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Abstract

The COVID-19 pandemic has tossed the world into a state of uncertainty, not only from a health point of view but also from an economic perspective. To reduce the spread of the virus, most countries adopted a strategy of strict lockdowns, which halted many business operations, leading to a fall in production and a rise in unemployment. From an economic perspective, this lockdown has erupted supply and demand shocks in the economy. In order to investigate potential impact of these shocks, we develop a post-Keynesian empirical Stock-Flow Consistent (SFC) model for Denmark. We analyse the impact of these shocks in the form of three different scenarios. Overall, our simulation results indicate that temporary (one year) shocks in the economy will lead to a fall in output but a quick recovery whereas persistent shocks can lead to a full-blown economic crisis. We find that the impact of these shocks can be lowered by public intervention in the form of fiscal stimulus, which can reduce the impact of these shocks and also improve the speed of economic recovery. We also addressed the economic consequences of financing this stimulus, and whether such a policy response is feasible. Our main conclusion is that fiscal stimulus seems to be an effective and affordable policy option available to Denmark.

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1 Introduction

The COVID-19 pandemic has tossed the world into a state of uncertainty, not only from a health point of view but also from an economic perspective. To reduce the spread of the virus, most countries adopted a strategy of strict lockdowns, which halted many business operations, leading to a fall in production and a rise in unemployment. The overall impact of the crisis at a global scale is not fully known yet, as the crisis is ongoing, but there are expectations that the current crisis will cause a recession of at least the same magnitude as during the Great Recession or even worse (IMF (2020a); Gali (2020)). Preliminary economic outlook for 2020 by IMF predicts that real output in the euro area will contract by 7.5 percent, US output will contract by 5.9 percent, and the global output will contract by 3 percent (IMF (2020b)).[1] Furthermore, the first wave of COVID-19 created panic in the global equity markets, and the stock prices initially fell by approximately 30 percent in the EU and US, but recovered later on. In the current episode, there are also fears that simultaneous lockdowns in many countries can affect global supply chains, which apart from reducing output can potentially increase the cost of production. Thus, there are concerns that the current crisis might be accompanied by a resurgence in inflation (Rogoff (2020)).

The ongoing crisis is interesting from a macroeconomic perspective, as this is the first economic crisis in the last century caused by a virus. In contrast, all previous crises were caused by forces related to markets and were endogenous in that sense (Danielsson et al. (2020)). The current crisis is inevitable and its primary causes are well beyond the scope of macroeconomic frameworks. The lockdown, however, can be interpreted as a source of exogenous supply shocks to the economy, which in turn is affecting aggregate demand through various channels. Thus, COVID-19 crisis has triggered both supply and demand shocks (Rogoff (2020), Nikiforos et al. (2020)). The direct effect of lockdown is obvious, however, the total damage associated with it may be much larger, if there are significant feedback effects in the economy. For example, Gali (2020) argues that the direct costs of lockdowns maybe be amplified by indirect effects, if output significantly lowers employment, leading to a fall in labour income and consumption.[2] To reduce the economic damage of the crisis, many governments approved packages of financial compensations to businesses and workers.

Like many other countries, the economy in Denmark is also going through an uncertain and turbulent phase. In response to the first wave of COVID-19, the Danish government responded by ordering a strict lockdown and completely shutting down the borders to all non-essential travel, including tourism.[3] From a health perspective, the lockdown has reduced the number of infections over time. The economic cost, however, is still not known with certainty, but preliminary estimates by various studies suggest a contraction in real output within the range of 3% to 10% in 2020 (Nationalbanken (2020), Statistics Denmark (2020), Danish

[1]The ECB has predicted that if the lockdown persists for one full quarter, eurozone GDP could decline by 5 percentage points as compared to their earlier growth prediction of 0.8 percentage this year. This corresponds to an output contraction of 4.2 percent. See: https://www.ft.com/content/711c5df2-695e-11ea-800d-da70cff6e4d3.

[2]This is a standard example of how supply side shocks can trigger demand side shocks.

[3]The lockdown and border shut down have been gradually lifted since the middle of April, but the society is still under mild restrictions.

Economic Council (2020), IMF (2020b)). From an international perspective, Denmark has greatly benefited from global trade by running persistent current account surpluses over the last three decades. The economy has a trade volume of roughly 105 percent of GDP. In the current crisis, global trade is predicted to shrink by 11 percent (IMF (2020b)), clearly signalling serious problems for the Danish economy. Overall, the economy is expected to suffer from adverse domestic and international economic shocks. Moreover, the crisis is looming at a time of high private debt and historically low interest rates, like in many countries, raising concerns whether there is any room for monetary policy intervention, when the central bank at the same time wants to maintain a fixed exchange rate.

The aim of this paper is to address two important questions. First, how exogenous shocks can propagate to the economy through various channels, and what are the subsequent feedback effects which can amplify the impact of these shocks. Understanding these feedback effects is crucial to evaluate the potential economic damage in terms of scale and scope. Second, given high private debt combined with historically low interest rates, what measures should the policy makers take to reduce the impact of the crisis and ensure a less painful recovery. To address these questions, we employ a large scale Stock-Flow-Consistent (SFC) model, using Denmark as a case study. We first theoretically discuss the impact of adverse exogenous shocks and their resultant feedback effects in the economy through different channels. We then empirically explore the potential economic damage associated with these shocks, using an empirical SFC model estimated for the Danish economy. Finally, we simulate various policy scenarios to discuss the available policy options.

Our paper has three main contributions. First, our attempt to explore the direct and indirect impact of adverse shocks can provide some insights that might be valuable in taking measures to reduce the intensity of these shocks. Second, we explore different policy options that can offer some useful information in shaping macroeconomic policy aimed at recovering from the crisis. Our third and final contribution is related to modeling, where we add a supply constraint in the labour market and thereby demonstrate that post-Keynesian SFC models, despite largely demand driven, are well capable of capturing the impacts of supply shocks and their resultant feedback effects.

The rest of the paper is organised as follows. Section 2 briefly reviews Denmark's response to the ongoing crisis. Section 3 presents an empirical SFC model for Denmark. Section 4 discusses the possible impact of the economic shocks faced by the Danish economy and evaluates different policy options. Section 5 concludes this paper.

2 Denmark's response to the crisis

In response to the first wave of COVID-19, the Danish prime minister announced a nationwide strict lockdown. In order to reduce the economic damage associated with this lockdown, the policy makers decided to introduce a number of aid packages on an enormous scale. The aim was to help private sector wage earners and firms, as those employed in the public sector, continued to receive their normal wages during the lockdown. Furthermore, the parliament has decided to move forward with planned public consumption and investment. Overall, the public sector has returned to a strategy of discretionary counter-cyclical fiscal policy on an unprecedented scale.

The use of crisis package is extremely crucial in the very short-run to reduce the impact of the crisis, the economy, however, requires a sustainable solution in the medium to long-term. The question of whether the crisis will put the economy on V-shape, U-shape or L-shape path is not entirely clear. This depends on a number of factors such as the health of the financial system and the degree of uncertainty in the economy. If there is prolonged uncertainty, consumer and business confidence will decline, which in turn will negatively affect consumption and investment decisions, leading to a prolonged recession. Thus, timely formulation of a medium term policy to recover from the crisis is absolutely crucial, and forms one of the core objectives of our analysis in this paper. A number of economists in Denmark have proposed two phase strategy to deal with the crisis as discussed in (Scheer (2020)). In the first phase, the government should compensate businesses and workers in order to keep the factors of production intact, so that the production is ready to accommodate the expected increase in the aggregate demand when the lockdown is removed. In the second phase, the government should inject fiscal stimulus in the medium term to help the economy recover from the COVID-19 crisis.

The situation regarding COVID-19 is frequently changing and it is not possible to construct a meaningful forecast at this stage. However, a number of Danish institutes have attempted to illustrate how the economy may evolve under different circumstances using different models.[4] Danish Economic Council (2020) introduces various shocks in the economy; a fall in global activity affects Danish exports, and the high level of uncertainly affects the decision to invest and consume in the private sector. In the optimistic scenario, assuming only one wave of COVID-19, the lockdown affects the production of the economy leading to a fall in GDP by 3.5% in 2020. In the pessimistic scenario, there is a second wave of COVID-19, leading to a fall in GDP by 5.5%. Statistics Denmark (2020) introduces four different scenarios in their model. The difference amongst the four scenarios can be summarized by the impact of COVID-19 crisis on the export market and whether the decision to consume and invest is affected or not. The four different scenarios suggest an output contraction within the range of 2.5% and 5.2%. Finally, Nationalbanken (2020) introduces three different scenarios where output is expected to fall between 3% and 10% in 2020, depending on the time of the reopening of the economy. That is, a prolonged lockdown is associated with a stronger contraction in output and vice versa.

Despite differences in the results in terms of magnitudes, all the aforementioned studies suggest that the Danish economy will be negatively affected by the ongoing crisis. How hard the economy is hit depends on mainly three factors: i) the size of the global crisis, ii) whether the inclination to consume and invest is affected, and iii) when the lockdown is removed.

We now proceed to assessing the possible macroeconomic impact of COVID-19 crisis in Denmark. Afterwards, we evaluate the impact of fiscal stimulus as proposed by a large number of economists and explore different economic paths of recoveries. To capture the dynamic of changes in stocks and flows, we are not only focusing on the effect in 2020 and

[4] Discussing the structure of these models is beyond the scope of this paper.

2021, but also looking at the medium-term effects until 2025.

3 Model

The empirical model employed in this paper follows the tradition of post-Keynesian Stock-Flow Consistent models as presented in Godley and Lavoie (2007). The most attractive feature of SFC models is the modeling of complex interlinkages amongst different sectors in the economy through transactions and balance sheets interactions. Apart from taking into account the origins and destinations of transactions, post-Keynesian SFC models pay significant attention to the composition of balance sheets,[5] and ensure that there are no leakages of stocks and flows in the economy. This feature becomes extremely relevant when discussing the development of balance sheets of the economies in the medium-term as we are going to do in this paper. The model therefore provides a good foundation for understanding the interaction between real and financial side of the economy, which is crucial to understanding the transmission mechanism of different shocks in the economy.

Like every macroeconomic model, post-Keynesian SFC models also have some shortcomings. These models are largely demand-driven in a sense that the level of economic activity and credit in general are determined by demand forces. This feature, despite being useful in many ways, also forms the basis of a general criticism towards post-Keynesian SFC models, where critiques usually point out the lack of supply side effects in these models (Skott (2019)). We argue that this criticism to a certain degree can be dealt with by integrating a labour market in the model. We show that introducing a labour market opens up the possibility of introducing labour supply constraints, which allows us to investigate the impact of supply side shocks along with their resultant feedback effects in the economy. Moreover, we show that supply constrains can also arise in the credit market even though credit growth is demand-driven, as will be discussed.

The empirical model we use in this paper has five main sectors namely non-financial corporation, financial corporations, Government, Households and Rest of the World. The model uses data from annual sectoral national account for Denmark that goes back to 1995. The description of all variables along with their notations is available in Table 3 in the appendix.

The model consists of three financial assets (interest bearing assets, equities, and pensions) and two fixed assets (capital and housing) as can be seen in the balance sheet structure in Table 1. The structure of balance sheet shows the distribution of assets across different sectors in the economy. The plus (+) sign is used to represent an asset in gross terms and a minus (–) sign is used to represent a gross liability. We refrain from using any sign in the case of net stocks (defined as the difference between assets and liabilities) as the net value can be negative or positive depending on the year.[6] The sum of financial stocks across the

[5] This particular feature sets post-Keynesian SFC models apart from mainstream macro models, where balance sheets structures are usually very simplified.

[6] The decision to use net stocks data in some cases is due to missing information, where it was not possible to match the asset of one sector with its respective counter-party. It is important to highlight that using net stocks loses some useful information but retains the basic accounting principles, ensuring that there are no leakages and that the sum of financial stocks across the sectors equals zero, as indicated by the rows in

sectors equals zero, indicating that someone's assets is someone' liability.

