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The effects of a less generous unemployment benefits system in a Stock Flow Consistent Model framework

Mikael Randrup Byrialsen
Hamid Raza
Jesper Eriksen

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AALBORG UNIVERSITY
DENMARK

Abstract

The aim of this paper is to analyse the effects of lowering unemployment benefits on the level of employment. We focus on the Danish labour market and critically examine the policy proposals, calling for further reductions in unemployment benefits. In this regard, we develop a Stock-Flow-Consistent (SFC) model with an emphasis on the labour market. We then compare and contrast our analysis with the Annual Danish Aggregated model (ADAM) used by the Danish Ministry of Finance and Statistics Denmark. The implication of our results raises serious questions on the proposals calling for a reduction in unemployment benefits as an effective policy to reduce unemployment.

1 Introduction

How do unemployment benefits affect the labour market and macroeconomic outcomes? Determining the optimal level of unemployment benefits has been a hot potato for both policy makers and economists. On the one hand a high compensation rate secures the unemployed against the loss of income, but on the other hand, a high compensation rate is largely expected to affect the incentive for the unemployed to work, hence increasing unemployment.

The view that increasing unemployment benefits can increase unemployment can theoretically be explained from both the supply and demand perspectives. On the demand side, higher benefits lead to higher wage–demand from the workers, resulting in a lower demand for labour (Snower, 1994). On the supply side, higher benefits imply that the unemployed sacrifice a smaller part of their future consumption when they are unemployed. However, the empirical evidence regarding the relationship between changes in the level of unemployment benefits and changes in the level of unemployment is not unequivocal. Several studies have rejected the hypothesis of any significant correlation (e.g, (Howell and Rehm, 2009) and (Howell and Azizoglu, 2011)). In addition, quantifying the effects of unemployment benefits on macroeconomic outcomes is challenging as described by Chodorow-Reich and Karabarbounis (2016).

Over the last few decades, unemployment benefits in Denmark have declined as confirmed by Danish Economic Councils (DØRS).[1] In the beginning of the 1980s the rate at which the unemployed were compensated for the loss of income was set to 65% of the average wage in the industry. The compensation rate, however, declined to less than 50% by 2015 (DØRS, 2014; Cevea, 2015).

The recent decline in unemployment benefits in Denmark is clearly linked to the changes in the active labour market policy during this period. In 2014, a labour market commission was formed to investigate how to make the more than 100 year old system of unemployment benefits contemporary to the modern labour market (Ministry of Employment, 2014). The recommendations from the commission as well as the labour market reforms pointed in the same direction – the incentive to work must be increased, which requires a reduction of unemployment benefits and thereby a reduction of the security for the workers. These recommendation are also supported by the Annual Danish Aggregated Model (ADAM) used by the Danish Ministry of Finance and Statistics Denmark as will be discussed in detail.

The aim of this paper is to analyse the effects of unemployment benefits on the economy. We adopt a Stock-Flow-Consistent (SFC) approach with an emphasis on the dynamics of the labour market. We then compare and contrast our analysis with the Annual Danish Aggregated model (ADAM), which is widely used in policy analysis in Denmark.

This paper makes three important contributions. First, we critically analyse the proposals calling for a reduction in unemployment benefits as an appropriate policy to reduce unemployment. Second, we develop a SFC model by explicitly modelling the dynamics of a labour market. Third, our paper contributes to the ongoing debate on the possible effects of unemployment benefits on the level of unemployment as well as on the macroeconomic outcomes.

The paper is organised as follows. Section 2 reviews the literature on the subject, with a special focus on post–Keynesian theory. Section 3 discusses the Danish system of unemployment benefits. Section 4 presents an SFC model, followed by an analysis in section five. Section 6 contains a discussion of our results, and section 7 concludes.

2 Literature Review

According to (Rosholm, 2006; DØRS, 2014) most research on the link between compensation rates and their effects on employment is based on the classical search theory. In a nutshell, these theories in their simplest form investigate the correlation between incentives to work and behaviour for job–search. In these models a change in the unemployment benefits has an effect on a worker's reservation wage and

[1] Danish Economic Councils referred to as De Økonomiske Rd Sekretariat(DØRS).

thereby whether a given job–offer is accepted; a reduction in the unemployment benefits therefore leads to a reduction in the reservation wage, which can result in a shorter duration of unemployment (Rosholm, 2006).

(Andersen et al., 2015) reviews a number of empirical studies investigating the link between benefits and the changes in employment. Overall, the results in these studies indicate weak partial evidence that higher unemployment benefits are associated with lower traffic from unemployed to employed. The results from these studies are subject to uncertainty mainly due to data, choice of methods, and the fact that some of the results are old. (Fredriksson et al., 2008) also suggests that generous unemployment benefits are likely to increase unemployment.

In (Andersen and Svarer, 2009), the trade–off between incentives to work and insurance (as also mentioned by (DØRS, 2014)) is discussed. In their general equilibrium model, the unemployment benefit is seen, like a tax, as a distortion to the economy, which prevents it from reaching optimum conditions. The causality is explained to run from a more generous welfare system to a higher rate of unemployment.

In the Annual Danish Aggregated Model (ADAM),[2] a link between the compensation rate and the unemployment rate can be identified. The compensation rate is a factor in determining the level of structural unemployment. The level of structural unemployment is represented in the wage–relation as a lagged variable with no direct effect on wages. It is represented as the difference between unemployment and the structural unemployment in the previous period, which has an effect on wages. If the level of unemployment in the previous period exceeds the rate of structural unemployment (which could be the outcome of a decrease in compensation rate) in the previous period, downward pressure is asserted on *the change in wages* in the current period. Ceteris paribus, a decrease in the compensation rate decreases wage–inflation.

Prices are set as a mark–up over the long–term unit cost. A smaller increase in wages decreases price–inflation and thereby increases domestic demand as well as the level of net exports (due to an increase in competitiveness). According to this dynamic, the level of unemployment falls until it equals the structural level of unemployment. In this model, the effect of a change in the compensation rate is set to have a wage elasticity; the direct elasticity of a change in compensation rate on the long run unemployment is 0.766, which Statistics Denmark admits to be too high (Statistics Denmark, 2012, p, 129).[3] In order to handle this, an educated guess of 0.1 from the labour market committee (2009) has been used, while the rest of the elasticity (0.666) is determined exogenously (Statistics Denmark, 2012, p, 130). The change in the rate of unemployment has an elasticity of -0.25. The coefficient of the variable is not significant, but included without any description (Statistics Denmark, 2012, p, 129).[4]

The findings in several other studies using data from OECD countries are in sharp contrast to the studies suggesting a significant positive relationship between compensation rate and unemployment, i.e., there is no significant correlation between unemployment benefits and the level of unemployment as mentioned in (Howell and Rehm, 2009). On the contrary, the empirical evidence in (Howell and Rehm, 2009) indicate that the causality could run in the opposite direction, i.e., a change in the unemployment may have the effect of changing unemployment benefits.

The link between unemployment benefits and work incentives is also discussed in (Howell and Azizoglu, 2011). The authors argue that "the evidence overwhelmingly shows that in the real world holding a job is typically highly valued independently of the income it generates, and if it is so, changes in UI [unemployment insurance] generosity may have nothing to do with changes in the disutility of work". Their results indicate, that the link between benefits and work incentives may not be as strong as widely

[2] ADAM is a traditional model, which tries to represent a synthesis between Keynesian(short–run) and neoclassical(long–run) theories. In the short–run, employment is determined by demand, while supply (through a vertical phillips–curve) determines employment in the long–run.

