wealth, i.e., capital. Unfortunately, this is not (always) the case. The reason lies in the next observation.

While the collection of flow data has a long tradition and is harmonised internationally, the collection of stock data is much more recent. As a consequence, for the Netherlands, stock data on a sectoral level, in particular on financial wealth, are frequently revised considerably. This also explains why the data are not always stock-flow consistent.

The second reason why we aim for consistency of the data with the national accounts is that we want to make sure that we account for all available information in our model, correction factors included. That does not mean we intend to be able to explain the development of all time series observed in our model. But we think it is important to point out what information is left out and kept as exogenous variables. For instance, the amount of liabilities of households we identify as mortgages ($-MO$ in Table 1) is about 9 per cent of GDP below total household liabilities. Similarly, the amount of assets of households we are able to allocate to various sectors is about 13 per cent below total household assets. As a consequence, we introduce in our model a time series of miscellaneous assets for households (Xa_h in Table 1) fluctuating around 4 per cent of GDP. This also ensures that the net worth measured by the national accounts is identified properly in our model. Below we use a similar approach to correct for income and savings flows such that the data are fully compatible with the national accounts.

2.1 Problems when measuring wealth

With respect to identifying financial wealth, we mention five general problems.⁴ The first problem is to identify the items in the balance sheet from the items presented in the national accounts. The items of financial wealth presented in the Dutch national accounts appear in the right-hand column of Table 2.⁵ In several cases, it is reasonably obvious which national account item should be allocated to which balance item – for instance, the national account

3. Although most data on financial wealth at a sectoral level can be found on Eurostat, the European Union dataset, we use the data provided by the CBS (Statistics Netherlands), which is also the data source of Eurostat.

4. We do not think that it is a problem whether one should take the consolidated or unconsolidated data for a sector. As far as we know, everybody uses consolidated data, since intra-sectoral transactions are not modelled.

5. All items appear as both assets and liabilities in the national accounts. In many items, also sub-divisions are made, but these are not relevant in most cases.

Table 2 Balance sheet items and national account items

Balance sheet	National accounts (financial wealth) ^a
Bank deposits	Currency and deposits
Loans	Loans
Bills	Debt securities
Capital/houses	—
Participations	Equity and investment fund shares
Non-traded assets	
Equities	
Mortgages	
Pension claims/liabilities	Insurance and pension schemes
Foreign reserves	—
Miscellaneous	Fin. derivatives, employee stock options
	Other accounts receivable/payable
Total net worth	Total net worth

Note: a. We ignore ‘Monetary gold and special drawing rights’, since this is only relevant for the financial sector.

item ‘Currency and deposits’ should be allocated to the balance sheet item ‘Bank deposits’ of households. But we decided to ignore this for government and firms.

All these decisions are motivated later on. Since we are not able to allocate all national account items to all balance sheet items, we add the remaining national account items to the balance sheet item ‘Miscellaneous’ of each sector.⁶

A second problem is to identify for each asset or liability of a sector, to which sector the corresponding liability or asset belongs.⁷ This is particularly problematic with allocating items to the foreign sector. For instance, we assume that all financial assets issued by firms are held by the foreign sector, and none by the financial sector. Moreover, for the financial sector, we apply this procedure to detailed financial assets. We elaborate on this below.

A third problem is to identify to what extent changes in financial wealth occur due to valuation changes and to what extent due to transactions in wealth, for instance, buying or selling financial assets in the latter case. These data are provided by the national accounts. The valuation changes of an asset or liability then enable us to identify the (implicit) price changes of that asset.⁸ The relevant data are presented for the several sectors below.

The fourth problem is to ensure that total transactions in financial wealth correspond to the savings of the relevant sector. This follows from the observation that all savings have to result in a transaction, assuming no hoarding takes place. It turns out that the national account data for net-wealth transactions in each sector (resulting from the stock data – see the right-hand side of Table 2) do not always add up to savings (presented in the flow data – discussed below). We solve this by adding a correction term for savings.

6. As indicated above, ‘Miscellaneous’ is included in the balance sheet as Xa_s for sector s . It is the net result of excess assets and liabilities. Including Xa_s in the model ensures that net-wealth in the model (Vs) is consistent with the national account data.

7. For many assets, the data are provided from 2010 onwards by the CBS in the so-called whom_ to_whom matrix. However, for non-traded financial assets and derivatives no data are provided.

8. That is, $\Delta p.q = p.\Delta q + q_{-1}\Delta p$, where the first component on the right-hand side represents transactions and the second part valuation changes (vc). We then use the data on vc to calculate: $p = p_{-1} \cdot [1 + vc(p_{-1}, q_{-1})]$. One should be aware that sometimes valuation changes also contain ‘statistical discrepancies’, but these are usually very small.

Finally, the fifth problem is that national account data are revised every five years and this can lead to problems when applying the data in SFC models. For instance, phenomena that appear to be quite substantial can turn out to be significantly smaller (also in the past) after a revision – we illustrate this in Section 2.4 for the banking sector. Or apparent constant fractions can turn out to behave quite differently (see appendix A1.9 of Meijers and Muysken 2024) for the impact of revisions of the capital stock of households and government).

Next to financial wealth, most sectors also have non-financial wealth items according to the national accounts of which the most important is fixed assets.⁹ Here four problems are relevant, similar to the problems mentioned above. First, we have to identify which fixed asset belongs to which sector. We explain below that this is in particular relevant for houses in the case of households and for the fixed assets of the financial sector, which we allocate to firms.

The second problem is that we have to identify to what extent changes in non-financial wealth occur to valuation changes and to what extent to transactions in wealth. Similar to financial wealth, these data are provided by the national accounts. The valuation changes then enable us to identify the price changes. The relevant data are presented for the several sectors below.

The third problem is that changes in non-financial wealth may occur to depreciation. Hence, we also need data on depreciation. These are presented by the CBS in the flow data, distinguishing between gross and net investments.

Different sources, stock and flow data also lead to the fourth problem, which is to ensure that the total of transactions in non-financial wealth corresponds to the net-investment of the relevant sector. This follows from the observation that all net-investments have to result in non-financial wealth accumulation (net of depreciation). Fortunately, this turns out to be not problematic as we discuss below for each sector.

2.2 Identifying financial wealth of households, firms and government

With respect to the financial wealth of households, we distinguished in our earlier models between currency, deposits and equity ('participations') on the assets side. The reason was that we wanted to analyse the impact of sharp fluctuations in asset prices, following the financial crisis in 2007. However, when studying wealth inequality, we discovered that a large amount of 'participations' consists of non-traded financial assets, which are owned exclusively by the top 5 percentile of wealth owners. For that reason, we also include non-traded assets as a separate category in our model. On the liability side, we only identify mortgages. We assume that all financial assets and liabilities are held by the financial sector, except non-traded assets, which are held abroad.

With respect to firms, we identify all financial assets with outward foreign direct investments, and most financial liabilities with inward foreign investments – the remaining liabilities are loans. However, according to Butler et al. (2019), a substantial part of the non-tradeable assets and liabilities of firms is created for tax reasons only – we ignore these in our analysis. We assume that loans are provided by the banking sector and foreign direct investment by the foreign sector.

With respect to government, we ignore all financial assets, while we only identify outstanding bonds (constituting the EMU-debt) on the liability side. The national accounts also allow us to ascertain the amount of bonds held by each sector. Although the EMU debt is measured at face value of the bonds, we measure the bonds at market value, since that corresponds to the reason for holding assets by sectors.