Table 1 Balance sheet matrix

	NFC	FC		G	H		W	$\sum$
		A	L		A	L		
Interest bearing (IB)		$+IBA^F$	$-IBL^F$		$+IBA^H$	$-IBL^H$		0
Net interest bearing (NIB)	NIB^N	NIB^F		NIB^G			NIB^W	0
Net equities (NEQ)	NEQ^N	NEQ^F			$+EQA^H$		NEQ^W	0
Pensions (PEN)		$-PEN^F$			$+PEN^H$		$NPEN$	0
Financial net wealth (FNW)	FNW^H	FNW^F		FNW^G	FNW^H		FNW^W	**0**
Fixed assets (K)	K^N	K^F		K^G	K^H			K^T

Table 2 Transaction flow matrix

	NFC		FC		G		H		ROW		
	Current	Capital	Current	Capital	Current	Capital	Current	Capital	Current	Capital	$\sum$
Private Consumption	$+C$						-C				0
Government Consumption	$+G$				$-G$						0
Investment	$+I$	$-I^N$		$-I^F$		$-I^G$		$-I^H$			0
Exports	$+X$								$-X$		0
Imports	$-M$								$+M$		0
$[GDP]$	$[Y]$										
Taxes	$-T^N$		$-T^G$		$+T^G$		$-T^H$		$-T^W$		0
Gross Operating Surplus	$-B2^N$		$+B2^F$		$+B2^G$		$+B2^H$				0
Wages	$-WB^N$						$+WB^H$		WB^W		0
Capital Income	rK^N		rK^F		rK^G		rK^H		rK^W		0
Transfers	STR^N		STR^F		STR^G		STR^H		STR^W		0
Pension adjustments			$-CPEN^F$				$+CPEN^H$				0
Savings	$-S^N$	$+S^N$	$-S^F$	$+S^F$	$-S^G$	$+S^G$	$-S^H$	$+S^H$	$-S^W$	$+S^W$	0
Capital transfers		KTR^N		KTR^F		KTR^G		KTR^H		KTR^W	0
Acquisitions - disposals of...		NP^N		NP^F		NP^G		NP^H		NP^W	0
Net lending		NL^N		NL^F		NL^G		NL^H		NL^W	0

Table 2 shows the transaction flows related to various economic activities across the sectors. A flow with a plus (+) sign represents an inflow or income whereas a flow with a minus (-) sign represents an outflow or expenditure. Here again, the sum of transaction flows across the sectors equals zero, indicating that every transaction has an origin and a destination.

The monetary flows in the economy can be identified from the circular flow diagram shown in figure 1:

table 1.

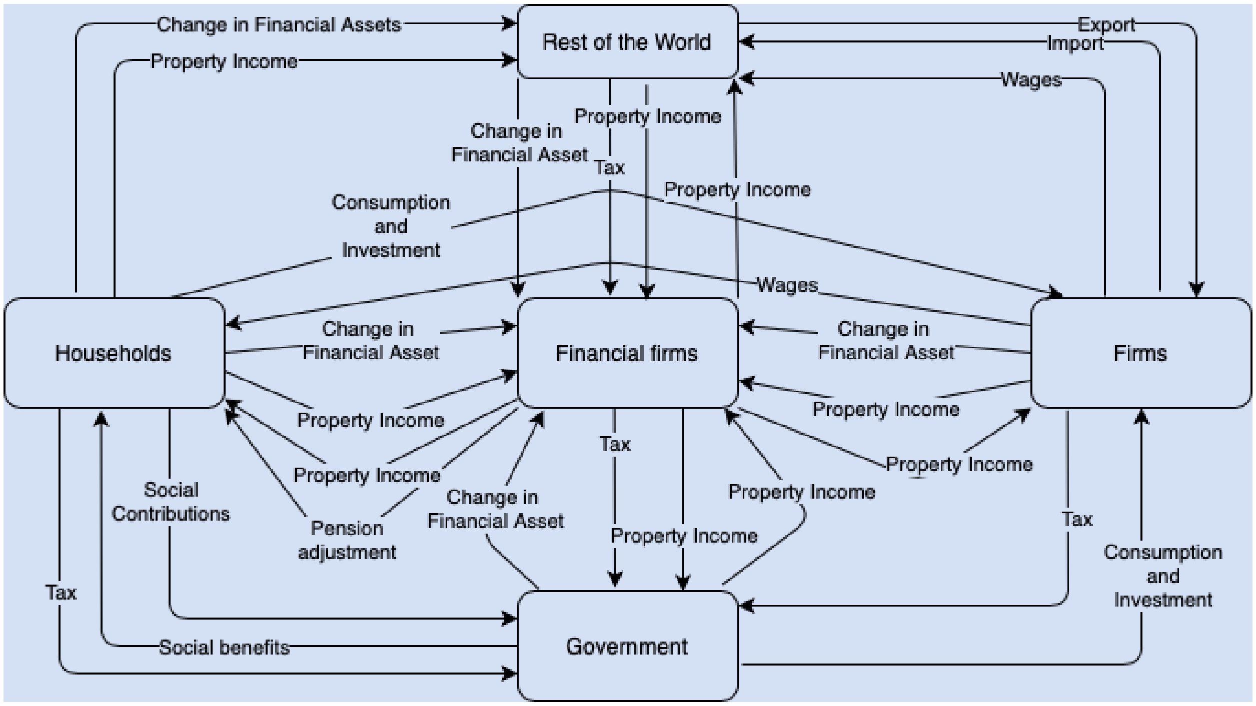

Figure 1: Monetary flows in the model

We now proceed to explaining the structure of the model while focusing on the equations that are most relevant for the current analysis. A more detailed description of the benchmark model including technical details of our data bank, balance sheet structures, transaction flows and equations, is available in Byrialsen & Raza (2020).

3.1 Structure of the model

The structure of our model to a larger extent relies on theoretical building blocks of post-Keynesian theory, as in Godley and Lavoie (2007), however we also contribute by adding some novel features. We now proceed to explaining the model equations while focusing on the central elements of the model along with our new contributions. We present the equations from the perspective of each sector in the economy as follows.

Non-financial corporations (NFC)

The production of all goods and services takes place in non-financial corporations, which implies that the value of production constitutes the main source of income for this sector. The GDP in nominal terms (Y_t) is presented as the sum of household consumption (C_t), investment (I_t), public consumption (G_t) and net export ($X_t - M_t$).[7]

$$Y_t = C_t + I_t + G_t + X_t - M_t$$

[7]Nominal variables in the model are denoted by capital letters whereas real variables are denoted by small letters.

The value of real output (y_t) can be written as the sum of the real value of each individual component as follows.

$$y_t = c_t + i_t + g_t + x_t - m_t$$

The individual components of real GDP are deflated using their respective price deflators. The GDP deflator (P_t^y) is calculated by using the ratio of nominal GDP to real GDP.

$$P_t^y = \frac{Y_t}{y_t}$$

In order to be able to introduce supply constraints in the economy, we model the total production capacity (y_t^s) of the economy using a Leontief production function, assuming fixed proportion of inputs.

$$y_t^s = \min(a_0 k_t, a_1 l_t)$$

where a_0 and a_1 represent the technical coefficients for capital and labour. The inverse of these two parameters determines the amount of labour (l_t) and capital (k_t) required to produce one unit of output. The maximum level of input of labour, l_t, is defined as follows:

$$l_t = (1 - UR_t^s)LF_t$$

where UR_t^s represents structural rate of unemployment, and LF_t represents the labour force.

The actual no. of individuals employed in the economy is determined by the realized level of output.

$$ln(N_t) = \beta_i + z * \beta_i ln(y_t) + (1 - z) * \beta_i ln(y_t^s) + \beta_i ln(LF_t)$$

The realized level of output (y_t) in the above equation is demand constrained, however, if supply constraints arise and the production capacity of the economy falls so that ($y^s < y$, then $z = 0$), the level of employment will be determined by the production capacity of the economy. In that case, even if demand is high, the realized (or actual) production is low due to supply constraints.

The no. of unemployed individuals is equal to the difference between the available labour force and the no. of employed as follows:

$$UN_t = LF_t - N_t$$

The rate of unemployed can be calculated as a ratio between the level of unemployed and the labour force:

$$UR_t = \frac{UN_t}{LF_t}$$

The wage rate is modeled as a function of the difference between realized unemployment rate (UR_t) and structural unemployment rate (UR_t^s). This implies that when the level of output approaches its production frontier, the dnumber of unemployed is low, which in turn will increase the wage rate.

$$W_t = \beta_0 + \beta_i W_{t-i} + \beta_i (UR_t - UR_t^s)$$

The wage (WB_t^H) bill in the economy, which is an expenditure for NFC and a source of income for the households, is computed as follows:

$$WB_t^H = W_t(N_t)$$

where (W_t) represents the wage rate and (N_t) represents the the no. of individuals employed in the economy. The wage rate is assumed to be the same for Denmark and RoW.

Real investment to capital ratio $\left(\frac{i_t^N}{k_t^N}\right)$ in our model is determined by the rate of capacity utilisation, which in turn is proxied by dividing the level of economic activity (measured by real output) with the real stock of capital in NFC:

$$ln\left(\frac{i_t^N}{k_t^N}\right) = \beta_i + \beta_i ln\left(\frac{i_{t-i}^N}{k_{t-i}^N}\right) + \beta_i ln\left(\frac{y_{t-i}}{k_{t-i}^H}\right)$$

The theoretical argument is that a high rate of capacity utilisation motivates the firms to raise their capital stock by increasing investment and vice versa. Thus, capacity utilisation in that sense also carries the accelerator effect. Our investment function and measure of capacity utilisation is similar to the one used in SFC model for the UK by Burgess et al. (2016).

Nominal investment in fixed asset is calculated as follows:

$$I_t^N = i_t^N (P_t^i)$$

The savings of the firms can be computed from the primary and secondary incomes:

$$S_t^N = Y_t - WB_t^N + (B_{2_t}^N - B_{2_t}) + r_{N_{t-1}}(NIB_{t-1}^N) + \chi_t(NEQ_{t-1}^N) - T_t^N + STR_t^N + \epsilon^N$$

The net lending of the firms is the difference between saving and investment adjusted for the exogenous determined capital transfers and NP.

Net lending/borrowing:

$$NL_t^N = S_t^N - I_t^N - NP_t^N + KTR_t^N$$

Focusing on the financial side of the economy, the firms finance their expenditures through two different financial assets: net interest-bearing assets and net equities. In the current version of the model, the transaction of net equities in the NFC sector plays a passive role, and accommodates the demand for new equities originating from other sectors. The transaction of net interest-bearing assets is described as the difference between total net lending and transaction for equities.

We now explain the financial balance sheet structure of NFC, which consists of two assets equities and interest bearing stocks. The accumulation of net equities is given by:

$$NEQ_t^N = NEQ_{t-1}^N + NEQTR_t^N + NEQ_{CG_t}^N$$

where NEQ_{CG}^N denotes capital gains associated with equities, and $NEQTR_t^N$ represent the net new equities issued.

The accumulation of net interest bearing stocks (i.e., assets - liabilities) is given by:

$$NIB_t^N = NIB_{t-1}^N + NIBTR_t^N + NIB_{CG_t}^N$$

where NIB_{CG}^N denotes capital gains associated with the stock, and $NIBTR_t^N$ represent the net interest bearing financial transactions, given by the following equation:

$$NIBTR_t^N = NL_t^N - NEQTR_t^N$$

The above equation implies that firms, after issuing new equities, finance their expenditures or hold their savings in interest bearing stocks.

The financial net wealth of the firms can be written as the sum of the two assets explained above:

$$FNW_t^N = NIB_t^N + NEQ_t^N$$

The total net wealth of the firms can then be expressed as the sum of the financial net wealth and the stock of fixed capital:

$$NW_t^N = FNW_t^N + K_t^N$$

Household sector

The household income consists of various flows: wages (WB^H) from the firms, gross operating surplus from production ($B_{2_t}^H$), social transfers (STR^H) from the government, and capital income associated with interest bearing assets (IBA^H), pensions ($PENA^H$), and equities (EQA^H).

The income (Y^H) of the households can be represented as follows:

$$Y_t^H = WB_t^H + B_{2_t}^H + r_{A_{t-1}}^H(IBA_{t-1}^H) - r_{L_{t-1}}^H(IBL_{t-1}^H) + \chi_t(EQA_{t-1}^H) + \psi_t(PENA_{t-1}^H) + STR_t^H + \epsilon^H$$

where (r_A^H) and (r_L^H) represent interest rate on interest bearing assets and interest rate on liabilities (loans), respectively. (χ_t) and (ψ_t) denotes returns associated with equities and pensions, respectively.