[3] This could be explained by the fact that the fall in the compensation rate has taken place at the same time as other political actions with the objective of tightening labour market policy.

[4] Furthermore, as recognized by ADAM (2012:129), no co-integration between unemployment and the rate of compensation can be found in the data. The lagged rate of unemployment has a coefficient of -0.55.

believed.[5]

As reviewed above, not only is there a question of causality between the unemployment benefits and unemployment, but even the link between the two factors seems to lack coherence in the literature. This clearly questions the assumptions of the ADAM model often used in public policy analysis. In the following section a non-orthodox theory is presented, where employment is determined in the market for goods, and not in an actual labour market.

2.1 Post-Keynesian 'Labour Market' Theory

In the post–Keynesian tradition, the level of employment is essentially determined by effective demand in the market for goods - which means, that unemployment is a demand–led problem, and not a function of high real wages or wage inflexibility as suggested by New Keynesian economists. For a small open economy the international competitiveness plays an important role when effective demand is determined. There are however, also supply-side constraints to production, e.g. lack of productive capacity.

In the post–Keyensian literature, as emphasized by (Lavoie, 2014), workers are not seen as a normal commodity and wages are not treated as a price of some commodity. Unlike a good, labour cannot be stored; if a unit of labour at some point of time is not used, then it is lost forever. Neither the supply of labour nor the demand for labour is well–behaved, and should not therefore be treated that way. Contrary to the belief in mainstream theory, the decision to work is not automatically attributed to disutility, instead the single worker has the capacity to feel satisfaction as a result of employment. If this line of thinking is followed, unemployment can bring dissatisfaction in itself. Hence, the major determinant of satisfaction may be whether one is unemployed or employed.

The decision to work in Post-Keynesian literature can be linked together with the decision to consume (Lavoie, 2014, p, 316), which means that the standard of living plays a crucial role. The current standard of living for the single household is often seen relative to two factors: the past standard of living and the relative standard of living compared to a reference group. This link is however weak when it comes to people who work a fixed number of hours per week since they cannot change their income by increasing the number of hours they work. Instead, the decision to demand or supply labour relies on norms as indicated. In contrast to mainstream theory, the link between unemployment benefits and the decision to work is not obvious, since this decision depends on other factors, e.g. norms.

Moreover, households are not expected to maximise utility, thus, even though an intertemporal maximization process would tell the household to increase their supply of labour, this is not automatically the result achieved by the evaluation of the household of whether (or to what extent) they are satisfied or unsatisfied. Only when they are unsatisfied with the current situation will they have an incentive to increase their labour supply.

Empirical analysis within the post–Keynesian tradition contradicts the results of several studies based on the mainstream story; the role played by the labour market institution should be a minor one (or even insignificant) in comparison with that proposed in the mainstream theory (Stockhammer and Klär, 2010).

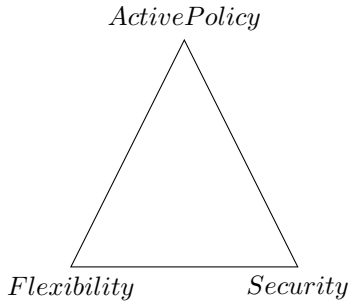
To sum up, the level of employment is not determined in a labour market, but on the market for goods by effective demand. The decision to supply labour does not depend solely on wages (a price in a market clearing mechanism), and the decision of whether or not to work is not solely dependent on the unemployment benefits available (financial optimisation). In other words; an increase in unemployment benefits neither forces people to leave their jobs nor to stay unemployed for longer periods.

3 Unemployment benefits in Denmark

The main purpose of the Danish system of unemployment benefits is to provide a security net by compensating their members in the event of a loss of income due to unemployment. Thus reducing the risks

[5] The effect on a less strong link is the topic of the discussion later in the paper.

associated with unemployment. This generous system has been an important factor of the well-known Flexicurity system. This system is famous for its combination of flexibility of the labour market, security for the single worker and an active labour market policy. This trinity is known as *the golden triangle*.



The flexibility on the labour market makes it easy for the firms to hire and fire people. In periods of economic growth, firms are not cautious about expanding the number of employees, since they can easily fire them again. People are not afraid of taking a job despite the risk of being fired, because of the security net. As compensation for the loss of income unemployment benefits are given to the unemployed.[6] The last side of the triangle consists of an active labour market policy. An active employment policy is used to force people to increase their disposal of the labour market. This accomplished through increasing the skills of the unemployed, i.e. by education. Together, the forces in this *golden triangle* have the purpose of increasing the dynamic in the labour market and thereby deliver low rates of unemployment.

Despite the success of the model, the security for the workers, measured by both unemployment benefits(compensation rate) and the duration of the benefits, has changed significantly for the last few decades. An aggregated macro compensation rate, where the average unemployment benefit is compared to the average salary in the industry sector for the period 1980 to 2014 shows a significant decrease (DØRS, 2014, p, 182). When pension contributions are deducted from wage income, the compensation rate decreases from 63% in 1980 to 55% in 2014. If the pension contribution is included in wages, the decrease is even larger, i.e., from 63% in 1980 to 48% in 2014.

The maximum rate of compensation is fixed at 90% of personal wage income, measured over the three months preceding unemployment. The maximum benefit can however not exceed Kr. 17 660 per month (2014 prices), the consequence of which is that the maximum level of benefit is received by 85% of the members of unemployment funds who are receiving benefits. A second implication, due to this cap on unemployment benefits, is an inverse relationship between personal income distribution and the rate of compensation (calculated as a proportion of income); the compensation rate is higher in the lower part of the income distribution than in the higher part of the distribution.

Aside from the distortion discussed above for higher personal incomes, there are two other important reasons for the decline in the compensation rate. These relate to the regulation of the benefits and pension contributions. The maximum benefit is regulated in accordance with wage inflation in the private sector. [7] Due to the method of calculating the maximum potential benefit, the level of benefits does not adjust fully to changes in the wage rate. Thus the aggregate level of compensation is designed to decline over time with progressive wage increases. This divergence can be directly linked to the reduced adjustment method of the tax reform of 2012, and the gap is likely to broaden with time. In the case where nominal wages adjust equally with inflation this implies that over time there will be a decline in benefits in real terms.

[6] There are two kinds of unemployment benefits; benefits given to members of a unemployment fund and benefits given to non-members of an unemployment fund. Unlike many other countries (i.e. Norway, Holland and Germany) membership in an unemployment fund in Denmark is voluntary.

[7] If the wage rate increase exceeds 2.3% per annum, the percentage change in the benefit rate is reduced through legislation by a flat 0.3% points. Thus for all wage increases that exceed 2.3% the maximum benefit amount will lag by at least 0.3% per adjustment.

Aside from the inadequate adjustment of unemployment benefits, contributions to pension funds also explain a part of the fall in the compensation rate. An increasing part of the wage is transferred directly into occupational pension schemes. These contributions are withdrawn from the calculation of benefit rates, which results in a lower rate of increase in the unemployment benefits.

Moreover, the duration of unemployment benefits has changed. In 2010, a reform on the unemployment system was adopted by the Danish parliament. The reform had two primary constituents: i) a cut in the duration of unemployment benefit from 4 to 2 years, and ii) an increase in required conditions to attain the benefit from 6 months full–time employment to 12 months.

The reform was clearly a tightening of the unemployment benefits system. The purpose of the reform was to increase employment and reduce the government spending and thereby improve the public finance (DØRS, 2014, p, 159).