9. The national accounts also identify inventories, land and oil and gas reserves – we ignore these.

The identification of the wealth components discussed above is motivated extensively in appendices A1.1 – A1.3, where we also identify the remaining financial assets and liabilities for each sector. The remaining net financial assets Xa_i in Table 1 are discussed in Section 2.5. The relevant asset prices are discussed in Section 2.6.

2.3 The nature of the financial sector

In Section 2.2, we dealt with the financial sector as one sector – this is similar to the general structure of the national accounts. However, in our model, we want to distinguish between various sub-sectors: the Central Bank, banks and pension funds. Fortunately, the national accounts also present more detailed information, recognising the relevant sub-sectors presented in Table 3. The way they are included in our model is presented in the balance sheet of Table 4.

We discuss these sectors in more detail in the next section. Here, we first analyse the specific measurement problems related to the national accounts. Then we discuss the specific issues related to the three financial sectors, i.e., pension funds, the central bank and banks. For a detailed discussion of the nature of the financial sector and its development over time, see Muysken and Meijers (2022).

Following the sectoral composition of the national accounts, the financial sector consists of monetary financial institutions (MFIs), other financial institutions and insurance corporations, and pension funds (cf. Table 3). MFIs consist of banks and the central bank.¹⁰ Banks are under the supervision of the central bank and issue deposits. OFIs consist of investment funds, financial intermediaries and special financial institutions.¹¹ Pension funds are financial institutions that manage the funded pension system – they also include insurance companies, which are dominated by life insurances that have the same function as pension funds. In Figure 1, we show the development of the assets for each of these sectors over time, relative to GDP. Since liabilities show a similar development, we do not present these.

An important complication when analysing financial sector data is presented by the special financial institutions (SFIs). We describe extensively in Muysken and Meijers (2022) that SFIs mainly consist of Special Purpose Vehicles, which are only created for tax evasion and are strongly related to the Netherlands as a conduit country. As can be seen from Figure 2, the SFIs' assets and liabilities are above 500 per cent of GDP in recent years, which is an enormous amount. However, in our view, these SFIs do not contribute to the Dutch economy in any relevant respect. Therefore, we ignore them in our further analysis, albeit with one exception. The reason is that we think that the non-traded assets held by households stem from SFIs (see also appendix 4 of Meijers and Muysken 2024). We subtracted these from SFIs liabilities and included these in the banking data ($pa_{nt}Ant$ in Table 4).¹²

We also ignore the sector's other financial intermediaries (OFIs) since they operate mainly between financial sectors and the foreign sector. As a consequence, we only include investment funds in the banking sector.

10. We ignore 'Money market institutions', which are very small.

11. The special financial institutions or 'captive financial institutions and money lenders' subsector consists of all financial corporations and quasi-corporations, which are neither engaged in financial intermediation nor in providing financial auxiliary services, and where most of either their assets or their liabilities are not transacted on open markets.

12. This also explains why the liabilities of SFIs in Figure 2 are lower than assets.

Table 3 Structure of the financial sector

National accounts (broad)	National accounts (detail)	Our model
Monetary financial institutions	Central Bank	Central Bank
Other financial institutions	Deposit taking corporations ^a	Banks
	Investment funds	
	Other financial intermediaries	
	Special Financial Institutions ^b (SFIs)	Not included (see text)
Insurance corporations and pension funds	Insurance corporations	Pension funds
	Pension funds	

Notes: a. We ignore 'Money market institutions', which are very small.

b. The official name is recently changed to 'Captive institutions and money lenders'.

Finally, a remarkable feature of the financial sector in the Netherlands is the funded pension system. Due to the funded pension system, Dutch households have to pay each year a compulsory contribution to a pension fund until the retirement age is reached. Afterwards, they receive each a benefit, related to the wage they earned in the past. Consequently, households accumulate large claims on pension funds, from which future benefits have to be paid out. Moreover, pension claims increased strongly due to the low interest rate after the financial crisis (Meijers and Muysken 2022). Pension claims are around 220 per cent of GDP.

With respect to the problem of measuring assets and liabilities, the problems identified in Section 2.1 are complicated by the observation that many transactions occur within the financial sector – it, therefore, is quite hard to identify who is trading with whom. This is aggravated by the interwovenness of the financial sector with the foreign sector, while transactions with the foreign sector are not identified separately. We tackled this problem in two ways.

A first approach is that we look at all assets and liabilities for each sector at the level of the components of financial wealth presented in the national accounts – cf. the right-hand side of Table 1. For each of these assets, we decide to which sector we want to attribute these, where a comparison of assets and liabilities is very important. For instance, when we look at the deposits of banks on the liability side, we subtract the deposits held on the assets side by households, firms and government. We also know the deposits held by the central bank (A_v in Table 4) and pension funds. Then we attribute the remaining deposits of banks to the assets side of foreign. When we look at the deposits of banks on the assets side, we subtract the deposits held as liabilities by the Central Bank (M_{cb} in Table 4) and attribute the remaining deposits of banks to the liabilities side of foreign. The foreign deposits on the assets and liability side then are included in the participations abroad of the banking sector ($pa_{ab}A_{ab}$ and $pa_{ba}A_{ba}$, respectively, in Table 4).

By dissecting the national accounts for each financial asset at a sectoral level, we try to ensure that we make only minor mistakes in assigning the data to the relevant sectors. We then group all financial assets allocated this way in the balance sheet items of Table 4. This is explained in more detail for each financial sector in the appendices.

The second approach when identifying assets and liabilities within sub-sectors ensures that we correct for transactions within sectors. For instance, when we look at investment funds, financial intermediaries and special financial institutions separately, we have to ensure that the sum of financial assets we analyse is consistent with the total assets of the

Table 4 Balance sheet with full financial sector

	Households, firms, government	Central Bank	Banks	Pension funds	Foreign	Total
Central bank		$-M_{cb}$ A_v	M_{cb} $-A_v$			
Bank deposits			$-M_b$			
Loans	M_b		L_f			
Bills	$-p_b.B_{fin}$	$p_b.B_{cb}$	$p_b.B_b$	$p_b.B_{pf}$		
Capital	$-p_b.B_a$				$p_b.B_a$	
Participations	$pk.K + pk.K_g$					$pk.(K + K_g)$
	$pa_b.A_b$		$-pa_b.A_b - pa_{pf}.A_{pf}$	$pa_{pf}.A_{pf}$	$-pa_{ab}.A_{ab} + pa_{ba}.A_{ba}$	
			$pa_{ab}.A_{ab} - pa_{ba}.A_{ba}$		$-pa_{na}.Ant$	
Equities	$pa_{na}.Ant$				$pe_{fa}.E_{fa}$	
	$-pe_{fa}.E_{fa}$				$pe_{af}.E_{af} - pe_{apf}.E_{apf}$	
	$pe_{af}.E_{af}$			$pe_{apf}.E_{apf}$		
Mortgages	$-MO$		MO			
Houses	$ph.HS$					$ph.HS$
Pension claims/liabilities	$p_{cpf}.Cpf$			$-p_{cpf}.Cpf$		
Foreign Reserves		R			$-R$	
Miscellaneous	$Xa_{h,fg}$	Xa_{cb}	Xa_b	Xa_{pf}	Xa_a	0
Total net worth	$Vh + Vf + Vg$	Vcb	Vb	Vpf	Va	Vt