Social transfers (STR_t^H) recieved by the households are calculated as the the sum of social benefits ($SBEN^H$) and other transfers (OTR^H) paid to the household by the government minus the social contributions ($SCON^H$) paid by the households to the government.

$$STR_t^H = SBEN_t^H + OTR_t^H - SCON_t^H$$

Households disposable income is calculated by subtracting taxes (T^H) from total income (Y^H):

$$YD_t^H = Y_t^H - T_t^H$$

whereas (T^H) is calculated by assuming that households pay a constant proportion of their income in taxes as follows:

$$T_t^H = \beta_i(Y_t^H)$$

The level of social benefits received by the households depends on the level of unemployment UN_t and the wage rate W in the economy.

$$ln(SBEN_t^H) = \beta_i + \beta_i ln(UN_t) + \beta_i ln(W_{t-i})$$

That is an increase in the no. of unemployed individuals will directly increase social benefits, e.g., unemployment benefits will rise with an increase in unemployment. Moreover, the level of social benefits is also positively affected by a change in the wage rate, since the compensation rate (ratio of unemployment benefits to wage rate) is legally determined as a share of the wage rate. This feature of our model is similar to the SFC models for Denmark proposed in two previous studies by Godley and Zezza (1992) and Byrialsen and Raza (2018).

Real disposable income (yd_t^H) of the households is given by:

$$yd_t^H = \frac{YD_t^H}{P_t^c}$$

where (P^c) represents consumper price index.

The real consumption of the households depends on their real disposable income (yd^H) and real net wealth (nw^H). However, we split the disposable income of the households into real wage (wb^H) income and non-wage real income ($yd^H - wb^H$)

$$ln(c_t) = \beta_0 + \beta_i ln(wb^H) + \beta_i ln(yd_{t-i}^H - wb^H) + \beta_i ln(nw_{t-1}^H)$$

Nominal consumption of the household sector is calculated as follows:

$$C_t = c_t(P_t^c)$$

The consumption price index (P^c) in our model is determined by the wage rate and import prices P^m. This is a plausible assumption, given that Denmark is a small open economy with a high degree of trade openness.

$$ln(P^c_t) = \beta_0 + \beta_i ln(W_{t-i}) + \beta_i ln(P^m_{t-i})$$

We now turn to explaining the housing market in our model. Real investment to capital $\left(\frac{i^H_t}{k^H_t}\right)$ in housing is represented as follows:

$$ln\left(\frac{i^H_t}{k^H_t}\right) = \beta_i + \beta_i ln\left(\frac{i^H_{t-i}}{k^H_{t-i}}\right) + \beta_i ln\left(\frac{P^H_{t-i}}{P^i_{t-i}}\right) + \beta_i ln\left(\frac{yd^H_t}{k^H_t}\right) + \gamma\beta_i LEV$$

The level of investment in housing depends on two important variables, i) Tobins q for housing, which is proxied by the ratio of house price (P^H) to the construction cost (P^i). This ratio reflects the incentive to invest in new housing, i.e., an increase in the house prices relative to the construction cost improves profitability, thereby making investment in housing more attractive (Kohlscheen et al. (2018)). ii) An increase in the real disposable income relative to the stock of capital will also induce more investments in housing.[8] Our behavioural equation of investment in housing is in line with a number of studies such as, Gattini and Ganoulis (2012), Caldera and Johansson (2013) and Kohlscheen et al. (2018).

Investment in housing requires financing, which in our model takes the form of households securing loans from the banks. Therefore, an increase in investment in housing induces credit growth. However, supply constraints in the credit market can arise, which can adversly affect investment. Credit supply shocks in our model can occur when borrowing exceeds a certain threshold set by the regulators. In the case of Denmark, a household can borrow an amount up to approximately 4 times its disposable income. Using this information, we introduce a threshold captured by LEV^H, which is defined as the difference between 4 times disposable income and the stock of household loans. If the stock of loans exceeds the threshold, γ takes the value of one,[9] and supply constraints kick in, which adversly affects investment as was also the case during 2007-08 crisis.

Nominal investment (I^H) in housing can be written as:

$$I^H_t = i^H_t(P^i_t)$$

where (P^i_t) represents price deflator for investment.

The nominal stock of capital can be written as follows:

$$K^H_t = K^H_{t-1}(1 + \Delta P^H_t) + I^H_t - D^H_t$$

where P^H represents house prices, (I^H) is the new investments in housing, and (D^H) is the depreciation of capital.

House prices in our model are endogenous and depend on a number of factors as follows:

$$lnP^H_t = \beta_i + \beta_i ln(yd^h_{t-i}) + \beta_i ln\left(\frac{K^H_{t-i}}{P^h_{t-i}}\right) + \beta_i ln(LF)$$

[8] This is in line with the model proposed in Zezza (2008).

[9] If credit is below the threshold, there are no supply constraints and γ takes the value of zero.

where $\left(\frac{K^H_{t-i}}{P^H_{t-i}}\right)$ represent the previous stock of housing relative to house prices. An increase in this ratio reflects an increase in the supply of houses, which will put a downward pressure on prices. LF denotes the labour force, which represents demographic factors, i.e., an increase in the number of working population will increase the demand for housing, which in turn would raise prices. Finally, house prices also positively depend on the purchasing power of the households, proxied by dispoable income of the households.

The households savings S^H equation can be defined as the difference between disposable income and consumption plus the adjustment for the change in pension entitlements $CPEN^H$:

$$S^H_t = YD^H_t - C^H_t + CPEN^H_t$$

Net lending/borrowing is calculated as the difference between savings and investment adjusted for 'net acquisition of non-produced non-financial assets' (NP) and capital transfers (KTR^H)

$$NL^H_t = S^H_t - I^H_t - NP^H_t + KTR^H_t$$

We now turn to explaining the behavioural equations that determine households financial investments along with their borrowing decisions. The asset side of the households balance sheet consists of three financial assets, namely interest bearing assets, equities and pensions. The liability side of the households consists of loans.

The financial balance of the households FNL^H_t is the difference between the accumulation of financial assets $FATR^H_t$ and financial liabilities $FLTR^H_t$ as follows:

$$FNL^H_t = FATR^H_t - FLTR^H_t$$

The total transaction of financial assets $FATR^H$ is the sum of three financial transactions; interest-bearing assets transactions $IBATR^H$, equities transactions $EQATR^H$, and pension transactions $PENATR^H$.

$$FATR^H_t = IBATR^H_t + EQATR^H_t + PENATR^H_t$$

The demand for assets in our model is inspired by Tobin's portfolio theory in the sense that a household is faced with the choice of investing in different financial assets. The investment decision amongst other things is determined by the relative return on each financial asset. However, households invest a portion of their savings in pensions regardless of the return on other financial assets. Thus, households, after allocating a proportion of their savings in pension, are typically faced with a choice of investing in interest bearing assets and equities.

We now explain the accumulation of each asset individually. Focusing on pension, the accumulation of pensions is determined by wage bill and the return on pension as follows:

$$PENATR^H_t = \beta_i + \beta_i(\psi_t) + \beta_i WB^H_t$$

The equation implies that a proportion of wage bill is allocated in pensions, thus an increase in wage bill (e.g., due to an increase in employment) will increase the accumulation of pensions in the economy. Moreover, an increase in returns on pension (ψ) will make pension schemes more attractive, which will draw more savings.

Focusing on equities, investment in new equities depends on equity returns χ_t, interest rate r_A^H as well as the credit available to the households.

Equities transactions:

$$EQAHTR_t = \beta_i + \beta_i(\chi_t) + \beta_i(r^H_{A_{t-1}}) + \beta_i(IBLTR^H_t)$$

An increase in equity return (χ_t) will attract more funds in the equity market whereas an increase in the interest rate will divert funds from equity market towards interest bearing assets. Furthermore, an increase in borrowing will also induce purchasing of new equities.

The demand for deposits by the households (interest bearing assets) is modeled as a residual in this model:

$$IBATR^H_t = NL^H + IBLTR^H_t - EQATR^H_t - PENATR^H_t$$

Focusing on the liability side of the households balance sheet, the demand for new loans ($IBLTR^H$) depends on a number of factors as follows:

$$IBLTR^H_t = \beta_i(I^H_{t-i}) + \beta_i(IBL^H_{t-i}) + \beta_i(FATR^H_t) + \beta_i(r^H_{L_{t-1}})$$

We now turn to explaining how each factor in the above equation affect the liability side of the balance sheet. An increase in housing investment (I^H) will increase the demand for loans, which will increase leverage. A higher stock of debt (IBL^H) last period will negatively affect new loans issued to the households. The negative effects of existing debt on new borrowing can be explained from various perspectives, e.g., from the supply side, a high level of debt will advesly affect creditworthiness by lowering the collateral, which will result in low access to new credit. In contrast, the accumulation of financial assets ($FATR^H$) which is an indication of better creditworthiness, will positively affect the demand for loans, i.e., households have more collateral to borrow against to finance their expenditures.[10]. Finally, an increase in the interest on loans r_L^H will reduce the demand for new loans.

In general, credit growth in our model is demand-driven, however, supply constraints can arise if the stock of loans exceeds a certain threshold set by the regulators, as discussed earlier. Thus, supply of credit is not constrained by savings but by regulations. This implies that lax regulations in our model will not discourage credit creation, which in turn can compromise the stability of the financial system.

The transactions of financial assets and liabilities affect the corresponding stocks. The stock of interest-bearing assets at time t, can be calculated by adding the stock in period $t-1$, the transaction of interest-bearing assets in period t and capital gains in period t

$$IBA^H_t = IBA^H_{t-1} + IBATR^H_t + IBA^H_{CG_t}$$

[10]Our behavioural equation is supported by the empirical evidence at an individual household level (see, e.g., Brown and Taylor (2008); Brown et al. (2013))

The accummulation of pension assets is given by:

$$PENA_t^H = PENA_{t-1}^H + PENATR_t^H + PENA_{CG_t}^H$$

The liability side of the balance sheet which consists of loans is given by:

$$IBL_t^H = IBL_{t-1}^H + IBLTR_t^H + IBL_{CG_t}^H$$

The stock of equities is expressed in a slightly different way to highlight the effect of stock prices as follows:

$$EQA_t^H = EQA_{t-1}^H(1 + \Delta S_t) + EQATR_t^H$$

where S_t denotes equity prices. The equation implies that changes in equities can occur due to stock price movements along with new equity purchases as represented by equity transactions $EQATR^H$.

Equity prices in our model are endogenous and represented by the following equation:

$$ln(S_t) = \beta_0 + \beta_i ln(S_{t-i}) + \beta_i ln(yd_{t-i}^h) + \beta_i(\chi_t)$$

Stock prices in our model positively depend on real disposable income of the households and return on equities (χ_t).

Total financial assets in this model are the sum of the three financial assets

$$FA_t^H = IBA_t^H + EQA_t^H + PENA_t^H$$

Note that the total stock of financial liabilities in the household sector is equal to the stock of interest-bearing liabilities.

$$FL^H = IBL_t^H$$

The difference between total financial assets and total financial liabilities determines the financial net wealth as follows:

$$FNW_t^H = FA_t^H - FL_t^H$$

We now obtain total net wealth by simply adding the housing to the financial net wealth:

$$NW_t^H = FNW_t^H + K_t^H$$

Real net wealth for the household sector is simply calculated by deflating net wealth with consumption prices

$$nw_t^H = \frac{NW_t^H}{P_t^c}$$

Financial sector

The financial sector in this model accommodates the demand for credit in the rest the economy. The balance sheet interaction of FC with all other sectors except households is model on net basis. The financial balance of the sector is computed as the difference between accumulation of financial assets and accumulation of financial liabilities as follows:

$$FNL_t^F = IBATR_t^{F\sim H} + NIBTR_t^F + NEQTR_t^F - IBLTR_t^{F\sim H} - PENLTR_t^F$$

Focusing on the transactions between FC and households, ($IBATR_t^{F\sim H}$) denotes interest bearing asset transactions, which equal the supply of new loans to the households:

$$IBATR_t^{F\sim H} = IBLTR_t^H$$

Similarly, ($IBLTR_t^{F\sim H}$) denotes interest bearing liability transactions, which equal the proportion of households savings allocated in interest bearing assets:

$$IBLTR_t^{F\sim H} = IBATR_t^H$$

The build-up of pension liabilities for the financial corporation is the sum of the new pensions paid by domestic households and the rest of the world.

$$PENLTR_t^F = PENATR_t^H + NPENTR^W$$

The transaction of FC and all other sectors takes places on net basis and are captured through net financial flows. Focusing on the transactions related on interest bearing asset, ($NIBTR^F$) denotes net interest bearing asset transaction, which is given by:

$$NIBTR_t^F = -(NIBTR_t^N + NIBTR_t^G + NIBTR_t^W)$$

where $NIBTR^N$, $NIBTR^G$, and $NIBTR^W$ represent transactions of net interest-bearing stock of NFC, Government sector, and the rest of the world, respectively.