After being evaluated, there was huge discrepancy between the expected number of people leaving the benefit system and the actual number. Instead of 2000-4000 per year, 34 000 people left the system in 2013 - nearly 10 times as much as expected.[8] This example clearly shows the great differences between the models used to evaluate the effect of the policy and the non-ergodic economy system in which we live.

The reason for cutting the duration of unemployment benefits can be found in the incentive to search for a job; a strong correlation between the time remaining prior to the expiry of the benefit and the likelihood of finding employment is assumed: the share of people hired increases as the expiration date draws closer (Ministry of Employment, 2010; Ministry of Finance, 2010; DØRS, 2014).

The Minister of Employment at that time, Stojberg, shared the same point of view, stating that,

> "No matter what, we know, that most unemployed gets far more active regarding job seeking, when they face the fact, that their period for employment benefit expires. That is a fact." (Ministry of Employment, 2010)

Whether the motivation of the unemployed tells the whole story is debatable. It could just as well be due to the actions taken by the Job Center, an institution which also increases its job seeking efforts on behalf of the unemployed as their duration periods expire.

In 2014, after four years of debate about the unemployment benefits reform from 2010, a commission was charged with investigating how to make the more than 100 year old system of unemployment benefits contemporary to the modern labour market, (Ministry of Employment 2014). The recommendations from the labour market commission basically followed the mainstream argument; the incentive to work must be increased by a reduction of unemployment benefits and thereby a reduction of the security for the workers. Jørgensen criticizes the recommendations by calling it a *political experiment*, where even the commission itself admits the lack of empirical evidence for some their assumptions (Brandsen, 2015).

These developments in the duration period, the level of unemployment benefits and the recommendation from the commission, point in a clear direction; a tightening of the unemployment system. From a political perspective, a generous unemployment benefit system gives people incentive to stay unemployed instead of applying for a low paid job. The security side of *the golden triangle* is therefore continuously deteriorating, which erodes the foundation of the flexicurity model.

In the next section a simple model, which is used to analyse the effects of a decrease in the security of the workers by means of the compensation rate, is set up.

[8] This is in Denmark known as *the biggest decimal point mistake in history* (AK-Samvirke, 2014).

4 The Model

In this section the SFC-model is presented, following in the tradition from (Godley and Lavoie, 2012).[9] The economy is split up into six sectors: Non-financial corporations, financial corporations, the Central Bank, Government, Households and Rest of the World[10]. Even though the model is in itself demand-driven, supply-side arguments are integrated into the model. Since the purpose with the model is to discuss the *principles problems* of unemployment benefits, a simple model is applied.

4.1 Matrix and identities

The balance sheet for the sectors can be summarized in table 1

Table 1: Balance Sheet

ASSETS	HOUSEHOLDS	FIRMS	BANKS	CB	GOVERNMENT	REST OF THE WORLD	TOTAL
Money	+ Hh		+Hb	– H			0
Loans (Centrla bank)			– Lc	+Lc			0
Deposit	+ M		– M				0
Loans		– L	+ L				0
Obligations	+Bh			+ Bc	- B		0
Capital (machines)		+ p · K					+ p · K
Stocks	+ E · pe	– E · pe					0
Total (net wealth)	+ Vh	+ Vf	0	0	- B	0	+ p · K

From the matrix above, some assumptions can be deduced. i) Firms hold neither government bills nor money, but they take loans from the banks or issue equities when financing is needed. All investment in real capital is carried out by the firm sector. ii) Banks do not issue equities (or hold them) and their net worth is zero. iii) The government sector does not hold any assets but issues bills when needed. iv) Households do not take any loans. v) The rest of the world does not hold any assets in the domestic country, just as domestic households, firms, etc. do not own any 'foreign' assets.

In table 2 the transactions of the economy can be traced.

Table 2: Transaction matrices

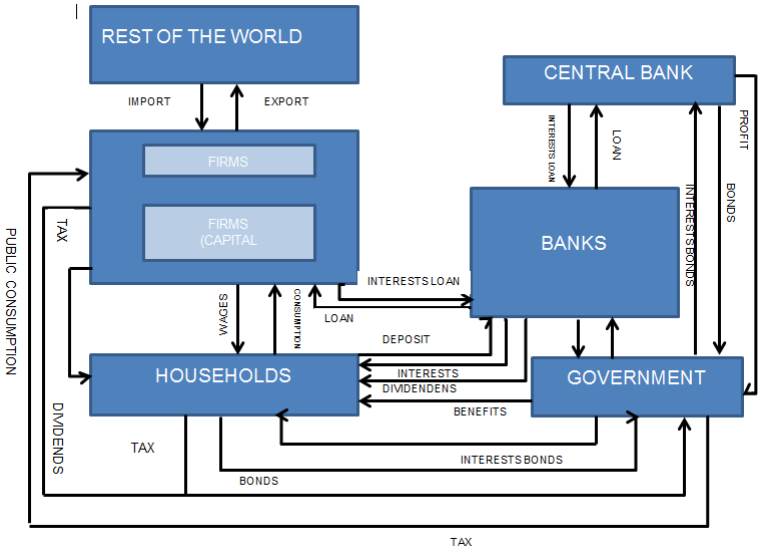
Asset	Households	Firms		Banks	CB	Government	Rest of the world	Total
		Current	Capital					
Consumption	– C	+ C						0
Investment		+ I	– *I*					0
Public consumption		+ G				– *G*		0
Export		+ EX					– *EX*	0
Import		– IM					+ *IM*	0
Dividends	+ FD	– FD						0
Bank profit	+ FB			– *FB*				0
Wages	+ W	– W						0
Benefits	+ UNB					– *UNB*		0
Interests	$+ rm_{t-1} \cdot M_{t-1}$			$- rm_{t-1} \cdot M_{t-1}$				0
Interests bonds	$+ rb_{t-1} \cdot Bh_{t-1}$				$+ rb_{t-1} \cdot Bc_{t-1}$	$- rb_{t-1} \cdot Bh_{t-1}$ $- rb_{t-1} \cdot Bc_{t-1}$		0
Interests loans		$- rl_{t-1} \cdot L_{t-1}$		$+ rl_{t-1} \cdot L_{t-1}$				0
Interests CB				$- rc_{t-1} \cdot L_{t-1}$	$+ rc_{t-1} \cdot L_{t-1}$			0
Transferred surplus		– FU	+ FU					0
Surplus CB					– *FC*	+ *FC*		0
Tax (income)	– DT					+ *DT*		0
Tax (firms)		– TF				+ *TF*		0
Δ Money	+ H			– ΔHb	+ ΔH			0
Δ Deposit				+ ΔLc	– ΔLc		(D)	0
Δ Deposit banks	– ΔM			+ ΔM				0
Δ Loan		+ ΔL		– ΔL			(ΔL)	0
Δ Bonds					– ΔBc	+ ΔB		0
Δ Capital		+ p · K						0
Δ Stocks	– pe · ΔE		+ pe · ΔE					0
Δ Total (net wealth)	0	0	0	0	0	0	0	0

[9] The Model is build on the foundation offered by (Dos Santos and Zezza, 2005), where they present a SFC-model of growth for a closed economy. Their model is expanded to an open economy just like the labour market is more complex in this model.