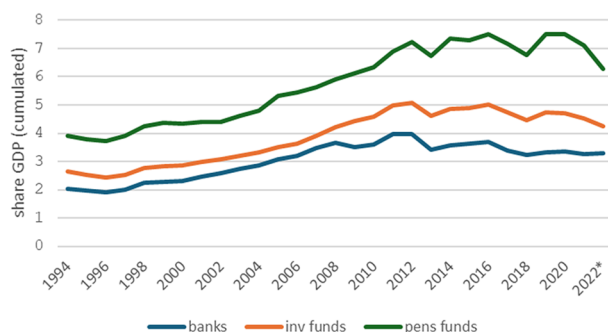


Figure 1 Assets financial institutions

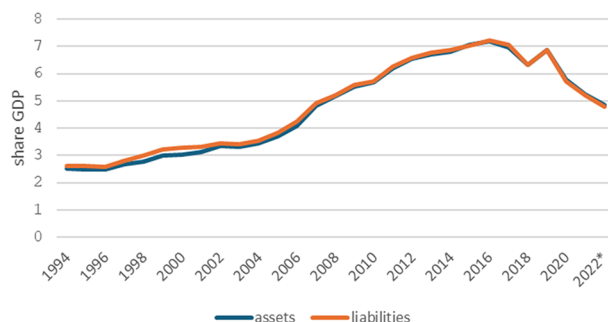


Figure 2 Special financial institutions

other financial institutions sector, to which all three sub-sectors belong. We, therefore, identify the within-sector asset holdings by subtracting the total assets from the sum of the three assets of each sector, for each wealth component. Then we allocate these within-sector holdings to each sub-sector, again by comparing assets and liabilities.

An example of the procedures described above is described for non-traded assets in appendix 4 of Meijers and Muysken (2024).

2.4 Identifying financial wealth of the financial sector

As we mentioned in the previous sector, the funded pension system is a remarkable feature of the financial sector in the Netherlands. Households accumulate large claims on pension funds, from which future benefits have to be paid out. These pension claims include life insurances and constitute almost all liabilities of the sector 'Insurance corporations and pension funds' of the national accounts, since the sector 'Insurance corporations' is dominated by life insurances, which are similar to the funded pensions. For that reason, we use in our model the data of the whole sector for modelling 'Pension funds' (see also Table 3). Pension claims are around 220 per cent of GDP.

To finance their benefits, pension funds invest the contributions from households in financial assets. As we elaborate in Muysken and Meijers (2022), prior to the mid-1990s pension funds had to finance their assets domestically. However, asset management was liberalised in the late 1990s to include foreign assets, since the sheer magnitude of assets required to match the liabilities can hardly be found in a small economy like the Netherlands. Next, pension funds also outsourced part of their foreign investments to investment funds. See appendix A1.4 of Meijers and Muysken (2024) for more details.

We want to include a Central Bank in our model since ‘unconventional’ monetary policy operations, like quantitative easing, have an important impact on our economies. Moreover, the Central Bank also plays an important role in managing financial crises. For that reason, we use in our model the notion that the Central Bank holds bills issued by the government B_{CB} and advances provided to banks A_{CB} . Next, it does hold foreign reserves R , which include Target2 balances. Its liabilities are deposits held by banks M_{CB} . Since the revenues of the Central Bank are transferred to the government, the balance sheet of the Central Bank is closed without remaining net worth. We elaborate this in appendix A1.5 of Meijers and Muysken (2024), where we also discuss the differences and similarities between the national account data and the central bank data.

In our discussions of the assets and liabilities of the various sectors above, we have identified most of the assets and liabilities of banks. With respect to the assets of the banks, we have identified mortgages to households, loans to firms, government bonds and deposits held at the central bank. As liabilities, we have identified deposits, participations and non-traded assets, all held by households. Next, we also have participations held by pension funds and advances provided by the central bank. The remaining assets and liabilities have to be allocated to either foreign or miscellaneous.

In appendix A1.6 of Meijers and Muysken (2024), we show how foreign assets and liabilities held by banks increase from around 60 per cent of GDP in the mid-1990s to around 210 per cent of GDP in 2018, and decrease somewhat thereafter.¹³ Interestingly enough, in 2023 a revision of the national accounts showed a decrease in assets and liabilities of the financial sector, fluctuating around 25 per cent of the total amount. In terms of GDP, this implies that the assets and liabilities of the banking sector as we describe it in our model are 150 per cent of GDP lower than the data we used till 2007 and between 250 and 300 per cent of GDP lower after 2010. However, none of the data of the other sectors changed significantly – also not the foreign sector, surprisingly enough.

2.5 Modelling corrections for wealth

As we explained above, we do not cover all financial assets and liabilities identified in the national accounts. However, we have to identify the remaining net financial assets (Xa_i in Table 1) for each sector, in order to maintain stock-flow consistency.

From Figure 3, we observe that the net financial assets of households and firms are relatively low compared to the liabilities of these sectors – in most years less than 10 per cent.¹⁴ This suggests that we cover the data of the national accounts relatively well in our model for these sectors. That government has much larger net financial assets is due to our

13. Meijers et al. (2015) indicate how this development has contributed to the problem of the deposit financing gap in the Netherlands.

14. The firms’ net financial assets are negative, but for presentation reasons, we present them as positive. The same holds for pension funds in Figure 4.

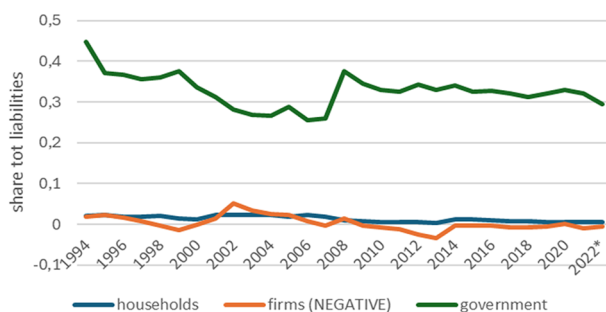


Figure 3 Excess financial assets

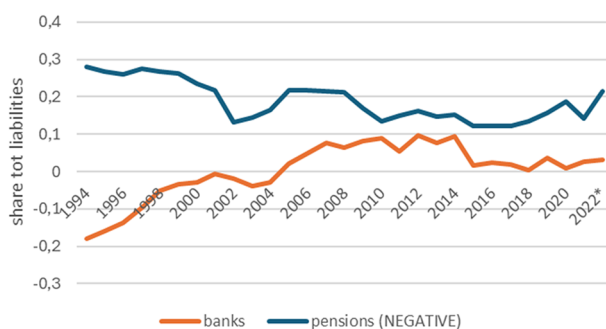


Figure 4 Excess financial assets

neglect of financial assets on the asset side of the balance sheet. We leave this as a question for further research.

For pension funds, we see in Figure 4 that excess financial assets fluctuate around 19 per cent of total liabilities. The excess financial assets for banks increased from 15 to 10 per cent of total liabilities in the mid-2000s and stabilised around 1 per cent after 2015.¹⁵ We do not present the excess liabilities of the Central Bank, since these are very volatile. In terms of GDP, these are very small.

Since the excess financial assets of the six sectors add up to the excess financial assets of the foreign sector, we do not present the latter separately. However, we observe that the negative excess foreign assets mirror those of the banking sector closely, which is consistent with the observation that SFIs mainly operate abroad.