Finally, the transaction of net equities is modeled as a residual between net lending and the transaction of other financial assets as follows:

$$NEQTR_t^F = NL_t^F + IBLTR_t^{F\sim H} + PENLTR_t^F - IBATR_t^{F\sim H} - NIBTR_t^F$$

Government sector

Denmark is characterised as a welfare state, where the government sector plays a central role in the economy. The annual government expenditure is persistently over 50 percent of GDP over the last two decades, which is one of the highest amongst OECD countries. The public expenditures are financed through higher taxes. The total tax revenue is approximately 45 percent of GDP over the last two decades which is relatively higher than the OECD average of roughly 34 percent of GDP.

Total tax revenue received by the government is computed as follows:

$$T_t^G = T_t^{NF} + T_t^H + T_t^F + T_t^W$$

where T_t^{NF}, T_t^H, T_t^F, and T_t^W denotes the taxes paid by the firms, households, financial corporations, and the rest of the world, respectively.

Focusing on the expenditure side of the government, we break down the government expenditures into two categories namely, government consumption of final goods and services (G) and social expenditures (STR_t^G). Government consumption is assumed to be exogenous whereas social transfers are determined as the of social transfers to the rest of the economy:

$$STR_t^G = -(STR_t^H + STR_t^{NF} + STR_t^F + STR_t^W)$$

A part of the social transfers paid to the private sector is endogenously determined in our model as explained in the households behavioral equations. The social transfers paid by the government to the non-financial sector is going to play a significant role in the policy scenario later on.

The net lending of the government sector (NL^G) is calculated as the difference between expenditures and revenues.[11]

$$NL_t^G = B_{2_t}^G + r_{N_t-1}(NIB_{t-1}^G) + T_t^G + STR_t^G - G_t - I_t^G$$

Turning to the balance sheet of the government, we assume government debt as well as assets takes the form of interest bearing stocks. Thus, we can write that

$$NIBTR_t^G = NL_t^G$$

The equation implies that government surpluses (or deficits) are placed in interest bearing assets (or liabilities). In that sense, interest rate movements can directly affect the fiscal balance, and the balance sheet of the government, which is given by the following equation:

$$NIB_t^G = NIB_{t-1}^G + NIBTR_T^G + NIB_{CG}^G$$

Balance of payments and trade

Denmark is a small open economy which has greatly benefited from global trade. The country has run persistent current account surpluses since 1989, and the volume of trade openness is roughly 105% of GDP.

[11]On the revenue side, the government sector also receives a share of the gross operating surplus (B_2^G) from the production sector, which is exogenous in the model.

Focusing on the trade balance, imports are modeled in a standard way. In particular, real imports are affected by the ratio of domestic price to import price ($\frac{P^y_{t-1}}{P^m_{t-1}}$) and private demand. The import equation can be represented as follows:

Real imports

$$ln(m_t) = \beta_i + \beta_i ln\left(\frac{P^y_{t-1}}{P^m_{t-1}}\right) + \beta_i ln(c_{t-1} + i_{t-1} + x_{t-1})$$

The real exports are determined by the level of competitiveness (proxied by the ratio of export prices to import prices) and the market share of Danish exports in the global market. The export equation is based on Armington (1969) and can be expressed as follows.

$$\frac{x_t}{m^W_t} = \left(\frac{P^x_t}{P^m_t}\right)^\beta$$

where β denotes the price elasticity, x_t is real exports, and $\frac{P^x_t}{P^m_t}$ is the ratio of export prices to import prices, reflecting price competitiveness. m^W_t is an index representing the weighted import of the trading partners.

After log-linearisation, the export equation can be simplified as follows:

$$ln(x_t) = \beta_i + \beta_i ln\left(\frac{P^x_{t-1}}{P^m_{t-1}}\right) + \beta_i ln(m^W_t)$$

Nominal imports and exports are calculated by multiplying real flows with the corresponding prices.

$$M_t = m_t(P^m_t)$$

where (P^m) denote import prices, which are assume to be exogenous in the model.

Nominal exports

$$X_t = x_t(P^x_t)$$

Where P^x denotes export prices, which are affected by import prices (P^m) and the domestic unit labour cost (ULC). The equation can be represented as follows:

$$ln(P^x_t) = \beta_i + \beta_i ln(P^m_t) + \beta_i ln(ULC_{t-1})$$

In our behavioural equation, we account for the fact that Denmark, being a small open economy, is a price taker and imports a high degree of semi-manufactured goods. Our export price setting is in line with several other studies (see, e.g., Onaran and Obst (2016)).

The savings equation of the foreign sector vis-à-vis Denmark is given by the following identity:

$$S_t^W = M_t - X_t + \chi_t(NEQ_{t-1}^W) + \psi_t(NPEN_{t-1}^W) + r_{N_{t-1}}(NIB_{t-1}^W) + WB_t^W - T_t^W + STR_t^W + \epsilon^W$$

Net lending NL^W of the foreign sector is given by:

$$NL_t^W = S_t^W - NP_t^W + KTR_t^W$$

The Danish current account balance (CAB) can be expressed as follows:

$$CAB_t = -NL_t^W$$

The above equation, apart from trade flows, takes into account various cross-border flows namely, net capital income (net equity, pension and interest-bearing assets), net wages, net taxes, and net social transfers. The financial transactions between Denmark and the rest of the world includes transactions of net equities ($NEQTR_t^W$), net pension ($NPENTR_t^W$) and net interest-bearing asset ($NIBTR_t^W$). Transactions of net equities ($NEQTR_t^W$) and net pension ($NPENTR_t^W$) are exogenous in the model, while the transactions of net interest-bearing asset ($NIBTR_t^W$) is modeled as follows:

$$NIBTR_t^W = NL_t^W - NEQTR_t^W - NPENTR_t^W$$

3.2 Estimation and Simulation

While the choice of variables in our behavioural equations is based on economic theory (mostly post-Keynesian), the functional form of these equations is determined by data using a dynamic econometric model. The aim is to obtain statistically valid estimators for time series data. The structural parameters in the model are estimated using annual Danish data from 1995-2016.[12]

The model is then numerically solved by performing simulation, and the results are compared with the actual data as shown in the appendix.[13] We find that our model is able to explain the macroeconomic dynamics of the Danish economy to a reasonable extent. After simulating the baseline until 2025, we then introduce a number of scenarios as will be explained. The primary objective of the simulations until 2025 is not to forecast the actual development of the economy, but to explore how the economy may evolve in the medium term when hit by various exogenous shocks triggered by COVID-19.

[12]To estimate the equations, in most cases, we start our estimation by including 2 lags due to small sample. We then follow general-to-specific methodology and fit a parsimonious model. We also test for unit roots and account for any significant structural breaks in our estimations.

[13]This comparison is only presented for certain key variables of interest in the appendix in order to reserve space, however, more results can be made available upon request for interested readers.

To establish the baseline, this paper relies on a few very important assumptions, some of which are as follows.[14] i) All exogenous capital gains are assumed to be zero in the baseline scenario. ii) All exogenous prices are set to grow at an average growth rate of the last 12 years. iii) The returns on financial assets which include interest rates, return on equities, and return on pension are assumed to remain constant, using their latest values. The implication of these assumptions, is a slightly low growth rate in real variables (around 0.9 %) in the baseline scenario.

4 Results

We introduce a number of adverse shocks in the model and analyse their impact in the form of three different scenarios. Our first scenario is related to the immediate potential damage associated with COVID-19. Our second and third scenarios deal with the economic crisis and recovery pattern following the initial damage.

Scenario 1: In the first scenario, a lockdown is introduced in response to COVID-19 shock at both domestic and international level. This triggers simultaneous supply and demand shocks in the economy. On the supply side, the shock leads to a fall in labour supply in our model, leading to a fall in production capacity of the economy. On the demand side, firms are more resistant to demanding labour in order to cut down their expenditures. Moreover, the simultaneous lockdown in other countries adversely affects trade, leading to a fall in Danish exports. These shocks are introduced in the model for a specific year (2020) and are therefore temporary in nature.

Scenario 2: In the second scenario, we assume that the situation regarding COVID-19 pandemic persists and the shocks remain in the system for some time. In this regard, the aforementioned shocks in scenario 2 are made more persistent, following a stationary AR(1) process. We also assume that the persistence of shocks creates uncertainty in the economy, leading to a fall in consumer and business confidence. Therefore, we also lower the propensities to consume and willing to invest in this scenario.

Scenario 3: In the third scenario, we address the most crucial question of what measures can the policy makers take to reduce the initial damage of the crisis and secure a quick recovery in order to avoid stagnation. In this shock, we assume the policy makers respond to the situation by introducing direct financial compensations in order to keep the production capacity of the economy intact. In addition, we assume the government follows expansionary fiscal policy in the medium term. Thus, the direct financial compensations from the government are assumed to be a one year expenditure whereas the fiscal stimulus is assumed to be more persistent following a stationary AR(1) process.

[14] However, we do not strictly bind ourselves by the aforementioned criteria, and in some cases when a variable shows a mean reverting tendency, we either keep its value constant or zero, depending on how far has it been oscillating from zero.

4.1 Scenario 1: The initial impact of the COVID-19 crisis

In this scenario, the supply of labour is lowered by 3 percent as a result of the lockdown, which imposes a labour constraint on the economy, leading to a fall in the production capacity. Firms respond to the crisis by reducing their demand for labour by 3 percent. Moreover, we also simultaneously reduce the demand for Danish export by 10%.

The immediate impact of these shocks in the economy is quite strong as shown in figure 2 and 3. In particular, real GDP falls by 8.3 percent relative to the baseline (corresponding to an output contraction of 7.3%[15]), while the rate of unemployment increases with 3.7 percentage points compared to the baseline. The shock affects the real side of the economy through various channels. The lockdown reduces the level of employment, which directly affects household income. The fall in income is partially compensated through social transfers from the government. The overall drop in the disposable income results in a fall in both consumption and investment for the households. Since investment amongst the firms follows an accelerator mechanism the drop in economic activity leads to a fall in the level of investment. Despite a considerable fall in imports, the overall surplus on the current account reduces, as a result of the large drop in exports.

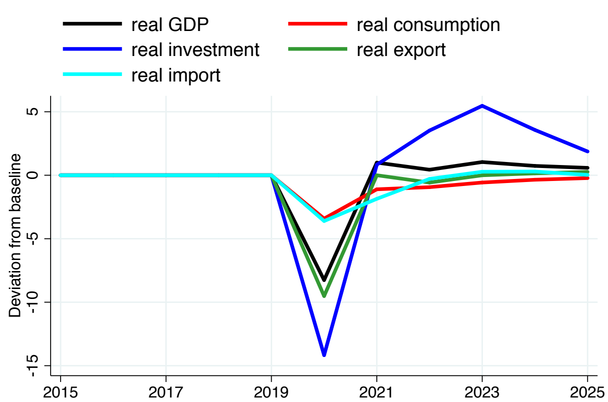

Figure 2: GDP

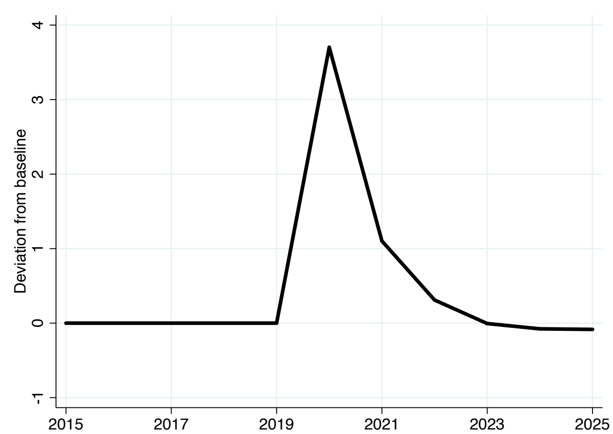

Figure 3: rate of unemployment

Since, the shocks in this scenario are temporary, the economy rebounds quickly. The level of GDP stabilizes at a slightly higher level than in the baseline scenario. The recovery in economic activity can be explained by two main drivers of output: i) an increase in net exports due to lower domestic prices, and ii) an increase in investment due to higher capacity utilization and growing house prices compared to the baseline.

We now turn to explaining the impact of these shocks on the public sector. Due to strong automatic stabilizers, both the fiscal balance and public debt are adversely affected by the aforementioned shocks to the economy.

[15]Note that the baseline assumes no crisis where the economy is growing at approximately 1 percent per year.

