# Introduction

The Danish Flexicurity model is well known worldwide, for being one of the most effective in keeping a low and stable unemployment rate compared to the other European countries (xyz).

(Kongshøj) puts up two main points of view in discussing the perspectives of the Danish flexicurity model. One of them being the deteriorations of the income insurance program, which is argued to be one of the main elements of the Danish flexicurity model, with the other main elements being an active labor market policy encouraging early activation and upskilling of unemployed and a flexible labor market.   
A result of the deteriorations of the income insurance program has been that the workers unions have demanded a higher dismissal protection, in form of allowances when going to unemployment on parts of the private labor market weakening the flexibility.

One way used to quantify the generosity of the flexicurity model is the compensation rate. The calculations of the compensation rate usually consist of the ratio between some type of average level of income insurance for those eligible to a type of average wage for employed, thereby showing the difference in income related to going from employment to unemployment, this is also specified as the gross compensation rate. An alternative to the gross compensation rate is the net compensation rate which is calculated using the disposable income in the two situations where the person is employed and unemployed therefor this includes effects as taxation changes between being employed and unemployed.

In the Danish income insurance program, the income insurance a person can receive will be calculated as 90% of the salary subtracted by labor market contributions but can never exceed the maximum level of income insurance set by the government. As the maximum level is set significantly lower than the working income for a person having a medium - high wage, the gross compensation rate is relatively high for the low-income group and low for the high-income group compared with other countries in the EU. In contrast to other countries, it is not mandatory for workers to be part of an income insurance program, still the insurance rate is quite high, meaning that workers are finding the insurance program attractive. The fact that being part of the program is not mandatory leads to an interesting aspect in that the lower the compensation rates the lesser attractive is the program leading to a lower insurance rate, possibly harming the flexicurity model.

As data from ADAM’s databank suggests the compensation rate in Denmark has been falling since 1990-2020:



One of the major contributions to the falling compensation rate is the political regulations towards the determination of the maximum level of income insurance. In 2003 the Danish ministry of finance legislated a yearly regulation of unemployment benefits (xyz) one of the regulations goes through the rate regulation percent which is set to equal 2% each year added by the rate adjustment percent. The rate adjustment percent is each year set according to the adjustment percent which is calculated as the change in wages two years prior to the financial year subtracted by two percent points. If the adjustment percent is lower than 0%, the rate adjustment percent is equal to the adjustment percent. Is the adjustment percent between 0% and 0.3% the rate adjustment percent is 0%. Lastly, is the adjustment percent larger than 0.3% the rate adjustment percent is equal to the adjustment percent subtracted by 0.3 percent points. This creates a situation in which wage growth of more than 2% would result in the maximum level of income insurance not following the wage growth, making the compensation rate decline over time. The plot below gives an idea of how often the wage has increased by more than two percent.



A more recent regulation is the one agreed upon in the Danish tax reform of 2012. One of the political initiatives in this reform was to suppress the regulations of employment benefits in the period of 2016-2023. Starting from 2016 the initiative would create a deduction of the rate regulation rate. The first year (2016) the deduction would be 0.3 percent points, next year 0.4 percent points and in period 2018-2023 0.75 percent points. (Skattereform 2012)

Other studies discuss whether a third reason for a falling compensation rate should be included. Over time a larger share of the wage has been paid to the workers labor market pensions. When calculating the compensation rate the amount paid to labor market pensions from both the worker and employer is subtracted from the wage. Therefor a larger share of the wage paid to labor market pensions will result in a higher rate of decrease in the compensation rate. One of the argumentations for including the development in the share of the wage paid to labor market pensions is that employed will benefit from their pensions later in their lives.   
This third effect is not included in the graph showing the compensation over time, including this effect should up the rate of decrease and thereby make the fall in the compensation rate even larger.

In this paper we will focus on the period of 2005 -2020 within this period other changes were made to the income insurance program. In 2010 a new income Insurance reform was agreed upon, decreasing the period in which an unemployed could receive income insurance from 4 years till 2 years, as well as increasing the requirements for receiving income insurance (xyz). Later, to make the cutoff date less strict updates to the period in which a person could receive insurance were redone making it a smoother transaction from the 4 to 2 years. A more recent change not included in the period of interest is the reform adopted in 2022 making two important adjustments to the program. First, there will be an increase in the amount one can get in the first 3 months for people with a strong working history, the second being a lowering of the amount one can get going directly from education to unemployment. The effects of these reforms will not be included in the analysis. Instead, this paper attempts to analyze the macroeconomic effects of the three effects that seems to be decreasing the compensation rate over time. We use a stock-flow consistent model as this enables us to include the effects of changes in the stocks of for example the households’ pension and government debt, which should be of great interest when assessing the policy regulations.

This paper makes three important contributions. First, we develop an empirical SFC-model integrating the dynamics of the Danish labor market, specifically including the variables that are used for political regulation of the unemployment benefits. Second, we do a counterfactual analysis of the regulations made towards the unemployment benefits. Third, this paper contributes to the ongoing debate of the effects of unemployment benefits on the level of unemployment.