To preserve consistency, the excess financial assets are included as exogenous variables in the model. This implies that exogenous add-factors are included for each sector. For

15. We also include here the net-wealth of SFIs (excluding household NTAs), in order to maintain consistency with the national accounts.

out-of-sample simulations, several options are available, all being somewhat arbitrary. The out-of-sample values of excess assets can be set to zero, or to their in-sample average values, or to the last in-sample value, or one can even growth rates into account and extrapolate the series using trend lines. The impact on the model simulations differs per sector, however. For instance, for the government sector, the amplitude of the net wealth has no explicit effect on the model, so whether the value of excess assets in out-of-sample situations is set to zero or to some other value does not lead to different outcomes, except that net wealth is affected.¹⁶ The only sector for which the net wealth matters in the model is the household sector. Total net wealth is a component of consumption and the excess financial asset thus matters in that respect. From Figure 3, it follows that the excess assets for the household sector are decreasing over time and near zero in 2020. In Meijers and Muysken (2022), we have chosen to set all excess assets to zero and out-of-sample simulations of the base run do not show particular shocks or deviations at the break of in-sample to out-of-sample results. In Section 3.6, we also discuss corrections on income and savings, which are needed to resemble the data and to retain consistency.

2.6 Modelling valuation changes

We calculate the asset prices from data on valuation changes, as described in Section 2.1. The results for prices of participations of households, firms and banks are presented in Figure 5 as an example. We added the development of GDP price for comparison.

With respect to households, the price of participations (pa_h) fluctuates as expected, with a peak prior to the dot-com crisis in 2000, falling afterwards until the financial crisis in 2008 and increasing consistently after the financial crisis.¹⁷

The prices of most other assets develop in a similar way (see appendix A1.8 of Meijers and Muysken 2024 for detailed descriptions of the prices per sector). In appendix A1.4 of the same paper, we pay special attention to the implicit price of pension funds, p_{pf} .

With respect to the price of fixed assets (capital goods in our model), we observe from Figure 6 that these broadly follow GDP price for both government and firms. House prices follow a different pattern, however.

Since the developments of prices of financial assets such as participations and equity, and the house prices clearly deviate from GDP prices, as depicted in Figures 5 and 6, these prices have to be modelled separately. But, since prices of capital goods follow broadly GDP prices, we set these capital goods prices equal to GDP prices for convenience in our model.

In Meijers and Muysken (2022), the growth rate of house prices and the growth rate of equity issued by firms are endogenously determined and the growth rate of prices of participations are linked to the growth rate of equity. Note that having different prices for investment in houses (valued against GDP prices, p) and for the stock of houses (valued against its own price, ph) requires an adjustment, as elaborated in Section 4.

Since we assume that prices of productive capital are equal to GDP prices, the stock of capital has to be adjusted to retain consistency. The real capital stock is constructed using the perpetual inventory method using 1995 as the base year. The nominal capital stock is based on this real capital stock and the GDP price level. The net wealth of firms and the

16. Note that from the balance sheet as presented in Table 1, it follows that government debt as measured by the outstanding bonds is not affected by these choices, at least not in a direct sense.

17. The price of deposits and mortgages (not shown) is constant over time, which is as expected.

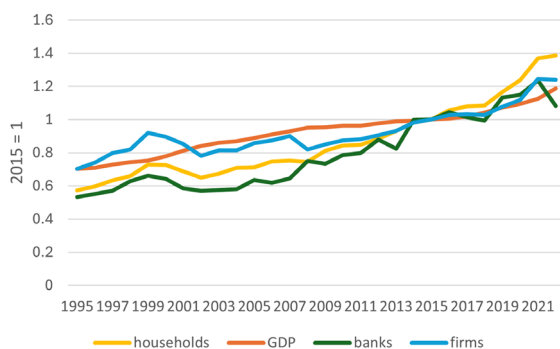


Figure 5 Asset prices sectors

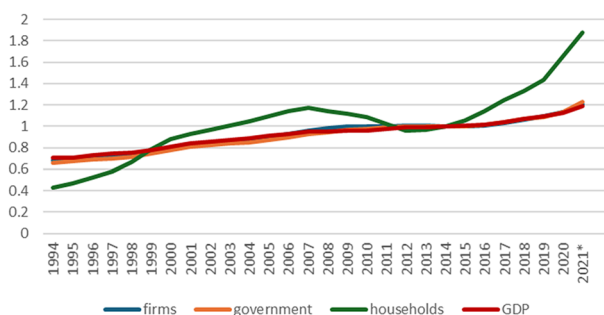


Figure 6 Price of capital (2015 = 1)

government is adjusted accordingly. This has no further consequences since the latter does not have any implications for the model as presented in Meijers and Muysken (2022).

3 GDP AND TRANSACTION DATA

Next to the balance sheet presented in Tables 1 and 4, covering the stock data as discussed above, we use in Meijers and Muysken (2022) a social accounting matrix, covering the transactions, based on the flow data (see Table 5). As we mentioned above, flow data are related to the measurement of GDP in various ways and we will discuss these below. We will first focus on the way the GDP transactions can be allocated to the various sectors in Sections 3.1 and 3.2, respectively – compare the first row and the first column of Table 5. Then we discuss the further transactions between sectors in the next sections. As one can observe from Table 5, the financial sector plays a key role in these transactions.

GDP can be measured in two ways: through income generation and through expenditures.

Table 5 Social accounting matrix

	Production	Households	Firms	Banks	Pension funds	Central Bank	Government	Capital account	Foreign	Correction	Total
Production											
Households	$W + Fh$	C		$r_{mh} \cdot M_{b-1} + r_{ab} \cdot pa_{b-1} \cdot A_{b-1}$	$Ypfh$		G	$If + Ih + Ig$	$Ex - Im$	$Ycorr_h$	Y
Firms	Ff										
Banks	Fb	$r_{mo} \cdot MO_{-1}$	$r_{ff} \cdot If_{-1}$			$r_{mcb} \cdot Mcb_{-1}$	$r_b \cdot pb_{-1} \cdot B_{b-1}$		$r_{ant} \cdot pa_{nt-1} \cdot Ant_{-1}$	$Ycorr_f$	Yf
Pension funds	Fpf								$r_{aab} \cdot pa_{ab-1} \cdot A_{ab-1}$	$Ycorr_b$	Yb
Central Bank	Fcb			$r_{apf} \cdot pa_{pf-1} \cdot A_{pf-1}$			$r_b \cdot pb_{-1} \cdot B_{pf-1}$		Fa_{pf}	$Ycorr_{pf}$	Ypf
Government	$Ti + F_g$	T_d	T_f	$r_{aw} \cdot Aw_{-1} \cdot T_b$		$Fcbg$	$r_b \cdot pb_{-1} \cdot B_{cb-1}$		$r_r \cdot R_{-1}$	$Ycorr_{cb}$	Ycb
Consumption of fixed capital		D_h	D_f				D_g			$Ycorr_g$	Yg
Capital account											D_{tot}
Foreign sector		S_b	S_f	S_b	S_{pf}	S_{cb}	S_g		S_a	0	S_{tot}
Total	Y	Yh	Ff_a	$r_{aba} \cdot pa_{ba-1} \cdot A_{ba-1}$	Ypf	Ycb	$r_b \cdot pb_{-1} \cdot B_{a-1}$	$If + Ih + Ig$	Ya	$Ycorr_a$	Ya

GDP through income generation follows from

$$Y = W + Ti + F$$

where

- W are wages, i.e., compensation of employees (wages and salaries plus employers social contributions);
- Ti are indirect taxes, i.e., taxes on production and imports less subsidies;
- F are profits, i.e., what remains after W and Ti have been subtracted from national income (sum of value added at basic prices). This is called gross operating surplus/mixed income.

The above division is consistent with the left-hand column of Table 5, labelled 'Production'. GDP from expenditures follows from

$$Y = C + I + G + (X - M)$$

where C is consumption expenditures, I is investment, G is government expenditures and $(X - M)$ is net exports. See also the top row of Table 5, labelled 'Production'.