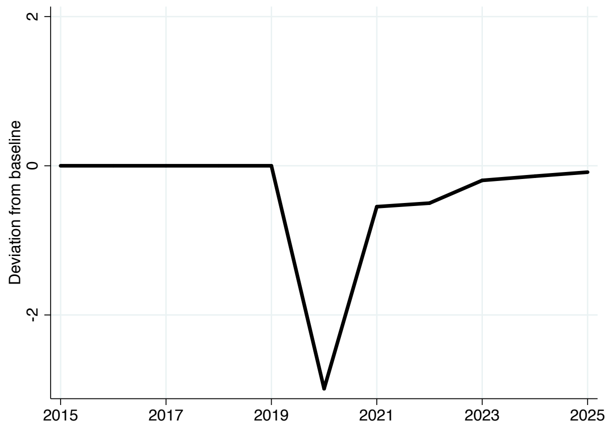

Figure 4: Public balance

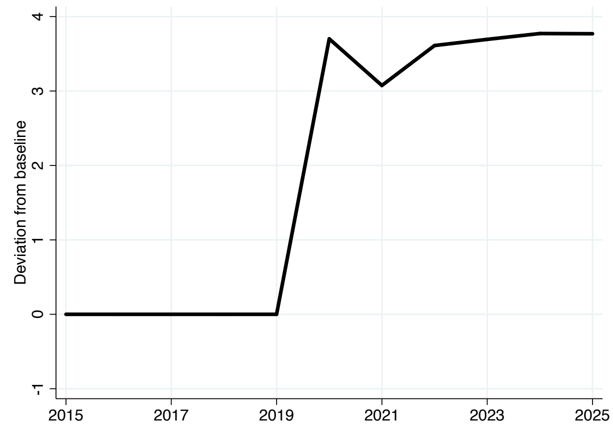

Figure 5: Public debt-to-GDP ratio

In particular, the fiscal balance to GDP reduces by 3 percentage points as compared to the baseline scenario. The adverse effects of the shocks mitigate slowly and the fiscal balance improves by moving towards the pre-shock level as the economy recovers. The fall in fiscal balance is financed via interest bearing liabilities by the government sector, as shown in Figure 5. Overall, the debt to GDP increases with 3.7 percentage points relative to the baseline. The debt, however, stabilizes at a higher level than in the baseline as fiscal balance improves in the medium term. Thus, temporary shocks on the real side of the economy seems to have persistent balance sheet effects.

4.2 Scenario 2: Economics crisis

While the purpose of the first scenario was to discuss the immediate impact of temporary exogenous shocks, the purpose of second scenario is to explore the potential impact of *persistent* shocks as a result of COVID-19. This scenario is introduced under the assumption that the lockdown prevails to some extent and there are fears of another wave of COVID-19 infections. We assume that such fears fuel economic uncertainty, which negatively affects consumer and business confidence as was the case during 2008 crisis. Therefore in addition to the shocks in scenario 1, we introduce exogenous shocks in consumption and investment behaviour.[16] We make the shocks more persistent by following an AR(1) process given by: $\epsilon_t = 0.6\epsilon_{t-1} + u_t$.

The results of this scenario show that real output reduces by 10.8 percent and unemployment increases by 4.1 percentage points as compared to the baseline as shown in the figure 6 and figure 7. Since the shock is more persistent in this scenario, the negative impact on the economy is large as well as more persistent. Following the shocks, the level of GDP reaches the baseline in 2025, which can be explained by a higher level of investment and a lower level of net exports. Overall, this scenario explores circumstances in which the pandemic can turn into a full-blown economic crisis.

[16] That is, consumption is exogenously reduced by 5 percent and investment is lowered by 25 percent.

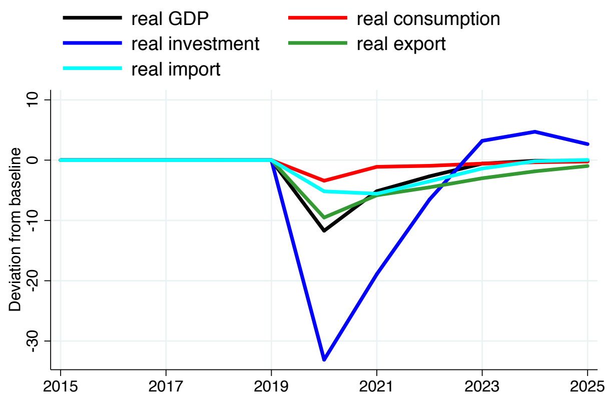

Figure 6: GDP

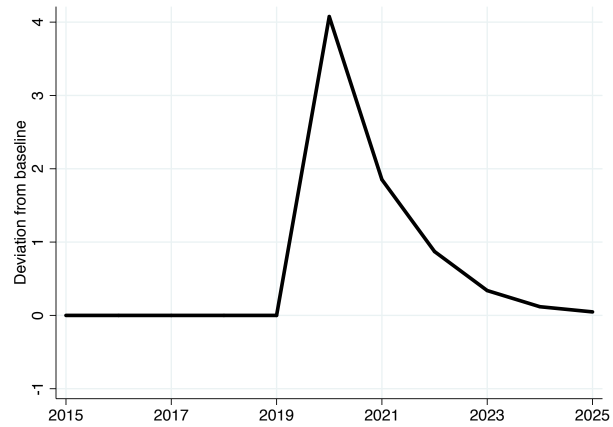

Figure 7: Rate of unemployment

Turning to the effect of the shocks on public sector, the lower economic activity leads to a fall in the tax revenue and a rise in the level of social transfers, which reduces the fiscal balance by 4 percent as compared to the baseline. The deficit of the public balance in this scenario is 4 percent of GDP in 2020. Since the fiscal balance is persistently lower as compared to the baseline scenario, the public debt to GDP increases over time, but then flattens in the medium term. The debt to GDP, when at its maximum, is 7.5 percentage points higher than in the baseline scenario as shown in figure 9 below.

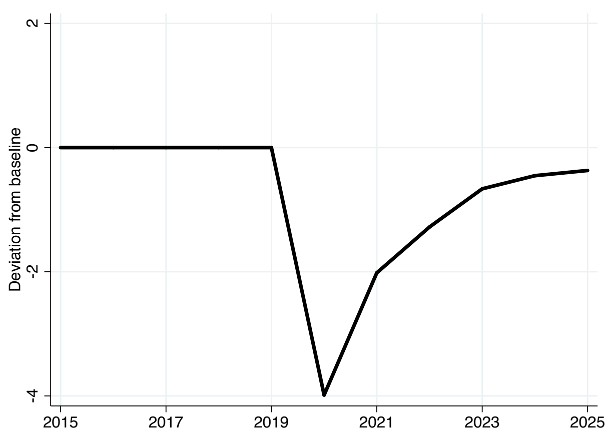

Figure 8: Public balance

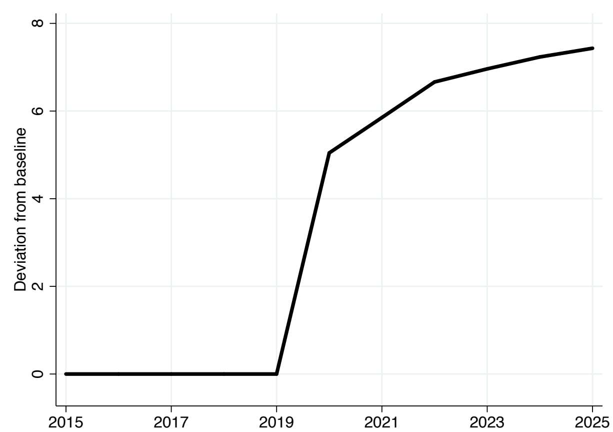

Figure 9: Public debt-to-GDP ratio

The analysis in scenario 2 presents a dramatic picture of the crisis, which clearly calls for the need of a policy intervention. We now proceed to exploring the effects of policy intervention in response to the crisis.

4.3 Scenario 3: Policy intervention

We assume that the aim of policy makers is to achieve two main objectives: First, to reduce the initial damage of the crisis. Second, to avoid a slow recovery of the economy as the one depicted in scenario 2. In order to do so, the only practical option in Denmark is a government intervention in the economy. The Danish economy is constrained by a fixed exchange rate regime, which leaves no room for an independent monetary policy intervention. In addition, interest rates are historically low which implies that expansionary monetary policy will have a minor impact.

In order to achieve the aforementioned objectives, we assume that the government responds by formulating a short run (immediate) strategy and a medium-term strategy. In the short-run, the government introduces relieve packages involving direct transfers to the firms in order to avoid job firings and keeping the production capacity of the economy intact. The medium-term strategy involves a fiscal stimulus in the form of increased public consumption.[17] While the aid packages is a one time intervention in 2020, the fiscal stimulus is more persistent, which we assume follows an AR(1) process, implying that the size of the stimulus reduces over time.

The intervention from the government clearly lowers the direct damage of the crisis as expected. In particular, both output and unemployment rates are less adversely affected as compared to scenario 2. In the medium term, real output in 2025 is slightly lower than in the baseline scenario whereas employment is higher than in the baseline. The different outcomes in scenario 2 and 3 can be explained by two main channels. 1) The increase in public consumption adds directly to GDP, and ii) due to the compensation from the government, the firms have an incentive to keep people employed, despite the fall in production. The level of employment is therefore higher in this scenario, which substitutes unemployment benefits with wages. Wages are higher due to the smaller distance between the rate of unemployment and the structural level of unemployment. The net disposable income of the households is higher in scenario 3, which results in a relative increase in the level of real consumption amongst the households. At the same time, the higher disposable income also stimulates real investment. The overall increase in aggregate demand, however, has a negative impact on the current account.

[17] Public consumption is chosen as an example of fiscal stimuli. In reality, public investment may also play a central role in this fiscal stimulus, but within the setting of this model, a change in public government and public investment is assumed to work through the same channels.

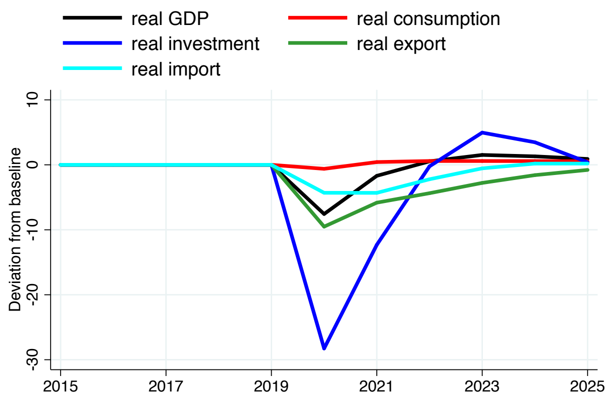

Figure 10: GDP

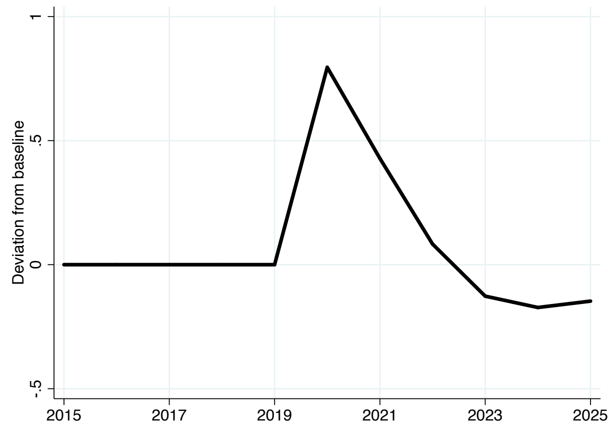

Figure 11: Rate of unemployment

Turning to the public sector in our model, fiscal balance in scenario 3 is affected by two opposing forces. On the one hand, the relative increase in the level of employment compared to scenario 2 increases tax revenues and reduces social transfers. On the other hand, transfers to the firms in 2020 and the fiscal stimulus negatively affects the fiscal balance as shown in figure 12. The net effect is, however, negative which has the consequence of increasing public debt as expected as seen from figure 13.