The paper is organized as follows:

# Section 2: Lit review

In the years leading to the Danish election in 2015 the discussion of unemployment benefits was a key topic, especially the income insurance. On the one hand the literature published by the Danish Ministry of employment finds that the gross compensation rate has been almost fixed since the 1990 (xyz). On the other hand, unemployment insurance companies in Denmark, claim that the compensation rate has been falling constantly since the 1990 (xyz). In addition to this the view of how an increase in the compensation rate would affect the economy is also looked upon very differently, resulting in different levels of government expenses and employment when increasing the level of income insurance.

The Danish ministry of employment put down a commission in 2015 to analyze the effects of income insurance in Denmark. Showing the results, they confirm that the rate regulation rate as mentioned in the introduction will lower the compensation rate over time. But when the wage growth increase by more than 2% and the rate adjustment percent is subtracted by up till 0.3% point, this amount is not lost for the unemployed as it goes into the “statspulje” permanently. The funds in the “statspulje” are mainly used for improving the terms for people being on transfer income, thereby (Dagpenge komission) argue that the funds are partly going back to the unemployed.

(xyz) confirms that when taking into account the increasing share of the wage going to worker pensions the calculations show a drop in the compensation rate of 6% point from 1994-2013. They later argue that when analyzing the income insurance, we should in general look away from pension payments, as they have no importance at the moment someone goes from employment to unemployment. They add that the income insurance system should be seen as an insurance against sudden income loss experienced, and not an insurance against loss of lifetime income.   
They further argue that people who are experiencing longer periods of unemployment throughout their life typically will be compensated by “folkepensions persontillæg” and maybe “ældreschek” which is also noted in the pension commission paper (xyz). Therefor the calculations giving the fall in compensations rate of 6% points can’t stand alone. They end up concluding that throughout the period of 1994-2013 the income insurance system has not been made worse of looking at the gross compensation rate.

The paper leaves out the latest of the regulations lowering the state regulation percentage from 2016-2023 that was agreed upon in 2012, this of course wouldn’t change the conclusion for the period 1994-2013, but could have been used for a prediction of how the future development in the compensation rate is expected to evolve.

(LO) in a response to the results of (xyz) mention how the calculations of the compensation rate are sensitive towards which method is used for calculating the compensation rate. It should be added that in their own calculations they use only LO-members. In the calculations of the compensations rate they include the higher ratio of pension payments that (xyz) argued to leave out. They argue that this is an economic gain for being employed, which is supported by the ministry of Finance (xyz), and therefore should be included in the gross compensation rate. Using the net compensations rate the paper argues that not including the increasing pensions would be wrong as people not getting pension payments through their salary would need to save more over time to keep up, thereby lowering their available amount, decreasing the net compensation rate.   
(LO) finds that the gross compensation rate from 1994 - 2018 fell by almost 9% point. If also the changes in the tax system with a falling taxation of the wage bill is considering by looking at the net compensation rate the fall in the same period is around 15% point. Adding to this they argue that the magnitude in the fall will increase over the coming years, as a result of the tax reform 2012, suppressing the rate regulation rate until 2023.

Other similar studies find almost the same results as (LO). For example (FH) when calculating the gross compensation rate, using almost same methods, estimates a fall of 10% points in the period of 1994-2020. (DØRS) follows with a macro-based calculation of the compensation rate using the average amount of income insurance for a full-time unemployed receiver of income insurance, in relation to the average wage in the industry. In addition to this they also add in the development in payments to the worker pensions. They find a drop of approximately 7% points in the period of 1980-2015 when not including pension payments, and a drop of approximately 14% points when including pension payments. The sources leading to this drop is expected to be the same as mentioned above looking at the rate adjustment percentage, the larger share of worker pension payments, and lastly, they expect further drop coming from the suppressed rate regulation rate.

Now knowing that multiple papers using different calculation methods concludes that there has been a fall in the compensation rate which is in contrast with the conclusion of (xyz). Furthermore, there seems to be a different view of which macroeconomic effects are playing in as a result of increasing the compensation rate. (xyz) use mainly mainstream theory to explain the effects of changes in the level of income insurance. They explain most of the effects using behavioral changes looking at the incentive to work. One of the effects is the exit rate, showing how many goes from being unemployed and on income insurance, to being employed. The second effect is the access rate, the idea for this is that the higher the level of income insurance, the less effort are workers going to put into their job, creating a movement from employment to being unemployed and thereby receiving income insurance. Therefor the main effects from changes in the income insurance level comes from behavioral changes from workers and unemployed. These are then estimated using two different models, a Markov model, and a statistical model. (Show results from a change in dagpenge for both?)