To understand the mechanisms through which income and expenditures are inter-linked, the concept of a circular flow is useful, distinguishing between (1) households who earn wages and consume; (2) firms who earn profits by producing goods, which are consumed and invested – they also pay out wages; (3) government who levies taxes and spends through government expenditures; and (4) a foreign sector that provides imports to the domestic economy and absorbs its exports. As a consequence, we distinguish between four sectors (households, firms, government and the foreign sector) when analysing the economy in more detail. However, it is impossible to analyse the relation between these sectors when we do not add a financial sector.

We introduce a financial sector because this acts as an intermediary between the various sectors. First, we want to explain how savings by the various sectors are used to finance investment by other sectors, next to financial asset accumulation. In many cases, this involves banks acting as intermediaries. Second, we wish to recognise how savings by various sectors provide future income. A telling example is the involvement of pension funds in this process in the Netherlands to provide pension income, financed by compulsory contributions.

We elaborate on the expenditure side of GDP from a sectoral perspective in Section 3.1 and GDP from income generation in Section 3.2. We then deal with income transfers between sectors in other sections. These transfers are important to identify income and expenditures on a sectoral level and the related savings.

3.1 The sectoral allocation of GDP measured from expenditures

GDP expenditures are consumption, gross investment and net exports.¹⁸ When we allocate these to the sectors, we find the distribution summarised in Table 6.

Consumption expenditures are presented as household consumption, which we allocate to households, and government consumption, which we identify with government expenditures.

The national accounts provide data for gross investment for all sectors. For simplicity, we include investment of the financial sector under firms.¹⁹ While gross investment

18. We ignore the small impact of FISIM on consumption and net exports– see Appendix 3 of Meijers and Muysken (2024) on FISIM.

19. Investment by the financial sector fluctuates between 4 and 7 per cent of firm investment since 2002, and between 7 and 11 per cent before 2002.

Table 6 GDP expenditures in all sectors

GDP	Households	Firms	Government	Finance	Foreign
Consumption	Consumption expenditures		Government expenditures		
Investment	Gross investment in houses	Gross investment in capital stock firms	Gross investment in capital stock gov't		
	(Depreciation)	(Depreciation)	(Depreciation)		
Net exports					Exports–imports

contributes to the expenditures in an economy, the capital stock is formed out of net investment. The difference between gross and net investment is depreciation. Actually, depreciation constitutes a large part of gross investment.²⁰

Net exports are allocated to the foreign sector. As a consequence, there are no expenditure flows from the financial sector.

3.2 The sectoral allocation of GDP measured from income generation

As mentioned above, GDP measured from the generation of income consists of wages (W^{NA}), indirect taxes (T^{NA}) and gross operating surplus/mixed income (F^{NA}), where the superscript NA indicates National Account data.

Almost all wages are earned by households (W_h) and only a tiny part is earned abroad (W_a). All indirect taxes are collected by the government; hence, we allocate all indirect taxes (T_g) as government income. However, gross operating surplus/mixed income (F) is allocated to the various sectors of the economy, i.e., households (F_h), firms (F_f), government (F_g) and the financial sector (F_{fin}). The foreign sector has no profits. This is summarised in Table 7.

With respect to profits, three observations should be made:

- (1) In households' income of self-employed persons (mixed income MI_h) is included under profits.²¹
- (2) Government gross operating surplus equals depreciation of government.
- (3) Gross operating surplus (profits) of households, firms and the financial sector include imputed Financial Intermediation Services Indirectly Measured (FISIM). Note that $FISIM_{fin} + FISIM_h + FISIM_f = 0$, where $FISIM_h$ and $FISIM_f$ are negative.

We focus here on the gross operating surplus of the financial sector and the role of FISIM therein. The gross operating surplus (F) is allocated to the various sectors of the economy,

20. For firms, it fluctuates between 80 and 100 per cent; for government, it was around 80 per cent before the financial crisis and increased to 90 per cent thereafter; and for households, it was around 50 per cent until the financial crisis and settled around 60 per cent in recent years.

21. Since self-employed persons also are involved as labour in the production of goods and services, it is reasonable to include their income under wages in our model.

Table 7 Sectoral allocation of GDP measured from income generation, national accounts

	Households	Firms	Government	Finance	Foreign
W^{NA}	W_b				W_a
T_i^{NA}			T_i		
F^{NA}	F_b	F_f	F_g	F_{fin}	
$F\ includes$	$MI_{b'}$, $FISIM_b$	$FISIM_f$	$D_g = F_g$	$FISIM_{fin}$	

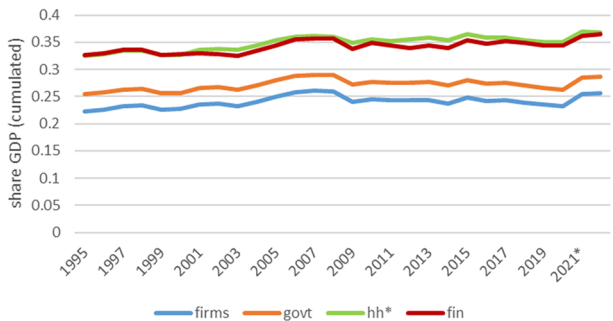


Figure 7 Gross operating surplus by sector

i.e., households, firms, government and the financial sector. The foreign sector has no profits. The development over time, relative to GDP, is summarised in Figure 7.

The gross operating surplus of households (indicated by hh* in the figure) can be considered as a reward for the non-tradeable assets held by households (van den Bergen et al. 2017: 9).²²

We mentioned above that the gross operating surplus of households, firms and the financial sector includes imputed Financial Intermediation Services Indirectly Measured (FISIM). As we explain in appendix 3 of Meijers and Muysken (2024), the practice of including FISIM is highly questionable and distorts the sectoral allocation of the gross operating surplus. In particular, it leads to an overestimation of the gross operating surplus of the financial sector at the expense of an underestimation of the gross operating surplus of the firms and households (see also Mazzucato 2018: 104 ff., Osborne-Kinch et al. 2014, Sturgess 2017). This is illustrated by comparing Figure 7 with Figure 8, where the latter contains the development of the gross operating surplus by sector relative to GDP when FISIM is excluded. It is remarkable that the gross operating surplus of the financial sector excluding FISIM is virtually zero.

Within the financial sector, we distinguish between banks, the central bank and pension funds. All these gross operating surpluses exclude FISIM.²³ The gross operating surplus of

22. Since the gross operating surplus of households includes mixed income, we subtracted from this surplus 66 per cent of mixed income, which we include in the wage sum as reward for self-employed. This 66 per cent is mentioned by van den Bergen et al. (2017) as an approximation.

23. The gross operating surplus for SFIs is zero, but excluding FISIM it becomes positive.

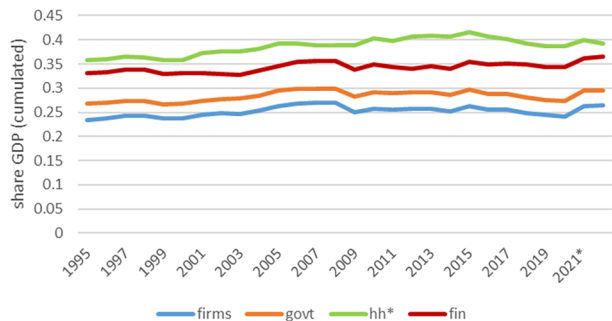


Figure 8 Gross operating surplus by sector (excl. FISIM)

Table 8 Sectoral allocation of GDP measured from income generation, SFC model

GDP	Households	Firms	Government	Fin. sector	Foreign
W	$W_h + 0.66 \times MI_h + W_a$				
T_i			T_i		
F	$F_h - 0.66 \times MI_h$	F_f	D_g	F_{fin}	
$Corr. = 0$	$FISIM_h$	$FISIM_f$		$FISIM_{fin}$	

the central bank fb is very small, but mostly positive. In our model, it is distributed to the government. The gross operating surplus of banks is consistently negative relative to GDP when we exclude FISIM, while that of pension funds is consistently positive. However, both are small and for simplicity we group all surpluses (including SFIs) under that of banks. A final observation is that when we correct for FISIM, the net operating surplus of the financial sector is negative.