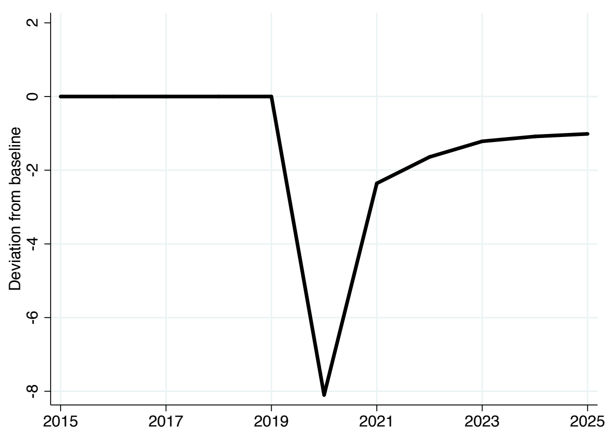

Figure 12: Public balance

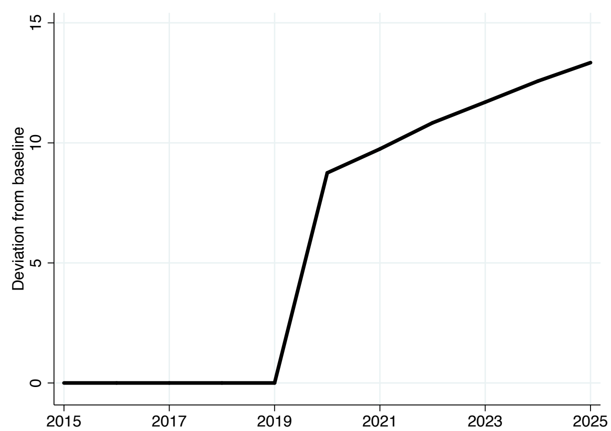

Figure 13: Public debt-to-GDP ratio

4.4 Discussion

Overall, our results replicated some stylized facts, suggesting that persistent shocks can create economic crisis, and government intervention can reduce the negative effects of the crisis as well as improve the recovery process. So far, we have explained our results while focusing on various transmission channels at play, however, a question of policy relevance is whether this intervention is practically feasible from an empirical point of view. To do so, we exploit the empirical aspects of the model and focus on the size of the deficits. In order to draw a statistically meaningful comparison, we make a reference to the situation in 2008 crisis in Denmark.

Even though the exact magnitude of the exogenous shocks is not known with certainty in reality, the resultant economic effects of our hypothetical shocks still offer some useful empirical insights. That is, our empirical results offer a rough gauge on the possible economic cost as well as the feasibility of policy intervention, when the economy is hit by exogenous shocks of various magnitudes. We now explain our results by presenting the actual data along with our projections.

Figure 14 shows the impact of our exogenous shocks on real output in scenario 2 and 3. We can clearly see that government intervention (scenario 3) in this case is effective and limits the reduction in output as compared to scenario 2. This also has the effect of limiting the rise in unemployment and recovering the labour market relatively quickly as compared to scenario 2. Focusing on the feasibility of the policy intervention, we can see that scenario 3 comes at a massive cost for the public sector. The fiscal deficit, which until the crisis was close to zero, drops to 8 percent of GDP. The level of deficit in scenario 3 is roughly 2 times the level of deficit experienced by Denmark in 2008 crisis. The higher deficit has the effect of turning net wealth into a negative level of roughly 17-18 percent of GDP which is comparable to the net public debt in 2012.

Our analysis present a clear trade-off between higher public debt and lower unemployment rate. In this regard, most policy makers in the past were concerned with higher public deficits and debt, often proposing measures of fiscal consolidation to avoid sovereign debt crisis. The great financial crisis in 2008, however, revealed that such measures led to painful recoveries in many countries calling into question the effectiveness of fiscal consolidations. It can be argued that fiscal consolidation is not desirable in the case of Denmark in the current times and the cost of fiscal stimulus is quite manageable for various reasons. First, the magnitude of public debt in the pre-COVID-19 crisis is small compared to the situation since 2000 as seen in figure 17. Second, an increase of net public debt by 10 percent of GDP as a result of fiscal stimulus is not a huge risk to the financial stability of the government in an environment of low interest rates. Third, if the public sector manages to finance its expenditures through domestic debt as is currently the case in Denmark, the risk to financial stability is likely to be even lower. That is, domestically financing the debt eliminates the risk of capital flight and creating sovereign debt crisis as has happened in many countries in the past.

Overall, our model results indicate that financing public deficits does not lead to any major balance sheet shifts in the economy. Hence, the empirical evidence in our model points towards using fiscal policy to reducing the impact of the crisis. As stated by two former chairmen of the economic council: if not now, then when should Denmark use active economic policy? (Scheer (2020)).

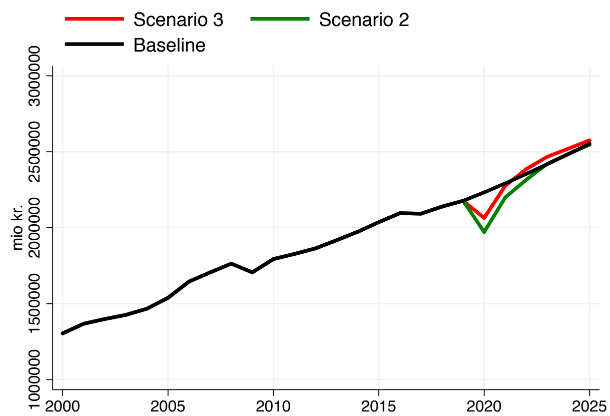

Figure 14: Level of real GDP

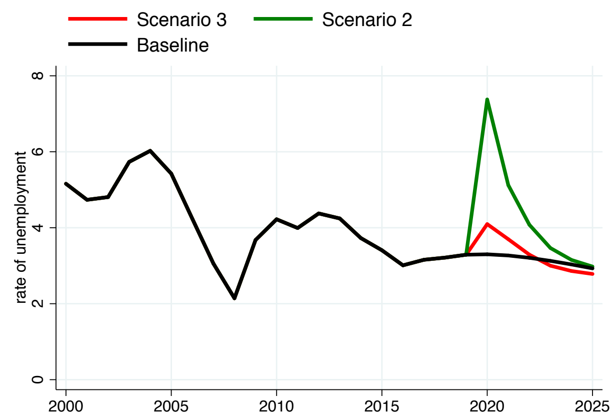

Figure 15: Rate of unemployment

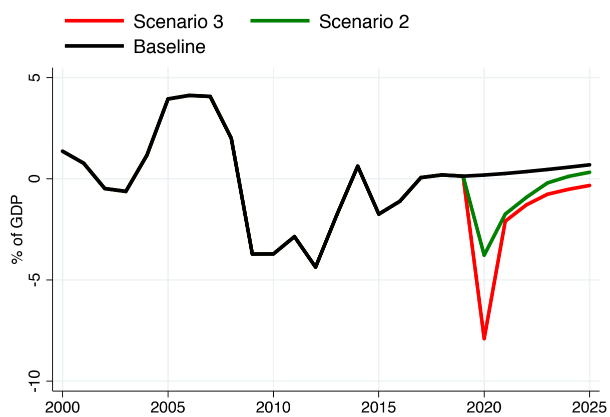

Figure 16: Public deficit

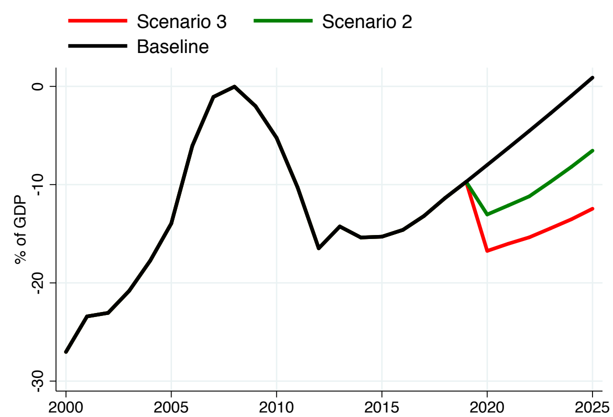

Figure 17: Public net wealth

5 Conclusion

The current COVID-19 pandemic has been compared to the Spanish flu 100 years ago in many aspects. While many policy makers at that time enforced social distancing and lockdown after the dissemination of the virus, most governments (with the exception of Sweden) this time took strict measures and enforced lockdown at a much earlier stage in order to prevent the spread of the virus. The lockdown, from a health point of view, has reduced the number of infections over time, the economic consequences, however, are still not known with certainty.

From an economic perspective, the lockdown has led to the eruption of supply shocks and demand shocks in the economy. In order to investigate the potential impact of these shocks, we develop a Post-Keynesian empirical SFC-model while using Denmark as a case study. We analysed the impact of these shocks in the form of three different scenarios. Although the exact magnitudes of our shocks are specific to Denmark, the transmission mechanism of these shocks are relevant for other small open economies with fixed exchange rates. Overall, our results indicate that temporary (one year) shocks in the economy will lead to a fall in output but a quick recovery whereas persistent shocks can lead to a full-blown economic crisis. We find that the impact of these shocks can be lowered by public intervention in the form of fiscal stimulus, which can reduce the impact of these shocks and also improve the speed of economic recovery. We also addressed the economic consequences of financing this stimulus, and whether such a policy response is feasible. In this regard, we argue that the pre-crisis financial position of the public sector was sound, and running deficits in an environment of low interests rate will not pose challenges to the financial stability of the economy. Hence, our main conclusion is that fiscal stimulus seems to be an effective and affordable policy option available to Denmark.

Finally, there remains the question of what should the fiscal stimulus target in the economy. In our analysis we use public consumption as the only tool of fiscal policy, but public investment may actually prove itself to be a more sustainable solution. In that sense, the COVID-19 may trigger the political and social support for addressing the issue of climate change and sustainability. A thread to our health, like COVID-19, has increased the awareness of the fragility of our current society. Even though this is beyond the scope of our analysis in the current paper, it can be argued that the policy makers may use this opportunity to invest in sectors that can promote sustainable and green transition.

6 Appendix

6.1 Model

6.1.1 Non-financial corporations (NFC)

The total production in nominal terms:

$$Y_t = C_t + I_t + G_t + X_t - M_t$$

Total sales in domestic economy:

$$S_t = C_t + I_t + G_t + X_t$$

Value of real output:

$$y_t = c_t + i_t + g_t + x_t - m_t$$

GDP deflator:

$$P_t^y = \frac{Y_t}{y_t}$$

Leontief production function:

$$y_t^s = \min(a_0 k_t, a_1 l_t)$$

Wage bill paid by NFC:

$$WB_t^N = W_t(N_t^N)$$

Taxes on production:

$$T_t^N = \beta_3(Y_t)$$

Gross operating surplus:

$$B_{2_t} = \beta Y_t$$

Nominal stock of capital of NFC:

$$K_t^N = K_{t-1}^N + I_t^N - D_t^N + K_{CG_t}^N$$

Level of depreciation:

$$D_t^N = \delta(K_{t-1}^N)$$

Real stock of capital:

$$k_t^N = \frac{K_t^N}{P_t^i}$$

Real investment:

$$ln\left(\frac{i_t^N}{k_t^N}\right) = \beta_i + \beta_i ln\left(\frac{i_{t-i}^N}{k_{t-i}^N}\right) + \beta_i ln\left(\frac{y_{t-i}}{k_{t-i}^H}\right)$$

Nominal investment in fixed asset:

$$I_t^N = i_t^N(P_t^i)$$

The savings of the firms:

$$S_t^N = Y_t - WB_t^N + (B_{2_t}^N - B_{2_t}) + r_{N_{t-1}}(NIB_{t-1}^N) + \chi_t(NEQ_{t-1}^N) - T_t^N + STR_t^N + \epsilon^N$$

Net lending/borrowing:

$$NL_t^N = S_t^N - I_t^N - NP_t^N + KTR_t^N$$

Net equities:

$$NEQ_t^N = NEQ_{t-1}^N + NEQTR_t^N + NEQ_{CG_t}^N$$

Net interest bearing stocks (assets - liabilities) held by the firms:

$$NIB_t^N = NIB_{t-1}^N + NIBTR_t^N + NIB_{CG_t}^N$$

Net interest bearing financial transactions:

$$NIBTR_t^N = NL_t^N - NEQTR_t^N$$

The financial net wealth:

$$FNW_t^N = NIB_t^N + NEQ_t^N$$

The total net wealth of the firms:

$$NW_t^N = FNW_t^N + K_t^N$$

6.1.2 Household sector

The total income for the households:

$$Y_t^H = WB_t^H + B_{2_t}^H + r_{A_{t-1}}^H(IBA_{t-1}^H) - r_{L_{t-1}}^H(IBL_{t-1}^H) + \chi_t(EQA_{t-1}^H) + \psi_t(PENA_{t-1}^H) + STR_t^H + \epsilon^H$$