[10] The full model can be seen in the appendix

The transactions taking place in our model can easily be identified in the following diagram

Figure 1: Flow-diagram



From this diagram the setup of the model can be traced:

The firms produce goods and services and sell it to households, government and rest of the world. Their production input is restricted to labour and capital. A part of their profit is distributed as dividend to the households (as owners), while the rest is used to finance investment. If the desired investment exceeds the retain earnings, the firms can choose between issuing equities and/or taking loans in the banks.

The public sector pays unemployment benefits to unemployed households and receives taxes from both the firms and the households. Spending from the public sector is an income for the firms. If the expenditures exceed the income, the government is issuing bonds to finance this deficit.

The banks lend out to the firms and holds deposits from the households. The banks interact with the central bank, where they can get advances. The central bank clears the market for bonds, in order to finance the public deficit.

The households receive wages from the firms and unemployment benefits from the government. Following (Dos Santos and Zezza, 2005) households receive distributed profits from both the banks and the firms. The household can hold their wealth in either cash, deposits, bills or equities. Households pay taxes out of income to the public sector. Rest of the World interacts with the domestic economy in our model through trade flow.

4.2 Behavioural Hypotheses

4.2.1 Non-Financial Corporations

In this economy all goods are produced by the firms. The total production in the economy is the sum of consumption (private and public), investment (all done by the firms) and net exports (trade with the rest of the world).

Following a standard assumption is Post-Keynesian growth-theory, firms determine prices p as a mark-up (ρ) over their unit labour cost measures as wage divided by productivity (π):

$$p = (1 + \rho)\frac{wage}{\pi}$$

Wages are a function of wages in the previous period, and the outcome of bargaining between the participants of the labour market.

$$wage = wage(-1) + \Omega_3 * (\Omega^T * p(-1) - wage(-1))$$

Workers have some real wage aspirations, represented by the target real wage Ω^T. The level of this target is a function of changes in the rate of unemployment (ur), changes in productivity($prod$) and changes in the compensation rate(η).[11]

$$\Omega^T = exp^{(\Omega_0 + \Omega_1 * log(prod) + \Omega_4 * log(\eta) + \Omega_2 * log((1-ur) + z3 * (ur) + z5 * bandT + z4 * bandB))}$$

In line with Godley and Lavoie (2012) a logical function is added. If the unemployment rate is within a 'normal' interval - that is, neither above nor below certain limits[12] - then changes in the unemployment rate will have no influence on the target real wage. If the unemployment rate is below the limit, the target real wage will increase.

The rate of compensation is set as a part of the wage

$$CR = \eta$$

The compensations rate η is determined exogenously, but, as in (Forges Davanzati, 2014, p,7), the rate is the outcome of a bargain between workers (or labour unions), firms and the Government. The income of the workers depends on the benefits, so the workers as a group want the rate to be high. For the unemployed the benefits represent present income, but the employed also have an interest in a high compensation rate in case of a sudden redundancy. The Government wants to reduce its expenditures, but at the same time, the Government needs to keep up with its responsibility in the universal welfare state. In the case of firms, the compensation rate has a dual effect; a high rate may stimulate domestic demand, but at the same time, a high rate may affect wage-negotiations and thereby the costs of the single firm. From the point of view of a single firm, higher cost is undesirable, but as shown by Kalecki, higher wages may result in an increase in both the profit rate and growth rate.

The level of employment is determined on the goods market, where firms will hire as many workers as needed to produce the demand for goods.

$$N = \frac{SK}{\pi}$$

The total cost of labour for the firms can therefore be written as

$$W = N * wage$$

The total level of unemployment in the economy can be written as the difference between labour force and employment,

$$UN = LF - N$$

Where the size of the labour force is a function of the population and a participation rate.

The unemployment benefits can therefore be written as

$$UNB = CR * wage * UN$$

Profits in the firm sector are given by sales minus wages and taxes,

$$FT = S - W - Ti$$

[11] The effect of changes in the compensation rate is best understood - from the workers point of view - when the compensation rate goes up. If the compensation rate goes up, e.g. as a result of a more generous welfare system, the workers need to see an increase in their wages to keep up their incentive to work - this is in line with the mainstream story told earlier in this paper. A decrease in the compensation rate, as seen in Denmark, would according to (DØRS, 2014; Statistics Denmark, 2012) lead to downward pressure on wages. This compensation rate mechanism can be seen as an inclusion of a part of the mainstream story into the model.

[12] In this model the unemployment rate is characterised as normal when it is between 5 % and 7%.

where Ti is sales taxes.

Retained earnings are given by

$$FU = FT - rl(-1) * L(-1) - FD - TF$$

Investment in this model is a function of autonomous investment (gr_0), and four variables: i) cash-flow rate, rfc, ii) the leverage ratio, lev, iii) Tobins q and iv) utilisation rate, u. This can be written as,

$$\begin{aligned} I = gr0 + gr1 * rfc(-1) - gr2 * rrl(-1) * lev(-1) \\ + gr3 * q(-1) + gr4 * (u(-1) - unorm) \end{aligned}$$

Investment is financed by either retained profits, loans or equities. The change in equities can be written as,

$$p_e * \Delta E = \chi * (p * \Delta K - FU)$$

And the change in loans as,

$$\Delta L = p * \Delta K - FU - p_e * \Delta E$$

4.2.2 Financial Corporations

The bank sector in this model is simplified. Banks need to meet the reserve requirement in order to issue deposits:

$$H_b = hbpar * M$$

Profit from the banks is distributed to households, which can be interpret as bonus payment. Bank profits are given as a function of the diffenrences between interest flows into the bank(L and Bb) and interest flows out of the bank(M and Lc),

$$FB = rl(-1) * L(-1) + rb(-1) * Bb(-1) - (rm(-1) * M(-1) + rc(-1) * Lc(-1))$$

4.2.3 Central Bank

The central bank holds bills issued by the government, B_{cb}, foreign reserves R and provides advances A to banks. Furthermore the central banks issues high powered money H, which is demanded and held by the households and banks. All revenue is transferred to the government. The Central bank has no net worth.

The revenues of the central bank are given by

$$FC = rc(-1) * Lc(-1) + rb(-1) * Bc(-1)$$

4.2.4 Government

Government expenditures is determined by an exogenous determined trend,

$$gk = gk(-1) * (1 + gr)$$

The income for this sector consists of taxes on; i) sales, IT, ii) firms profit TF, iii) income, DT and iv) central bank profit, Fc. The expenditures consist of public consumption G, unemployment benefit UNB and interest payment on bills, $i_b * B$.

The change in government bills can be derived from the budget balance

$$\begin{aligned} GD = (G + UNB + rb(-1) * Bh(-1) + rb(-1) * Bb(-1) \\ + rb(-1) * Bc(-1)) - (IT + DT + TF + Fc) \end{aligned}$$

4.2.5 Households

Households receive two different types of income from the private sector in this model: i) wages, ii) interest. This can be represented as:

$$YHP = W + rm(-1) * M(-1) + rb(-1) * Bh(-1)$$

Furthermore the households receive distributed profit from the banks(FB) and firms(FU) and unemployment benefits from the government (UNB)

$$YH = YHP + UNB + FB + FD$$

Real consumption depends on real disposable income, stock of wealth at the beginning of the period and real capital gains on equity. The propensity to consume depends on the source of income. This can be described by,

$$\begin{aligned} C = (1-t) * (\alpha_1 * (YHP)/p + \alpha_4 * (OFF/p) \\ +\alpha_5 * ((FB + FD/p) + \alpha_2 * VK(-1) \\ +\alpha_3 * (CGKE - infle * vk(-1)/(1 + infle)) \end{aligned}$$

The change in wealth can be written as

$$V = V(-1) + Y - C + CG$$

Wealth can be accumulated in four kinds of assets; i) high powered money, ii) bills, iii) deposits and iv) equities. The share of wealth held in high powered money is determined as a part of consumption. The shares held in equities and bills are decided by a Tobin-type portfolio model, while the rest is held as deposits with the banks.