The issues discussed above are summarised in Table 8, which represents the sectoral allocation of GDP measured from income generation in our model. The correction factors ensure that all columns are identical with the measurements for each sector in the national accounts, and all cells in the sector columns add up to GDP. Compare also the first column of Table 5, labelled ‘Production’.

3.3 Gross disposable income and savings

Since we want to identify savings for each sector, we analyse gross disposable income. The reason is that savings equal gross disposable income minus consumption.

Gross disposable income of each sector consists of primary income net of transfers. Primary income consists of income stemming from GDP (wages and profits) and net income from wealth. Income stemming from GDP has been analysed in Section 3.2. Net income from wealth and transfers involves interactions between many sectors as appears from Table 9.

Table 9 Gross disposable income in all sectors

		Households	Firms	Government	Bank	Pension fund	Foreign
Primary income	Wages						
	Profits						
	Net wealth income	<bank> <pension fund>	<foreign> <bank>	<bank> <pension fund> <foreign>	<all sectors>	<bank> <govt> <foreign> <household>	<bank> <govt> <firm>
Net transfers	Pensions Taxes and subsidies	<pension fund> <govt>	<govt>	<household> <firm>		<household>	

A problem in all cases is that for each sector we know from the data the incoming and outgoing flows, but not from which sector the incoming flows originate or to which sector the outgoing flows go. For that reason, we investigate each category in more detail below.

The discussion of wealth income involves the distribution of financial wealth over the sectors, indicated by the third row in Table 9 (net wealth income). This involves the financial balance sheet of each sector, which was discussed in Section 2. It is also obvious that banks play an important role in transferring wealth income between sectors. Therefore, we introduce banks in the analysis. In the national accounts, they are also part of the financial sector. Finally, since an important part of transfers are pension benefits and contributions, we also include pension funds in our analysis. The distribution of wealth income over the sectors is discussed in Section 3.4.

The way transfers between sectors take place is presented in Section 3.5.

Finally, with respect to savings, we already mentioned above that savings result from gross disposable income minus consumption. We use in our analysis of income and expenditures the savings data provided by the national accounts.²⁴

3.4 Identifying wealth income

The national accounts distinguish between five main categories of wealth income and payments, summarised in Table 10. As we mentioned above, we know from the data for each sector the incoming and outgoing flows, but not from which sector the incoming flows originate or to which sector the outgoing flows go. We, therefore, use for each sector the wealth composition presented in Section 2.2 to determine the flows.

That is, we associate each category of Table 10 with a certain wealth component. For instance, interest payments by households are associated with mortgages (the only financial liability of households). Then we use the link of the wealth component identified in Section 2.2 to provide the link of the wealth category. In the example of mortgages, we know that these are provided by banks; hence, we allocate the interest payments by households to the income of banks. We elaborate this further for each sector below.

Furthermore, three observations do hold for each sector. We will look at interest income and payments excluding FISIM (see also appendix 3 of Meijers and Muysken 2024). This

24. The only exception is the foreign sector. In the national accounts, foreign savings are zero, but total domestic savings are positive. We use the negative of the latter for foreign savings.

Table 10 Categories of wealth income and payments

Interest income and payments (including correction FISIM)
Distributed income of corporations (including dividends)
Reinvested earnings on foreign investment
Income payable on pension entitlements
Rent from natural resources

implies that the net FISIM income or payments is part of miscellaneous. We will also ignore the rent from natural resources, which is relatively small for most sectors. Here also net income or payments become part of miscellaneous. Finally, we have allocated all other wealth payments and expenditures of a certain sector to expenditures or payments in the same category of another sector or in case there were leftovers, grouped these under miscellaneous.

Following the wealth composition of households in Section 2.4, we distinguish on the income side of households between interest income from deposits, income on participations, income on non-traded assets and pension income.²⁵ On the expenditure side, only mortgage payments and net pension contributions are relevant. Miscellaneous net income closes the gap – this consists mainly of FISIM and net government payments. We use all wealth flows to calculate the corresponding rates of return (see appendix A2.1 of Meijers and Muysken 2024).

Consistent with the identification of the stock of wealth of firms in Section 2.4, all interest income from firms (excl. FISIM), together with dividends received, reinvested profits and attributed income to shareholders, are identified as returns on foreign investment received by firms. However, we excluded about 30–40 per cent of the assets and liabilities of firms recorded in the national accounts because a substantial part of non-traded assets was only created for tax reasons. This also applies to the returns on foreign investment paid by firms. With respect to interest payments, not all interest paid by firms is identified as interest paid on loans to domestic banks because part of the loans have been attributed to the foreign sector. As a consequence, we adjusted the interest payments in a proportional way and added the interest paid on foreign loans to the dividends paid. Miscellaneous net income closes the gap – again this consists mainly of FISIM and net government payments. For more details, see appendix A2.2 of Meijers and Muysken (2024).

For the government, we concentrate on the interest expenditures by government, which are by far the main expenditures on wealth. These expenditures are attributed domestically and abroad. We assume that these correspond to the interest payments by the government on bonds held by the financial sector and the foreign sector, respectively (see appendix A2.3 of Meijers and Muysken 2024).

Considering pension funds, assets consist of government bonds, foreign assets and participations held at banks. We know the income flows resulting from government bonds from the calculated rate of return. Therefore, we can allocate the remaining parts from wealth income (excluding FISIM) and income attributed to shareholders to participations held at banks and abroad and calculate the corresponding rates of return. For details, see appendix A2.4 of Meijers and Muysken (2024), where we also explain how the national accounts attribute income from pension funds to households related to the pension claims on the liability side.

25. Pension income (Y_{pfb}) is further explained in Appendix A2.4 of Meijers and Muysken (2024).

With respect to the central bank, we use the Dutch Central Bank (DNB) data on the rates of deposits and advances and the corresponding amounts of deposits and advances (also taken from DNB), to calculate the relevant flows of wealth income and expenditures (see appendix A2.5 of Meijers and Muysken 2024).

By subtracting the income and expenditure flows from pension funds, the central bank and OFIs and SFIs from those of the financial sector, we can now identify all income and expenditure flows to and from banks. All income and expenditure flows except those from the foreign sector then are known. For that reason, we identify the foreign sector as the remaining flows. This also allows us to calculate the returns on foreign assets held by banks (and by foreign). Finally, miscellaneous (due to FISIM) ensures consistency with the data gap in the national accounts.

3.5 Income transfers between sectors

Comparison of Tables 5 and 9 shows that the transfers between sectors consist of taxes net of subsidies paid out by households, firms and banks to the government, and of pension contributions paid by households to pension funds, net of benefits received. Both can be inferred directly from the national accounts and there is no problem with sectors, since the sector of origin is clear and of destination is either government or pension funds.²⁶ The relevant data are presented in appendix A2.9 of Meijers and Muysken (2024).