Social transfers:

$$STR_t^H = SBEN_t^H + OTR_t^H - SCON_t^H$$

Disposable income (YD_t^H) as follows:

$$YD_t^H = Y_t^H - T_t^H$$

Taxes paid by the households:

$$T_t^H = \beta_i(YD_t^H)$$

Social contributions:

$$SCON_t^H = \beta_7(YD_{t-i}^H)$$

Social benefits received by the households:

$$ln(SBEN_t^H) = \beta_i + \beta_i ln(UN_t) + \beta_i ln(W_{t-i}^H)$$

Real disposable income:

$$yd_t^H = \frac{YD_t^H}{P_t^c}$$

Real consumption by the households:

$$ln(c_t) = \beta_0 + \beta_i ln(wb^H) + \beta_i ln(yd_{t-i}^H - wb^H) + \beta_i ln(nw_{t-1}^H)$$

Nominal consumption:

$$C_t = c_t(P_t^c)$$

The consumption price index:

$$ln(P_t^c) = \beta_0 + \beta_i ln(W_{t-i}) + \beta_i ln(P_{t-i}^m)$$

Real investment in fixed assets (housing):

$$ln\left(\frac{i_t^H}{k_t^H}\right) = \beta_i + \beta_i ln\left(\frac{i_{t-i}^H}{k_{t-i}^H}\right) + \beta_i ln\left(\frac{P_{t-i}^H}{P_{t-i}^i}\right) + \beta_i ln\left(\frac{yd_t^H}{k_t^H}\right) + \gamma\beta_i LEV$$

Nominal investment in fixed asset:

$$I_t^H = i_t^H(P_t^i)$$

The nominal stock of housing:

$$K_t^H = K_{t-1}^H + I_t^H - D_t^H + K_{CG_t}^H$$

The change in house prices:

$$lnP_t^H = \beta_i + \beta_i ln(yd_{t-i}^h) + \beta_i ln\left(\frac{K_{t-i}^H}{P_{t-i}^h}\right) + \beta_i ln(LF)$$

The nominal stock of capital:

$$K_t^H = K_{t-1}^H(1 + \Delta P_t^H) + I_t^H - D_t^H$$

Real stock of capital as follows:

$$k_t^H = \frac{K_t^H}{P_t^i}$$

The households savings:

$$S_t^H = YD_t^H - C_t^H + CPEN_t^H$$

Net lending/borrowing:

$$NL_t^H = S_t^H - I_t^H - NP_t^H + KTR_t^H$$

The financial balance:

$$FNL_t^H = FATR_t^H - FLTR_t^H$$

The total transaction of financial assets:

$$FATR_t^H = IBATR_t^H + EQATR_t^H + PENATR_t^H$$

Equity prices:

$$ln(S_t) = \beta_0 + \beta_i ln(S_{t-i}) + \beta_i ln(yd_{t-i}^h) + \beta_i(\chi_t)$$

Equities transactions:

$$EQAHTR_t = \beta_i + \beta_i(\chi_t) + \beta_i(r_{A_{t-1}}^H) + \beta_i(IBLTR_t^H)$$

Pension transactions:

$$PENATR_t^H = \beta_i + \beta_i(\psi_t) + \beta_i WB_t^H$$

Interest bearing liability transactions:

$$IBLTR_t^H = \beta_i(I_{t-i}^H) + \beta_i(IBL_{t-i}^H) + \beta_i(FATR_t^H) + \beta_i(r_{L_{t-1}}^H)$$

The demand for deposits:

$$IBATR_t^H = NL^H + IBLTR_t^H - EQATR_t^H - PENATR_t^H$$

The stock of interest bearing assets:

$$IBA_t^H = IBA_{t-1}^H + IBATR_t^H + IBA_{CG_t}^H$$

The stock of equities:

$$EQA_t^H = EQA_{t-1}^H + EQATR_t^H + EQA_{CG_t}^H$$

The stock of Pension assets:

$$PENA_t^H = PENA_{t-1}^H + PENATR_t^H + PENA_{CG_t}^H$$

The stock of interest bearing liabilities:

$$IBL_t^H = IBL_{t-1}^H + IBLTR_t^H + IBL_{CG_t}^H$$

Total financial assets:

$$FA_t^H = IBA_t^H + EQA_t^H + PENA_t^H$$

Total stock of financial liabilities:

$$FL^H = IBL_t^H$$

Financial net wealth:

$$FNW_t^H = FA_t^H - FL_t^H$$

Total net wealth:

$$NW_t^H = FNW_t^H + K_t^H$$

Real financial wealth:

$$fnw_t^H = \frac{FNW_t^H}{P_t^c}$$

Real wealth:

$$nw_t^H = \frac{NW_t^H}{P_t^c}$$

6.1.3 Financial sector

Savings:

$$S_t^F = B_{2_t}^F + r_{A_t-1}^F(IBA_{A_t-1}^{F\sim H}) - r_{L_t-1}^F(IBL_{L_t-1}^{F\sim H}) + r_{N_t-1}(NIB_{t-1}^F) + \chi_t(NEQ_{t-1}^F) - \psi_t(PENL_{t-1}^F) - T_t^F + STR_t^F - CPEN_t^F + \epsilon^F$$

The stock of fixed asset:

$$K_t^F = K_{t-1}^F + I_t^F - D_t^F + K_{CG_{t-1}}^F$$

Net lending/borrowing:

$$NL_t^F = S_t^F - I_t^F - NP_t^F + KTR_t^F$$

The financial balance:

$$FNL_t^F = IBATR_t^{F\sim H} + NIBTR_t^F + NEQTR_t^F - IBLTR_t^{F\sim H} - PENLTR_t^F$$

Accumulating of interest-bearing liabilities:

$$IBLTR_t^{F\sim H} = IBATR_t^H$$

Accumulating of interest-bearing assets:

$$IBATR_t^{F\sim H} = IBLTR_t^H$$

The transactions of net interest bearing stocks:

$$NIBTR_t^F = -(NIBTR_t^N + NIBTR_t^G + NIBTR_t^W)$$

Stock of interest-bearing assets:

$$IBA_t^{F\sim H} = IBA_{t-1}^{F\sim H} + IBATR_t^{F\sim H} + IBA_{CG_t}^{F\sim H}$$

Stock of interest-bearing liabilities:

$$IBL_t^{F\sim H} = IBL_{t-1}^{F\sim H} + IBLTR_t^{F\sim H} + IBL_{CG_t}^{F\sim H}$$

The stock of net interest bearing assets:

$$NIB_t^F = NIB_{t-1}^F + NIBTR_t^F + NIB_{CG_t}^F$$

The transaction of pensions:

$$PENLTR_t^F = PENATR_t^H + NPENTR^W$$

The transaction net equities:

$$NEQTR_t^F = NL_t^F + IBLTR_t^{F\sim H} + PENLTR_t^F - IBATR_t^{F\sim H} - NIBTR_t^F$$

Transaction of net equities:

$$NEQ_t^F = NEQ_{t-1}^F + NEQTR_t^F + NEQ_{CG_t}^F$$

The financial net wealth:

$$FNW_t^F = NIB_t^F + NEQ_t^F + IBA_t^{F\sim H} - IBL_t^{F\sim H} - PENL_t^F$$

Total net wealth:

$$NW_t^F = FNW_t^F + K_t^F$$

6.1.4 Government sector

The total tax revenue received by the government:

$$T_t^G = T_t^{NF} + T_t^H + T_t^F + T_t^W$$

The social transfers paid by the government sector:

$$STR_t^G = -(STR_t^H + STR_t^{NF} + STR_t^F + STR_t^W)$$

Savings:

$$S_t^G = B_{2_t}^G + r_{N_t-1}(NIB_{t-1}^G) + T_t^G + STR_t^G - G_t + \epsilon^G$$

Stock of fixed capital:

$$K_t^G = K_{t-1}^G + I_t^G - D_t^G + K_{CG_t}^G$$

Net lending:

$$NL_t^G = S_t^G - I_t^G - NP_t^G + KTR_t^G$$

Financial net lending as follows:

$$FNL_t^G = NIBTR_t^G$$

Net transaction of net interest-bearing assets:

$$NIBTR_t^G = NL_t^G$$

Net stock of interest bearing asset:

$$NIB_t^G = NIB_{t-1}^G + NIBTR_t^G + NIB_{CG_t}$$

6.1.5 Balance of payments and trade

Real imports:

$$ln(m_t) = \beta_i + \beta_i ln\left(\frac{P_{t-1}^y}{P_{t-1}^m}\right) + \beta_i ln(c_{t-1} + i_{t-1} + x_{t-1})$$

Real level of export:

$$ln(x_t) = \beta_{35} + \beta_{36} ln\left(\frac{P_{t-1}^x}{P_{t-1}^m}\right) + \beta_{38} ln(m_t^W)$$

Nominal imports:

$$M_t = m_t(P_t^m)$$

Nominal exports:

$$X_t = x_t(P_t^x)$$

Price of exports:

$$ln(P_t^x) = \beta_{39} + \beta_{40} ln(P_t^m) + \beta_{41} ln(ULC_{t-1})$$

Savings of the rest of the world:

$$S_t^W = M_t - X_t + \chi_t(NEQ_{t-1}^W) + \psi_t(NPEN_{t-1}^W) + r_{N_{t-1}}(NIB_{t-1}^W) + WB_t^W - T_t^W + STR_t^W + \epsilon^W$$

Net lending of the rest of the world:

$$NL_t^W = S_t^W - NP_t^W + KTR_t^W$$

Current account balance:

$$CAB_t = -NL_t^W$$

Financial account balance:

$$FNL_t^W = NIBTR_t^W + NEQTR_t^W + NPENTR_t^W$$

Net interest bearing stocks:

$$NIB_t^W = NIB_{t-1}^W + NIBTR_t^W + NIB_{CG_t}^W$$

Net equity stocks:

$$NEQ_t^W = NEQ_{t-1}^W + NEQTR_t^W + NEQ_{CG_t}^W$$

Net pension stocks:

$$NPEN_t^W = NPEN_{t-1}^W + NPENTR_t^W + NPEN_{CG_t}^W$$

Net interest bearing transactions:

$$NIBTR_t^W = NL_t^W - NEQTR_t^W - NPENTR_t^W$$

Net financial wealth of the rest of the world:

$$FNW_t^W = NIB_t^W + NEQ_t^W + NPEN_t^W$$

6.1.6 Labour market

GDP at factor cost:

$$Y_t^F = WB_t^N + B_{2_t}$$

Wage share:

$$WS_t = \frac{WB_t^N}{Y_t^F}$$

Unit labour cost:

$$ULC_t = \frac{WS_t(Y_t)}{Y_t^F}$$

Number of unemployed individuals:

$$UN_t = LF_t - N_t$$

The rate of unemployment:

$$UR_t = \frac{UN_t}{LF_t}$$

The number of employed individuals in the domestic economy:

$$ln(N_t) = \beta_i + z * \beta_i ln(y_t) + (1 - z) * \beta_i ln(y_t^s) + \beta_i ln(LF_t)$$