4.2.6 Rest of the World

The foreign sector is highly simplified in this model, since it will only trade with the domestic production sector.
Exports are a function of international competitiveness and economic activity abroad. This can be described by,

$$EX = Y^* + e2 * KE$$

Economic activity abroad is assumed to grow at an exogenously determined trend,

$$Y^* = Y^*(-1) * (1 + gra)$$

while competitiveness is a function of the domestic price level as well as the foreign price level.

Imports are a function of domestic economic activity,

$$IM = impar * S$$

Imbalances in net exports are financed abroad in local banks and do therefore not have an influence in this model.

4.3 The Model as a whole

The full model can be found in appendix A.2. The closures of this model can be found two places: i) bank deposits close the balance sheets of the households and ii) Central bank accommodates treasury bills to clear the market for bills.

Expectations in this model are modelled as adaptive expectations in the form

$$x^e = x(-1) + \theta * (x^e(-1) - x(-1))$$

5 Results

In this section the results from the simulation of the model in last section are presented and discussed.

In the baseline solution some stylized facts of the post-crisis European economy are reproduced: a small surplus on the trade balance (exports less imports), a small government budget deficit, which can be characterized as the structural balance, a stable unemployment rate (6.3%), and slow growth in real GDP of around 1.4% per year.

To reach this baseline a specific set of parameter values is used. Some of the most important parameters affecting the 'labour market' will be discussed here (η, *act*, *popg* and Ω_4.

The compensation rate η is set to 0.55, which is the calculated value in Cevea (2015). DØRS (2014) set the value to 0.5. In the shocks, η is lowered from 0.55 to 0.5, which therefore seems to be in line with the accepted values. The participation rate (*act*) is set to 0.8. The ratio of the population between 15-64 years and the labour force is used as a proxy. The value is estimated as the average value of that ratio in the period 2000-2015.[13] The growth rate of the population is set to 0.18% pr. year, which is the average of the population growth in 2011-2015.

In the ADAM-model compensation rate elasticity of wages is set to 0.1; a value, which is consistent with the results from the labour market committee (2009). This value is also used in this model for Ω_4. This value however, has been called into question, so in the third scenario, the value is lowered to 0.085.

After finding the baseline solution three scenarios are tested: i) the ADAM-story, ii) the effect of an increase in the incentive to work and iii) the alternative story.

5.1 The ADAM-story

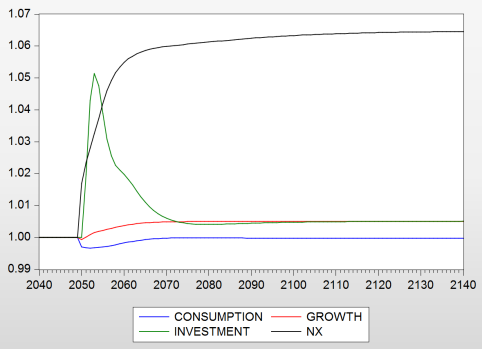
As examined in section 2 a change in the compensation rate affects the level of employment in the ADAM-model. A change in the compensation rate indirectly has an impact on the wage-relation and thereby on the domestic price-level. Since the price-level has an influence on the level of international competitiveness, a change in the compensation rate affects net exports via a wage-price-channel. Initially a decrease in the compensation rate causes a deterioration in domestic demand by means of a decrease in the income of the households, but in the medium-run the downward pressure on wages described above increases net exports. This increase in net exports dominates the decrease in domestic demand and the total effect on employment is therefore expansive.

This dynamic is tested in the simple model presented in this paper by decreasing the compensation rate η from 0.55 to 0.5. The argument behind this shock is as follows. The greater the extent to which wages are affected by changes in the compensation rate, the greater the effect on aggregate demand by such changes. Lower cost of production should lead to lower prices, which increases competitiveness and thereby increases net exports. When net exports increase, so does overall economic activity and thereby the level of employment.

[13] The value is roughly constant over the period of time.

Figure 2: Employment

Figure 3: Key Variables



As can be seen in Figure 1, the ADAM-story is reproduced (even though the decrease in unemployment lasts for a shorter period of time in this model); a decrease in the compensation rate, in the (very) short term, results in a fall in employment. In the short run, the effect from the fall in household income dominates the expansionary effects of increased competitiveness, which can be seen by figure 2. In the long run, however, the level of employment is higher than at the baseline, which is the result of a medium term increase in investment and an increase in net exports due to the increase in price-competitiveness. Essentially this implies that a reduction in the relative rate of unemployment compensation (η) can in the long run result in an increase in aggregate demand. The primarily demand driven model depicted here, surprisingly, was also able to demonstrate similar results to those attained by supply side models.

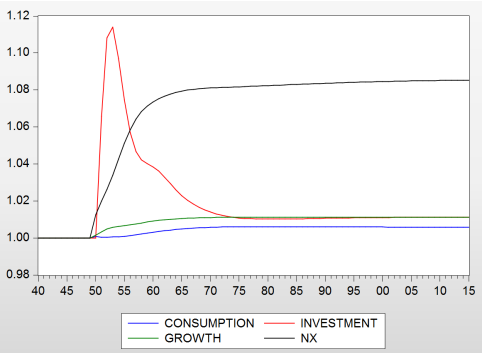
5.2 A stronger incentive to work

Looking again into the behavioral assumptions of the model reveals another interesting result. Here we consider the introduction of an increase in the incentive to work, when the compensation rate decreases. In the case of a less generous welfare system, the incentive to work should rise, according to mainstream theories.

In order to discuss this topic, a new behavioural shock is introduced into the model. That is, an increase in the incentive to work. This mechanism is described in the model by the participation rate, *act*. By changing the parameter associated with this, we expect to see a change in employment. A higher participation rate results in a larger labour force and thereby a lower wage.

Figure 4: Employment

Figure 5: Key variables



As can be seen in Figure 3, a stronger incentive to work combined with a fall in the compensation rate increases the number of people employed above the number in the baseline-scenario, both in the short and long run, which is fully in line with the mainstream story.

The results here differ from the ADAM-story, in which it takes four years before the expansionary effect on net exports to be dominated the fall in household income. That particular mechanism is not

build into this model explicitly, however, the impact observed on both employment and net exports appears to be very similar. Aside from the mechanism explained in section 5.1, a second factor causes the pressure on the wages. The labour force increases in numbers as a direct reaction to the increase in the participation rate, and the larger labour force has an effect on desired wages - if the unemployment rate moves out of is normal interval. In this case the competitiveness of domestic firms increases, which has a positive effect on net exports.

5.3 An Alternative Story

As admitted by (Statistics Denmark, 2012, p,130), the link between a change in the compensations rate and changes in wages is probably not as strong as expected. This recognition combined with the weak link between benefits and work incentives proposed in Howell and Azizoglu (2011) leads to a third scenario: a scenario, where the effects on the real-wage aspiration of a change in the compensation rate ($\Omega 4$) is lower and the participation rate isn't affected.