3.6 Modelling corrections for income

Since we do not cover all income and expenditure flows identified in the national accounts, we have to identify the remaining net flows ($ycorr_i$ in Table 5) for each sector, in order to maintain stock-flow consistency. These net flows for each sector are presented in Figures 9 and 10 as a share of the sectoral income. Important to note is that the aggregate of all remaining flows is zero so aggregate savings are not affected and total income in the data and model is not subject to injections or leakages. The correction thus only readjusts the income of various sectors without being explicit on the counterpart of these incomes.

As one observes from Figure 9, the correction factors for households and firms are relatively small. That the income correction of the government is much larger is not surprising, since we do not cover all wealth categories of government, as we explained above. One sees in Figure 10 that pension funds have a large correction factor, which is due to the attributed pension income to households (see appendix A2.4 of Meijers and Muysken 2024 for a further explanation).

The correction factors for banks and the foreign sector (after 2002) are relatively small. All corrections add up to zero.

Similar to the excess financial assets, the corrections on income that are needed to retain consistency also imply that this has to be made explicit in the model. The correction factors for all sectors do not have counterparts and the correction on income is relatively small for households and firms, which are the main 'behavioural' sectors in the model. This implies that the impact of the corrections is relatively small and in Meijers and Muysken (2022) we opted for exogenous add factors for these correction factors. In this way, the data that are used to estimate and calibrate the empirical model are fully consistent with the national accounts. Similar to the assets these are set at zero for out-of-sample

26. One should note that all taxes net of subsidies for the financial sector are attributed to banks. Moreover, pension contributions paid from the foreign sector net of benefits are ignored.

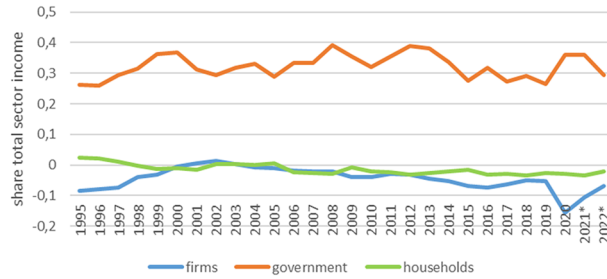


Figure 9 Income correction factors

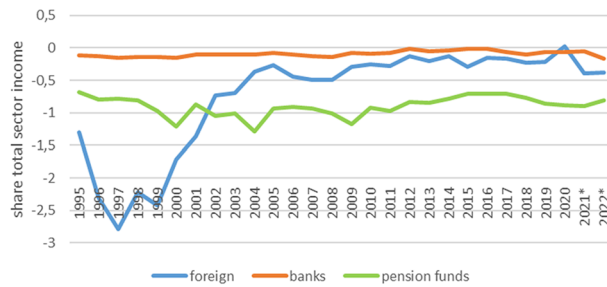


Figure 10 Income correction factors

simulations and we did not observe shocks at the boundary of in-sample to out-of-sample simulation results of the baseline.

4 SAVINGS AND NET CLAIMS

In our model, savings are used for investment and financial wealth accumulation. This is not fully consistent with the national account data. The national accounts present data on net claims, which are consistent with wealth accumulation. We add corrections to our savings data such that these net claims result, for reasons of consistency. For instance, these data are also used to present the EMU deficit in the case of government and the national debt accumulation in the case of foreign debt.

As one can observe from Figures 11 and 12, these corrections are sometimes substantial. This is partly due to the changes in miscellaneous wealth (xa_s in Table 1), which frequently exceed the correction for savings in almost all sectors.²⁷ Correction for firms and pension funds are substantial in the more recent years, especially in 2022.

27. Note that holds for sectors: $scorr_s = p_{ws} \Delta wealth_s + \Delta xa_s$, where p_{ws} is the price of wealth of sectors. The correction for house prices is indicated by 'houses' in the figure and table and is explained below.

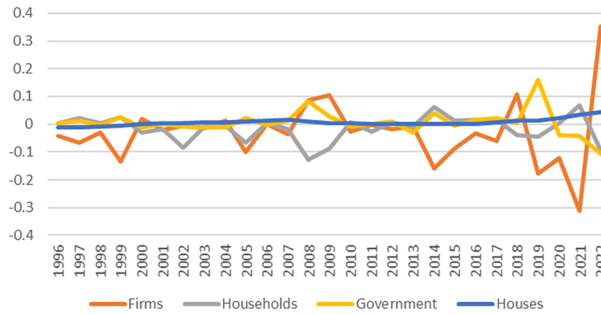


Figure 11 Correction for savings

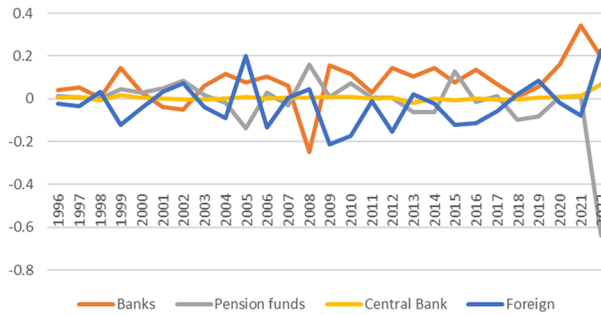


Figure 12 Correction for savings

Table 11 shows the average corrections for savings and the average correction for the change in excess wealth as percentages of GDP. Corrections on excess wealth are larger for government and pension funds since not all assets are included as explained in appendices A1.3 and A1.4, respectively. The corrections on savings are relatively small. All corrections are included as exogenous series in the model and are set to zero for out-of-sample simulations. This corresponds to the treatment of wealth such that consistency with national accounts is preserved.

Note that all corrections for savings aggregated over all sectors need to sum up to zero, except for the correction for price differences in housing. The latter can be explained by investigating the accumulation and investment of savings table. The full table is presented in the Appendix, whereas here we present the relevant elements in Table 12. As mentioned above, we assume that prices of the capital stock of firms and of the government follow the GDP prices. This is not the case for house prices and this introduces an inconsistency in the model that needs correction.

Focussing on houses only, we have the following identities from this table:

$$IH - D_h + Scorr_{ph} = ph \Delta HS$$

Table 11 Average correction for Δ excess wealth and for savings, as a percentage of GDP

	Δ excess wealth (%)	Corr savings (%)
Firms	-0.1	-2.9
Government	49.9	0.6
Households	8.3	-1.6
Banks	17.9	7.7
Central bank	8.6	0.5
Pension funds	-53.0	-1.7
Foreign	-2.6	-31.5
Houses		0.6

Table 12 Excerpt from the Accumulation and investment of savings table

	Households	Firms	Banks	Pension funds	Central Bank	Gov.	Foreign	Total
Gross investment		$IF + IH + IG$						$IF + IH + IG$
Cons of fixed capital	$-D_b$	$-D_f$				$-D_g$		$-D_{tot}$
Savings, correction	$Scorr_{ph} + Scorr_h$	$Scorr_f$	$Scorr_b$	$Scorr_{pf}$	$Scorr_{cb}$	$Scorr_g$	$Scorr_a$	$Scorr_{ph}$
Δ Capital	$ph\Delta HS$	$pk\Delta K$				$pk\Delta K_g$		$pk(\Delta K + \Delta K_g) + ph\Delta HS$

where IH refers to nominal investments in houses for which we use the GDP price deflator. Depreciation of houses is assumed to be against the current prices of houses. This implies that the above equation can be rewritten as

$$p.IH^k - \delta^b IH_{-1}^k ph + Scorr_{ph} = ph \Delta HS$$

where IH^k refers to the investment in houses in real terms. Using the standard rule of capital accumulation: $\Delta HS = IH^k - \delta^b IH_{-1}^k$, which implies that

$$Scorr_{ph} = (ph - p).IH^k$$

which has to be included in the model to retain consistency.²⁸ So the price difference between investment and accumulation has to be included to correct for the fact that investment prices differ from capital stock prices. The sector that receives this correction depends on the way the investment in houses is modelled. If households invest in houses against GDP prices, then it is natural to attribute the correction to households. If an explicit real-estate sector is included in the model, e.g., as part of the firms sector, and this real-estate sector is assumed to invest in houses and sell these houses to the household sector, as is done, for instance, by Zezza (2008), it seems natural that the correction is attributed to the real-estate companies. The full table in the Appendix also demonstrates that the savings corrections for all sectors taken together (excluding $Scorr_{ph}$) should sum up to zero.