The number of total employed:

$$N_t^N = N_t + N_t^W$$

Wage bill of the household sector:

$$WB_t^H = W_t(N_t)$$

The wage rate:

$$W_t = \beta_0 + \beta_i W_{t-i} + \beta_i(UR_t - UR_t^s)$$

Number of individuals hired from abroad:

$$N_t^W = \frac{WB_t^W}{W_t}$$

The maximum level of input of labour, l_t:

$$l_t = (1 - UR_t^s)LF_t$$

6.2 Model vs. Data

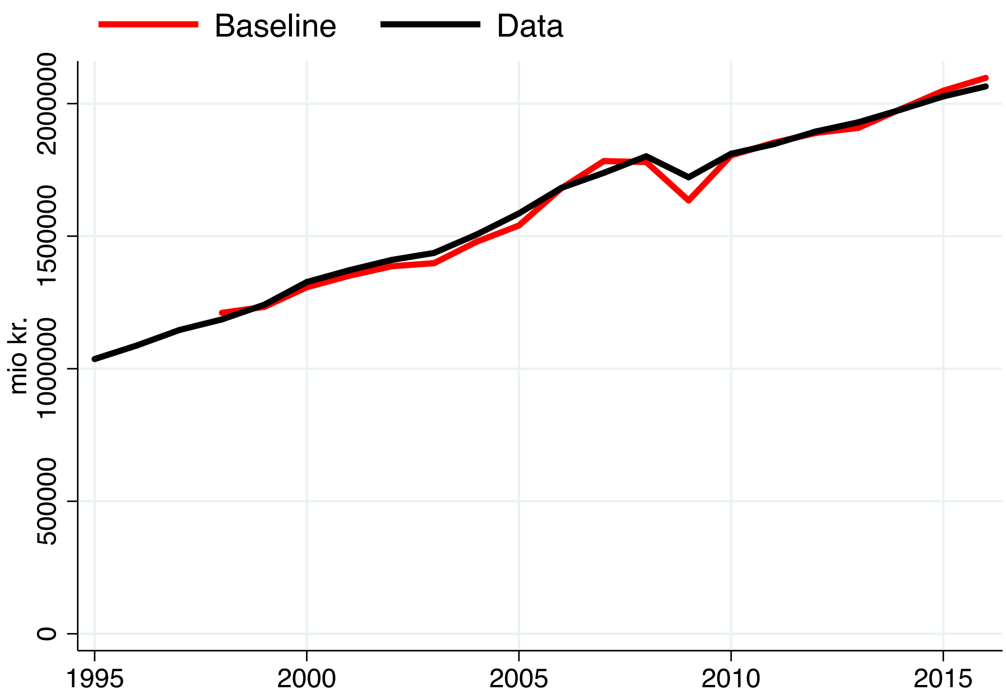

Figure 18: GDP

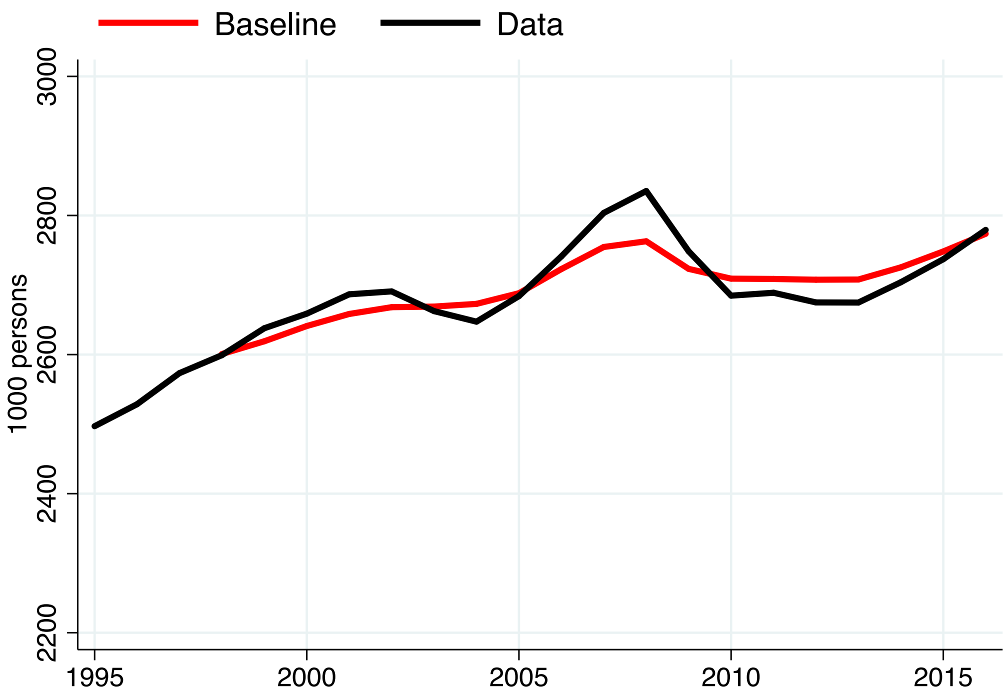

Figure 19: Number of employed people

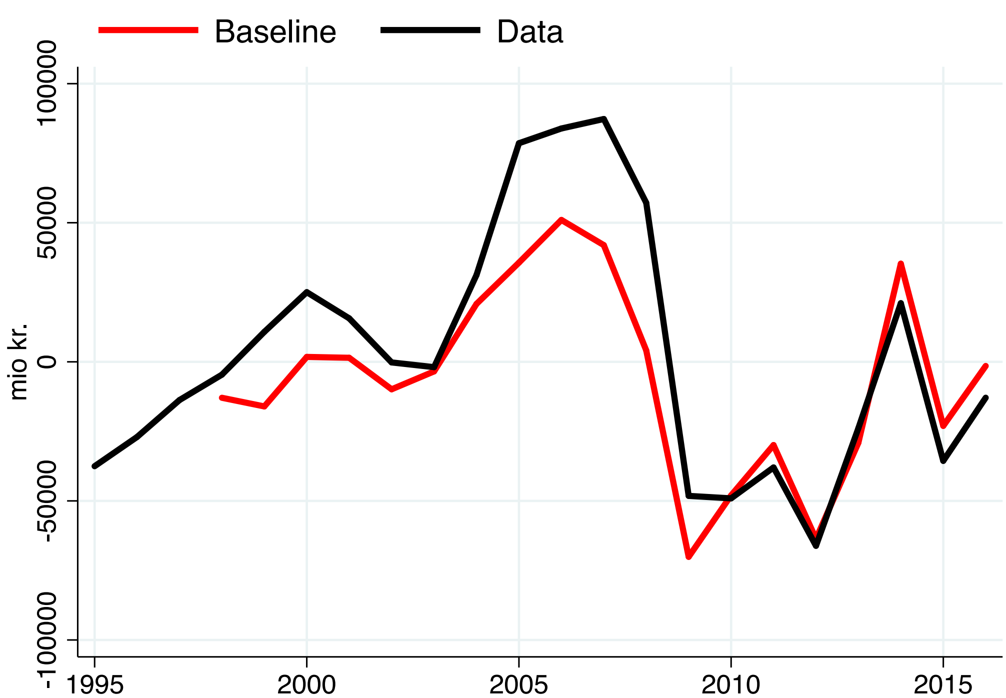

Figure 20: Net lending of the public sector

6.3 List of variables

Table 3 List of variables

Notation	Description
Y	GDP
Y^s	Total Production Capacity
C	Consumption
I	Gross fixed capital formation(total)
X	Exports of goods and services
M	Imports of goods and services
S	Sales
y	Real GDP
y^s	Real Total Production Capacity GDP
c	Real Consumption
i	Real Gross fixed capital formation
x	Real Exports of goods and services
m	Real Imports of goods and services
s	Real Sales
WB^N	Wage bill paid by NFC
WB^H	Wage bill received by NFC
W	Wage rate
N	Number of employed individuals
L	Maximum Level of input Labour
T^N	Taxes paid by NFC
T^H	Taxes paid by Households
T^F	Taxes paid by FC
T^W	Taxes paid by Rest of the world
T^G	Taxes received by Government
B_2	Gross operating surplus
B_2^H	Gross operating surplus received by households
B_2^F	Gross operating surplus received by FC
B_2^G	Gross operating surplus received by government
D^N	Capital depreciation of fixed asset held by NFC
D^H	Capital depreciation of fixed asset held by households
D^F	Capital depreciation of fixed asset held by FC
D^G	Capital depreciation of fixed asset held by government
K^N	Stock of capital owned by NFC
K^H	Stock of capital owned by households
K^F	Stock of capital owned by FC
K^G	Stock of capital owned by government
k^N	Real Stock of capital owned by NFC
k^F	Real Stock of capital owned by FC
k^H	Real Stock of capital owned by households
k^G	Real Stock of capital owned by government

Table 3 List of variables *(continued)*

I^N	Gross fixed capital formation by NFC
I^H	Gross fixed capital formation by households
I^F	Gross fixed capital formation by FC
I^G	Gross fixed capital formation by government
LEV	Leverage of households
K^N_{CG}	Capital gains on capital stock of NFC
K^H_{CG}	Capital gains on capital stock of households
K^F_{CG}	Capital gains on capital stock of FC
K^G_{CG}	Capital gains on capital stock of government
P^i	Price deflator on fixed assets
P^y	GDP deflator
P^c	Consumption price deflator
P^x	Export prices
P^m	Import prices
P^H	House prices
S	Stock prices
KTR^N	Capital transfers to NFC
KTR^H	Capital transfers to households
KTR^F	Capital transfers to FC
KTR^G	Capital transfers to government
KTR^W	Capital transfers vis-a-vis Rest of the world
NL^N	Net lending/borrowing by NFC
NL^H	Net lending/borrowing by households
NL^F	Net lending/borrowing by FC
NL^G	Net lending/borrowing by government
NL^W	Net lending/borrowing by Rest of the world
S^N	Savings of NFC
S^H	Savings of households
S^F	Savings of FC
S^G	Savings of government
S^W	Savings of rest of the world vis-a-vis Denmark
NEQ^N	Net stock of equity on NFC's balance sheet
NEQ^F	Net stock of equity on FC's balance sheet
NEQ^W	Net stock of equity on RoW's balance sheet
EQA^H	Stock of equities held by households
$NEQTR^N$	Net transactions for equities by NFC's
$NEQTR^F$	Net transactions for equities FC's
$NEQTR^W$	Net transactions for equities by RoW
$EQATR^H$	Transactions for equities by households
NIB^N	Net value of interest bearing stocks on NFC's balance sheet
NIB^G	Net value of interest bearing stocks on government's balance sheet
NIB^F	Net value of interest bearing stocks on FC's balance sheet

Table 3 List of variables *(continued)*

IBA^H	Stock of interest bearing assets on household's balance sheet
IBL^H	Stock of interest bearing liabilities on household's balance sheet
$IBA^{F\sim H}$	Stock of interest bearing assets on FC's balance sheet
$IBL^{F\sim H}$	Stock of interest bearing liabilities on FC's balance sheet
$PENA^H$	Stock of pension assets on households balance sheet
$PENL^F$	Stock of pension liabilities on FC's balance sheet
$NIBTR^N$	Net transactions of interest bearing stocks by NFC
$NIBTR^G$	Net transactions of interest bearing stocks by government
$NIBTR^F$	Net transactions of interest bearing stocks by FC
$IBATR^H$	Transaction of interest bearing assets by household
$IBLTR^H$	Transaction of interest bearing liabilities by household
$IBATR^{F\sim H}$	Transaction of interest bearing assets by FC
$IBLTR^{F\sim H}$	Transaction of interest bearing liabilities by FC
$PENATR^H$	Pension transactions by households
$PENLTR^F$	Pensions transactions by FC
NEQ^N_{CG}	Capital gains on net stock of equity on NFC's balance sheet
NEQ^F_{CG}	Capital gains on net stock of equity on FC's balance sheet
NEQ^W_{CG}	Capital gains on net stock of equity on RoW's balance sheet
EQA^H_{CG}	Capital gains on stock of equities held by households
NIB^N_{CG}	Net value of interest bearing stocks on NFC's balance sheet
NIB^G_{CG}	Net value of interest bearing stocks on government's balance sheet
NIB^F_{CG}	Net value of interest bearing stocks on FC's balance sheet
IBA^H_{CG}	Stock of interest bearing assets on household's balance sheet
IBL^H_{CG}	Stock of interest bearing liabilities on household's balance sheet
$IBA^{F\sim H}_{CG}$	Stock of interest bearing assets on FC's balance sheet (vis-a-vis households)
$IBL^{F\sim H}_{CG}$	Stock of interest bearing liabilities on FC's balance sheet (vis-a-vis households)
$PENA^H_{CG}$	Stock of pension assets on households balance sheet
$PENL^F_{CG}$	Stock of pension liabilities on FC's balance sheet
FNW^N	Financial net wealth of NFC
FNW^H	Financial net wealth of household
FNW^F	Financial net wealth of FC
FNW^G	Financial net wealth of government
NW^N	Net wealth of NFC
NW^H	Net wealth of household
NW^F	Net wealth of FC
NW^G	Net wealth of government
STR^N	Social transfers for NFC
STR^H	Social transfers for the households
STR^F	Social transfers for FC
STR^G	Social transfers for government
STR^W	Social transfers for RoW
$SBEN^H$	Social benefits received by households

Table 3 List of variables *(continued)*

$SBEN^G$	Social benefits paid by government
OTR^H	Other transfers for households
$SCON^H$	Social contributions by households
FNL^N	Financial balance of NFC
FNL^H	Financial balance of households
FNL^F	Financial balance of FC
FNL^G	Financial balance of government
FNL^W	Financial balance of RoW
LF	Labour force
UN	Number of unemployed individuals
UR	Unemployment rate
UR^s	Structural unemployment rate
ULC	Unit labour cost
YD^H	Houshold disposable income
yd^H	Real household disposable income
r_A^H	Interest rate on household interest bearing assets
r_L^H	Interest rate on household interest bearing liabilities
r_A^F	Interest rate on household interest bearing assets
r_L^F	Interest rate on FC interest bearing liabilities
r_N	Interest rate on FC net interest bearing stocks
ψ	Rate of return on pension assets
χ	Rate of return on equities

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