The mechanism of the model is the same as earlier; the fall in compensation rate still affects the wage-aspiration and thereby the wage-setting.
The effect of a change in unemployment benefits can be analysed within this model by lowering the value for the parameter η from 0.55 to 0.5 and $\Omega 4$ from 0.1 to 0.085.

As shown in Figure 5, a decrease in the compensation rate results, both in the short and long term, in a lower level of employment. This results occurs because the contraction resulting from lower household income dominates the expansionary effects of lower wages on competitiveness (and the resultant positive change in net exports). Since employment is determined by the relation between aggregate activity in the economy and productivity (the growth of which is explained exogenous in this model), the result for aggregate demand is similar to the result on employment - a small decrease compared to baseline.

Figure 6: Employment

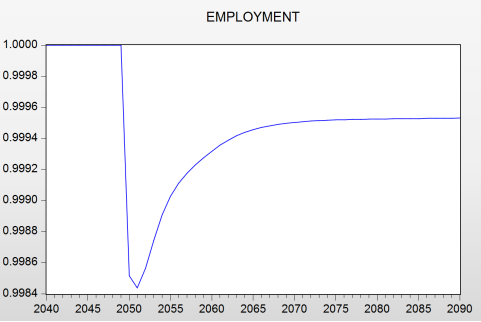
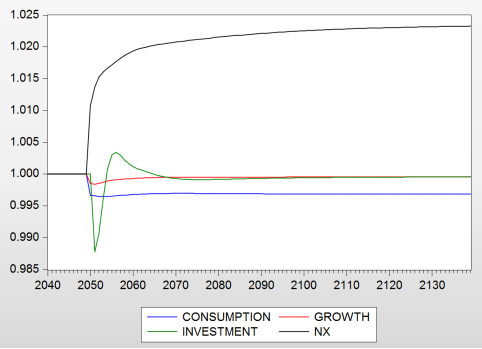


Figure 7: Key variables

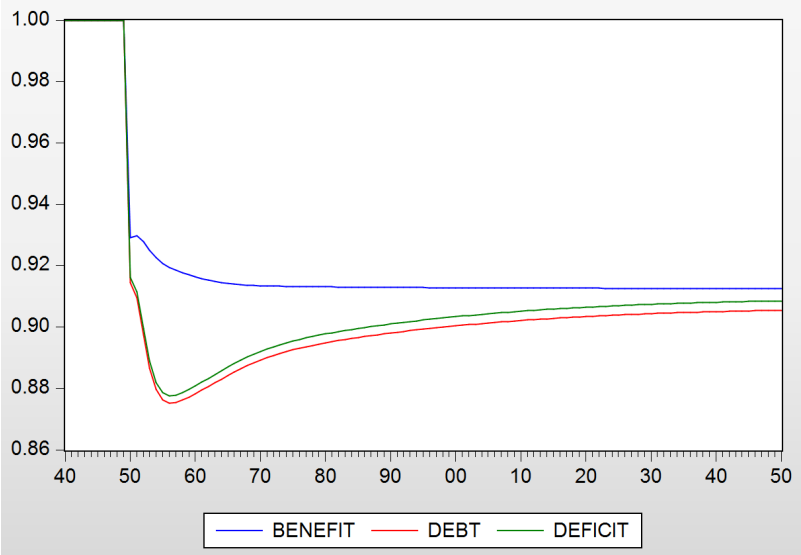


Looking at key variables the result is unsurprising, given the result in Figure 6; net exports rise due to the increase in price-competitiveness as a result of the lower target real wage resulting from the lower compensation rate. Consumption goes down because of lower income and investment fluctuates around the baseline scenario. The overall activity is marginally lower than in the baseline run.

Based on this simulation, the argument behind the positive effect on demand and employment, of a lower unemployment benefit, seems to be questionable.

The second argument for lowering the unemployment benefit, regarding a net cost reduction in the public sector, can also be tested within this framework.

Figure 8: public deficit after a fall in the compensation rate



The effect of the shock on public deficit, public debt and public expenditures(as percentage of GDP) as a result of the change in unemployment benefits can be seen in Figure 9. For all three measures of public cost the result is the same; a reduction in the cost, as predicted by mainstream theory.

Contrary to the explanation provided in mainstream theory, however, this reduction does not occur because of a decrease in the number of unemployed persons, nor an increase in the income of the state (i.e. tax revenues), but as a result of a lower expenditure following the decline in the compensation rate. The effect is thus simply the result of a change in the value of unemployment benefits paid, rather than a reduction of the real economic problem of unemployment.

The results from this alternative–story scenario reach in some aspects a completely contradictory conclusion to that proposed by mainstream theory.

5.4 Sensitivity and Reliability of the analysis

As shown by the three shocks, the results of the analysis are very sensitive towards changes in the values of the parameters Ω_4 and *act*. This sensitivity is particularly important to highlight, since the results from many models strongly rely on the selected value of the parameters. In some cases the values of the parameters can be the topic of discussion e.g. the income elasticities of labour supply, which can be very difficult to measure, and the selected value is therefore labelled with great uncertainty (AK-Samvirke, 2014).

This sensitivity towards selected values is normally seen as a weakness of the model, but in this situation it is considered to be exactly the opposite; the strength of the model. When the results rely so strongly on the parameter values and these values are debatable; should the results not be equally debatable

When the assumptions made in e.g. ADAM or mainstream models are put into question, shouldn't the results from their analyses be put into question as well?

It would appear therefore that the outputs of the model depend heavily on the theoretical disposition of the modeller. A concern that applies equally in the ADAM Model.

6 Discussion

The results from the simulation in the last section raise several questions regarding the relationship between a change in unemployment benefits and a change in employment. In the ADAM-model the compensation rate is the only variable that affects the level of structural unemployment. A change in the level of structural unemployment has an effect on wages, due to the error–correction term (an increasing distance between unemployment and structural unemployment).

Lower wages make labour cheaper, which - with a constant mark–up - lowers prices, and thereby increases the competitiveness of domestic firms. This has a positive effect on net exports via an increase in exports. At the same time the lower wage (and lower unemployment benefits) decreases the income of households, which has a negative effect on domestic demand. Initially, the fall in domestic demand dominates the increase in net exports, while the positive effect from the lower wages starts to dominate after a few years. This short run mechanism is indeed Keynesian in nature. In the medium-run (or long run) however, the supply effects dominated totally. This pattern can be identified in the first shock.

When the change in the compensation rate does not have any influence on peoples' dis-utility towards work, as suggested by Howell and Azizoglu (2011), and the link between a change in the compensation rate and wage-aspiration is low, an alternative story reveals itself. This is shown in the third shock, where the decrease in the unemployment benefits has a negative effect on employment.

The relaxation of these two assumptions opens up some important questions; to what extend does the level of unemployment benefits really 1) have an effect on wages?, 2) increase the incentive to work? The second question is especially important to understand the proposed causality between a change in the compensation rate and the supply of labour.

Changes in the compensation rate (expected or not) and changes in wages must be interdependent; as proposed in this paper changes in unemployment benefits affect changes in wages, but at the same time unemployment benefits are determined as a fraction of the wages. Thus, changes in wages, whatever the cause, also have an effect on unemployment benefits.[14] This represents a benefit-wage-spiral, which goes upwards as well as downwards. The question is, does the level of unemployment benefits(or changes there in) really have an effect on wages?

The importance for this discussion can be seen in (Statistics Denmark, 2012, p, 129), where it is admitted, that the parameter representing the partial effect of a change in the compensation rate is probably too high. They note that this is because the statistical correlation between changes in the compensation rate and wages is noisy, especially in the presence of an active labour market policy.