28. It is easy to see that this correction term is zero in case that both investments and accumulation of investments are valued against the same deflator, such as is assumed for instance for investment in productive capital.

5 CONCLUDING REMARKS

Our paper shows that the allocation of wealth and wealth income over sectors provides serious challenges. A detailed initial investigation of the data is necessary to identify the relevant wealth components and their allocation over sectors. In that respect, the nature of financial institutions complicates data analysis considerably. First, we had to decide how to deal with the enormous sector of special financial institutions (SFIs) which is in our data, but only due to the nature of the Netherlands as a conduit country – for that reason, we ignore these data (except for households in the top 1 per cent of the wealth distribution). Second, we had to decide how to deal with the considerable sector of other financial institutions, which exist next to banks. We chose to include these in our model, since they are important for transactions with the foreign sector and as pension fund intermediaries. However, we also chose to ignore considerable fractions of the assets and liabilities of this sector, which we could not allocate in our model and corrected only for the net wealth. This turned out to be a sensible decision, since the most recent revision of the national accounts scaled both assets and liabilities down by around 25 per cent, without affecting the net wealth. Third, we had to model the decisions of the pension funds, which constitute a large part of the financial sector, and their interaction with households.

We demonstrated the importance of looking at the national account data carefully before applying these to SFC models. We hope that documenting and motivating the choices made carefully helps to understand the model better and stimulates a fruitful discussion about the data used in the model.

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APPENDIX ACCUMULATION AND INVESTMENT OF SAVINGS TABLE

	Households	Firms	Banks	Pension funds	Central Bank	Gov.	Foreign	Total
Consumption	$-C$	$C + G$				$-G$		0
Gross investment		$IF + IH + IG$						$IF + IH + IG$
Net exports		$(X - IM)$					$-(X - IM)$	0
Wages	W	$-W$						0
GOS	Fb	$-Fb - Fcb - Fcb$	Fb	Fpf	Fcb	D_g		0
Taxes	$-T_d$	$-Fpf - D_g$						0
PF contrib./benefits	Ypf_h	$-T_f - T_i$	$-T_b$	$-Ypf_b$		T		0
Interest deposits	$r_{mb} \cdot M_{b-1}$		$r_{mc} \cdot M_{c-1} - r_{mb} \cdot M_{b-1}$					0
Interest loans/advances		$-r_{gf} \cdot Lf_{-1}$	$r_{gf} \cdot Lf_{-1} - r_{aw} \cdot Aw_{-1}$		$-r_{mc} \cdot M_{cb-1} + r_{aw} \cdot Aw_{-1}$			0
Interest bills			$r_b \cdot pb_{-1} \cdot B_{b-1}$	$r_b \cdot pb_{-1} \cdot B_{pf-1}$	$r_b \cdot pb_{-1} \cdot B_{cb-1}$	$-r_b \cdot pb_{-1} \cdot B_{a-1}$	$r_b \cdot pb_{-1} \cdot B_{a-1}$	0
Interest participations	$r_{ab} \cdot pa_{b-1} \cdot A_{b-1} + r_{ant} \cdot pa_{nt-1} \cdot A_{nt-1}$	$-r_{ab} \cdot pa_{b-1} \cdot A_{b-1} - r_{apf} \cdot pa_{pf-1} \cdot A_{pf-1} + r_{aab} \cdot pa_{ab-1} \cdot A_{ab-1} - r_{aba} \cdot pa_{ba-1} \cdot A_{ba-1}$		$r_{apf} \cdot pa_{pf-1} \cdot A_{pf-1}$			$r_{aba} \cdot pa_{ba-1} \cdot A_{ba-1} - r_{aab} \cdot pa_{ab-1} \cdot A_{ab-1}$	0
Interest mortgages	$-r_{mo} \cdot MO_{-1}$		$r_{mo} \cdot MO_{-1}$				$-r_{ant} \cdot pa_{nt-1} \cdot A_{nt-1}$	0
Interest reserves					$r_r \cdot R_{-1}$		$-r_r \cdot R_{-1}$	0
Dividends		$Fa_f - Ff_a$		Fa_{pf}	$-Fcbg$	$Fcbg$	$Ff_a - Fa_f - Fa_{pf}$	0

(continues overleaf)

APPENDIX (continued)

	Households	Firms	Banks	Pension funds	Central Bank	Gov.	Foreign	Total
Cons of fixed capital	$-D_h$	$-D_f$				$-D_g$		$-D_{tot}$
Correction	$Ycorr_h$	$Ycorr_f$	$Ycorr_b$	$Ycorr_{pf}$	$Ycorr_{cb}$	$Ycorr_g$	$Ycorr_a$	0
Net savings	S_h	S_f	S_b	S_{pf}	0	S_g	S_a	S_{tot}
Savings, correction	$Scorr_{ph} + Scorr_h$	$Scorr_f$	$Scorr_b$	$Scorr_{pf}$	$Scorr_{cb}$	$Scorr_g$	$Scorr_a$	$Scorr_{ph}$
ΔDeposits	ΔM_h		$\Delta M_{cb} - \Delta M_b$		$-\Delta M_{cb}$			0
ΔLoans/advances			$\Delta Lf - \Delta Av$		ΔAv			0
ΔBills		$-\Delta Lf$	$pb\Delta B_b$	$pb\Delta B_{pf}$	$pb\Delta B_{cb}$	$-pb\Delta B$	$pb\Delta B_a$	0
ΔParticipations	$pa_h\Delta A_b + pa_{nt}\Delta Ant$		$-pa_b\Delta A_b - pa_{pf}\Delta A_{pf} - pa_{ba}\Delta A_{ba} + \Delta A_{pf} - pa_{ba}\Delta A_{ba}$ $pa_{ab}\Delta A_{ab} - pa_{nt}\Delta Ant$				$pa_a\Delta A_{ba} - pa_{ab}\Delta A_{ab}$	0
ΔMortgages	$-\Delta MO$		ΔMO					0
ΔEquity		$p_{eqf}\Delta E_{af}$ $-p_{efa}\Delta E_{fa}$		$p_{capf}\Delta E_{apf}$			$p_{efa}\Delta E_{fa} - p_{caf}\Delta E_{af} - p_{capf}\Delta E_{apf}$	0
ΔClaims	$p_{capf}\Delta C_{pf}$			$-p_{capf}\Delta C_{pf}$			$-\Delta R$	0
ΔReserves					$+\Delta R$			0
ΔCapital	$pb\Delta HS$	$pk\Delta K$				$pk\Delta K_g$		$pk(\Delta K + \Delta K_g) + ph\Delta HS$
ΔMiscellaneous	ΔXa_b	ΔXa_f	ΔXa_b	ΔXa_{pf}	ΔXa_{cb}	ΔXa_g	ΔXa_a	0