The question about the effects of changes in incentives to work can be associated with the discussion of non-economic costs of being unemployed. In Larsen(2009) the motivations for labour among the unemployed are investigated. His review shows that, in a majority of studies, among unemployed people, non-economic factors increase the incentive to work. The non-economic factors, e.g. institutional norms, where unemployed people may be afraid of stigmatization and the need for an identity(workwise) and social belonging, are especially strong in Denmark compared to the rest of the world.(Larsen 2009).
If the only cost of being unemployed is the loss of income, there should be a clear connection between the size of that loss of income (e.g. compensation rate) and the actual cost of being unemployed. If more (non-economic) factors are included in the analysis, however, the picture becomes blurry. According to Howell and Azizoglu (2011) and Forges Davanzati (2014), the loss of income is only a small part of the total cost of unemployment - personal costs of unemployment often exceed the economic costs. Nina Smith and Torben M. Andersen - both former members of the Danish Economical Counsil(DRS) recognize this. In a feature they argue, that the focus on changes in the labour force associated with a change in e.g. the compensation rate needs to be changed; the change in the labour force may be very small Lønstrup (2016). Andersen concludes, that the latest reforms have only been beneficial to the group of unemployed closest to the labour market; other groups are still not a part of the labour market

[14] unless one already is at the maximum level.

(Lønstrup, 2016).

One fundamental flaw, is therefore the exclusive focus on the economic reasons for the incentive to work or not.

> "The evidence overwhelmingly shows that in the real world holding a job is typically highly valued independently of the income it generates, and if this is so, changes in the UI generosity may have nothing to do with changes in the dis-utility to work" (Howell and Azizoglu, 2011, p,9).

This *evidence* can be explained by the Post-Keynesian theory offered in section 2.1., where work is not automatically accommodated with dis-utility, and the single worker can feel satisfaction about being employed. The decision about whether to apply for a job or not does therefore not depend solely on wages or the loss of income, but also other factors, i.e. social norms (Van Staveren, 2014, p,189). A good example of a social norm is female participation in the labour market. In some parts of the world women devote their day to keeping a happy home and taking care of the children.

The effects of a decrease in unemployment benefits(or the duration period) can be analysed from another point; as an attack on the flexicurity model. A decrease in the compensation rate erodes social security, which is a fundamental part of flexicurity, as explained in section 3. An erosion of social security reduces the flexibility in the labour market, which is the main reason behind the willingness of workers to work under shorter notice periods and with minor or no severance benefits. A reduction in the compensation rate therefore reduces the flexibilities by changing the willingness of the worker to accept flexible contracts. If the worker's demand long notice periods and/or severances, the firms are likely to hire less people. To have a flexible labour market flexibility and social security must go hand in hand Madsen and Bjørsted (2016)

The flexicurity system has been used as one of the main explanations for the low rate of unemployment in Denmark , attributed largely to the dynamic labour market. The attack on this system is very likely to reduce the level of dynamism in the labour market and thereby reduce employment.

Even if it is accepted, that changes in compensation rate may have an effect on the incentive to work, one point needs to be raised; would an increase in the supply of labour automatically result in a decrease in the unemployment rate?

From the Post-Keynesian point of view, the level of employment(and thereby unemployment) is determined by the level of effective demand in the goods market. Labour supply and labour demand are interrelated by means of developments in aggregated demand. An increase in labour supply is therefore not in itself enough to guarantee an increase in employment; the level of effective demand needs to increase in order to secure that.
A policy with the target of an increase in employment should therefore be focused on stimulating effective demand and thereby the employment.

7 Conclusion

The combination of flexibility in the labour market, security in the form of an unemployment benefits system and an active employment policy are the cornerstones in the flexicurity model, which has gained enormous popularity due to its success since the 1990s.
Despite this success, with a dynamic labour market and low rate of unemployment, the security part of the model has been under attack for the last decades; both the duration of unemployment benefits and the rate of compensation has been at the centre of political as well as economic discussions. From at political point of view a high level of unemployment benefits affects the incentive for people to work, and people therefore choose to stay unemployed instead of applying for at low-paid job. This line of reasoning can also be found in economic theory, where substitution and income effects are used as an explanation for the choice of whether to work or not. Within this framework, a decrease in the compensation rate leads to a increase in the labour supply and thereby to an increase in the level of employment. From

a Post-Keynesian point of view the whole argument can be considered to be wrong for several reasons: firstly, because employment is determined by effective demand in the goods-market. This means, that unemployment is a demand-led problem, not a function of high real wages or high unemployment benefits. Secondly, because the decision to supply labour relies not only on financial motivations but also on social and institutional norms, and the link between unemployment benefits and labour supply is not that obvious. Thirdly, an increase in labour supply does not automatically result in an increase in employment.

If the incentive to supply labour does not only rely on economic factors, a discussion about the costs of unemployment opens up. If it is recognized, that non-economic costs of unemployment also exist, the link between a change in compensation rate and labour supply must be weaker than assumed.

Another important point to raise is whether the compensation elasticity of wages is as strong as proposed in ADAM; if the compensation rate goes up, then the reservation wage of the workers goes up(or they demand higher wages).

If these two assumption are relaxed, the SFC-model used in the analysis changes the result, from the mainstream-ADAM-story, where a decrease in the compensation rate is associated with a higher level of employment, to an alternative story, where a lower level of employment is the result of the decrease in compensation rate. In the alternative story, the fall in consumption following the decrease in household income(unemployment benefits) dominates the increase in net exports following the increase in (price)competitiveness towards the rest of the world.

If the results from this analysis should be taken seriously, a reform towards a less generous unemployment system is not necessarily the right way to increase the level of employment; instead, employment should be increased by an increase in the effective demand in the goods market.

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8 Appendix

8.1 Variables

8.2 The Model

Economy as a whole

$$SK = CK + IK + GK + (EXK - IMK) \tag{1}$$

$$S = SK * p \tag{2}$$

$$C = CK * p \tag{3}$$

$$I = IK * p \tag{4}$$

$$G = GK * p \tag{5}$$

$$EXK = \frac{EX}{p} \tag{6}$$

$$IMK = \frac{IM}{p} \tag{7}$$

$$gry = \frac{SK}{SK(-1)} - 1 \tag{8}$$

Firms

$$p = (1 + \rho) * \frac{wage}{\pi} \tag{9}$$

$$wage = wage(-1) + \Omega_3 * (\Omega^T * p(-1) - wage(-1)) \tag{10}$$

$$\Omega^T = exp^{(\Omega_0 + \Omega_1 * log(prod) + \Omega_4 * log(\eta) + \Omega_2 * log((1-ur) + z3 * (ur) + z5 * bandT - z4 * bandB))} \tag{11}$$

$$infl = \frac{p}{p(-1)} - 1 \tag{12}$$

$$N = \frac{SK}{\pi} \tag{13}$$

$$\pi = \pi(-1) * (1 + prodg) \tag{14}$$

$$prodg = prodg_0 + shockprod \tag{15}$$

$$z3 = (ur > (bandB)) * (ur <= (bandT)) \tag{16}$$

$$z4 = (ur < (bandB)) \tag{17}$$

$$z5 = (ur > (bandT)) \tag{18}$$

$$pop = pop(-1) * (1 + popg) \tag{19}$$

$$LF = pop * act \tag{20}$$

$$UN = LF - N \tag{21}$$

$$ur = (1 - \frac{N}{LF}) \tag{22}$$

$$act = acto1 + acto2 * (wage * (1 - eta)) \tag{23}$$

$$W = N * wage \tag{24}$$

$$FT = \rho * W \tag{25}$$

$$TF = tfrate * FT \tag{26}$$

$$FU = FT - rl(-1) * L(-1) - FD - TF \tag{27}$$

$$FD = (1 - ret) * (FT - rl(-1) * L(-1) - TF) \tag{28}$$

$$I = gr0 + gr1 * rfc(-1) - gr2 * rrl(-1) * lev(-1) + gr3 * q(-1) + gr4 * (u(-1) - unorm) \tag{29}$$

$$IK = KK - KK(-1) \tag{30}$$

$$KK = KK(-1) * (1 + gr) \tag{31}$$

$$K = KK * p \tag{32}$$

$$lev = \frac{L}{K} \tag{33}$$

$$rfc = \frac{fu}{K(-1)} \tag{34}$$

$$L = L(-1) + I - FU - p_e * \Delta E \tag{35}$$

$$E = E(-1) + x * \frac{I - FU}{pe} \tag{36}$$

$$q = \frac{pe * E}{K} \tag{37}$$

$$u = \frac{SK}{sfc} \tag{38}$$

$$sfc = \lambda * KK \tag{39}$$

Banks

$$FB = rl(-1) * L(-1) + rb(-1) * Bb(-1) - (rm(-1) * M(-1) + rc(-1) * Lc(-1)) \tag{40}$$

$$FC = rc(-1) * Lc(-1) + rb(-1) * Bc(-1) \tag{41}$$

$$BC = B - BH \tag{42}$$

$$rc = (1 + rrc) * (1 + infl * (1 - \theta_p) + \theta_p * infl^e) - 1 \tag{43}$$

$$rb = (1 + rrb) * (1 + infl * (1 - \theta_p) + \theta_p * infl^e) - 1 \tag{44}$$

$$rl = rc + spread1 \tag{45}$$

$$rrl = \frac{1 + rl}{1 + infl^e} - 1 \tag{46}$$

$$rm = rc + spread2 \tag{47}$$

$$rrm = \frac{1 + rm}{1 + infl^e} - 1 \tag{48}$$

$$Lc_0 = Hh + Hb - Bc \tag{49}$$

$$Lc = Bb + L + Hb - M \tag{50}$$

$$HB = hbpar * M \tag{51}$$

Government

$$GK = GK(-1) * (1 + grk) \tag{52}$$

$$GD = (G + UNB + rb(-1) * Bh(-1) + rb(-1) * Bb(-1) + rb(-1) * Bc(-1)) - (IT + DT + TF + Fc) \tag{53}$$

$$PSBR = \frac{GD}{S} \tag{54}$$

$$B = B(-1) + GD \tag{55}$$

Households

$$YH = W + FD + OOF + rm(-1) * M(-1) + FB + rb(-1) * Bh(-1) \tag{56}$$

$$Y = YH - DT \tag{57}$$

$$DT = dtrate * YH \tag{58}$$

$$YK = \frac{Y}{p} \tag{59}$$

$$OOF = CR * wage * UN \tag{60}$$

$$pop = pop(-1) * (1 + popg) \tag{61}$$

$$act = act_1 + act_2 * (wage - DP) \tag{62}$$

$$CR = \eta \tag{63}$$

$$\begin{aligned} C = (1-t) * (\alpha_1 * (YHP)/p + \alpha_4 * (OFF/p) \\ +\alpha_5 * ((FB + FD/p) + \alpha_2 * VK(-1) \\ +\alpha_3 * (CGKE - infle * vk(-1)/(1 + infle)) \end{aligned} \tag{64}$$

$$Sh = Y - C \tag{65}$$

$$CG = (pe - pe(-1)) * E(-1) \tag{66}$$

$$re = \frac{FD + CG^E}{pe(-1) * E(-1)} \tag{67}$$

$$ree = re + \theta_{re} * (ree(-1) - re(-1)) \tag{68}$$

$$pe^e = pe(-1) * (1 + pege) \tag{69}$$

$$pege = \frac{pe(-1)}{pe(-2)} - 1 + \theta_{pe} * (pege(-1) - (\frac{pe(-1)}{pe(-2)} - 1) \tag{70}$$

$$rree = \frac{(1 + ree)}{1 + infl} - 1 \tag{71}$$

$$CGK^e = \frac{(pee - pe(-1)) * E(-1)}{(p(-1) * (1 + infl^e} \tag{72}$$

$$CG^e = (pee - pe(-1)) * E(-1) \tag{73}$$

$$V = V(-1) + Y - C + CG \tag{74}$$

$$VK = \frac{V}{p} \tag{75}$$

$$V^e = V(-1) + Y^e - C + CG^e \tag{76}$$

$$infl^e = infl(-1) + \theta_p * (infl^e(-1) - infl(-1)) \tag{77}$$

$$BH = vpar_1 * (VE - HH) \tag{78}$$

$$vpar1 = \lambda_{10} - \lambda_{11} * rrm - \lambda_{12} * rree - \lambda_{13} * \frac{Y}{V^e} + \lambda_{14} * rrb \tag{79}$$

$$pe = (vpar_2 * (VE - HH) - x * (I - Fu))/E(-1) \tag{80}$$

$$vpar2 = \lambda_{00} - \lambda_{01} * rrm - \lambda_{02} * rree - \lambda_{03} * \frac{Y}{V^e} + \lambda_{04} * rrb \tag{81}$$

$$M = V - HH - BH - E * pe \tag{82}$$

$$HH = hhpar * C \tag{83}$$

Rest of the World

$$EX = Y^* + e2 * KE \tag{84}$$

$$Y^* = Y^*(-1) * (1 + gra) \tag{85}$$

$$KE = \frac{Pf}{P} \tag{86}$$

$$Pf = Pf(-1) * (1 + Pfg) \tag{87}$$

$$IM = impar * S \tag{88}$$

$$TB = EX - IM \tag{89}$$

$$TBK = EXK - IMK \tag{90}$$

8.3 Parameters

In this section the values of the parameter is shown

Table 3: Parameter values

Parameter	Value	Parameter	Value
impar	0.474	Ω^T	1
popg	1.001807366	$\Omega 0$	0.0672
act	0.798017459	$\Omega 1$	1
α_1	0.8	$\Omega 2$	2
α_2	0.025	$\Omega 3$	0.1554
α_3	0.08	$\Omega 4$	0.1
α_4	1	BandB	0.01
α_5	0.15	BandT	0.04
gr_0	-0.05	e2	100
gr_1	1	lcpar	0.4
gr_2	1	Λ	0.1
gr_3	0.2	parlf	0.4
gr_4	0.4	ret	0.2
ρ	0.2	t	0.2375
τ	0.1	tfrate	0.2
θ_{gr}	0.75	θ_p	0.75
θ_{pe}	0.75	θ_{pr}	0.75
θ_{re}	0.75	hhpar	0.2
hbpar	0.25	$vapr_1$	0
x	0.25	$vapr_2$	0.25
λ_{00}	0.24	λ_{10}	0.02
λ_{01}	0.3	λ_{11}	0.45
λ_{02}	0.25	λ_{12}	0.25
λ_{03}	0.01	λ_{13}	0.01
λ_{04}	0.1	λ_{14}	0.25
η	0.55	r_b	0.03
rc	0.025	rl	0.03
rm	0.02	rrc	0.025
rrb	0.03	gra	0.028