(CEVEA) argues that the behavioral effects (explained above) used to estimating the costs of an increase in the level of income insurance is miss leading. Especially they argue that (Dagpenge komissionen) is overstating the approach effects, stating that increasing the income insurance increases the approach towards unemployment for those employed. (xyz) also themselves states that there is very low empirical evidence for this effect even existing (En af effekterne brugt er tilgangseffekten, kan tænkes som en lavere tilgang til ledighed som følge af en generelt øget arbejdsindsats blandt de beskæftigede, som reducerer sandsynligheden for at blive afskediget og dermed få brug for dagpengesystemet. (xyz) nævner selv “Der foreligger en relativt beskeden, udenlandske litteratur, der har undersøgt eksistensen og størrelsen af tilgangseffekter til ledighed.”)  
Also (xyz) add that they don’t see the income insurance at a level where it should be pulling employed into unemployment, they argue that looking at the group experiencing the highest level of compensation rate a large percentage of these are still in job. `

A more resent paper by (DØR 2022) concludes that based on new literature the estimate of the approach effect when looking at changes in the level of income insurance is overstating the negative effect that the approach effect has on employment. They split up the analysis into three scenarios one being a change in the level of income insurance here they claim that the reason might be that the dagpengemodel is only including one of four effects that should be playing into the approach effect (samtidig med at estimaterne er estimeret ud fra ændringer I dagpenge periodens lænde?) The specific calculations of the approach rate will be presented in the next section, also looking at the missing effects.

One option to quantify the effects of changes in the compensation rate is by looking at the effect on the government finances, (CEVEA) splits up the effects in two, one being the immediate revenue effect, showing the direct expenses in the form of extra income insurance by for example increasing the level of income insurance, here it is also taken into account that a share of the higher level of income insurance is coming back in the form of taxes and other charges.   
The second effect is mentioned as the behavioral effects or dynamic effects, this is the effect of changes in the exit rate and approach rate, as mentioned above.   
(xyz) splits up the costs for three possible changes to the income insurance program, one of them being a cancelation of the suppressing of the rate regulation percentage for 2021, 2022 and 2023. The estimation of the expenses using the income insurance model created by the income insurance commission suggests that the expenses will be increased by 560% including the behavioral effects, where the exit rate will be contributing with 55% and the approach effect with 45% of the increase. Thereby the total expenses estimated by the income insurance model will be 1090 million kr. (xyz) criticizes the fact that 45% of the increase in expenses are coming from an effect that as mentioned above has no empirical evidence for existing. Adding to this the rules of increasing the level of income insurance states that the membership payments should increase as it follows the level of income insurance as a percentage, this effect would lower the financing needed from the government, and lower expenses. This effect has just recently been added into the income insurance model.

(xyz) argues that not only has the income insurance model been overstating the expenses of increasing the level of income insurance. They have also neglected some of the positive effects of increasing the level of income insurance. They argue that a negative effects of a falling compensation rate is the lower degree of members in the insurance program, in the same period as the fall in the compensation rate, the percentage of the working force being a member has dropped from 84% till 78% even though this period has included political adjustment intended to raise this percentage (xyz). Assuming it will be the people with the lowest chance of losing their job that would want to leave the insurance program this would lead to lower membership payments and a need for a larger financing of the expenses from the government. In addition (DØRS) argues that this in the long run will lead to higher requirements towards termination notices and thereby undermine the Danish flexicurity model.

(xyz) puts up multiple possible effects a lower insurance rate would have on the Danish economy: The most convincing one being the longer termination notices, resulting in a lower flexibility on the Danish labor market leading to a higher structural unemployment rate. In general, all these effects lead to the fact that a higher insurance rate increases the security and flexibility of the labor market which strengthens the employment, GDP, and the government finances. (xyz) criticizes the fact that (Dagpenge komissionen) neglects these effects when calculating the expenses of an increase in the level of income insurance and are thereby both overshooting the negative effects and undershooting the positive effects of an increase in the level income insurance.

Lastly, (FH) gives an overview of the government expenses towards income insurance over the years, where among others the falling compensation rate has lowered the net expenses. In 1994 the expenses after including taxes towards income insurance were 25 billion kr. This amount has decreased to 10 billion kr. In 2018, how much of this fall is coming from the fall in compensation rate is hard to tell. As the insurance program have had many other changes in this period as well. In 2018 the income from membership payments going to the government were 6.4 billion, creating a net deficit of 3.4 billion kr. in 2018.

# Section 3

The section above gives an indication that there is a disagreement between income insurance companies and the work of the income insurance commission within both the development of the income insurance program in Denmark, as well as the economic consequences of it. Therefor this section will take a deeper look at the model created by the commission in 2015, and present an alternative model created by Denmark’s statistics.

## Dagpengemodellen

The model of income insurance was developed to analyze effects of political changes in the income insurance program. The model consists of four different parts: A static model for income insurance, a static model for “kontanthjælp”, a Markovmodel and lastly, a “genoptjeningsmodel”. Each part will now shortly be presented.

(Den statiske model er koblet på resultaterne fra Markovmodellen)

The static model of income insurance is developed to be able to calculate the immediate economic effects for every person being unemployed when changing the level of income insurance. Therefor this model will not include the behavioral changes that might happen, when creating changes in the income insurance program.

The static model for “kontanthjælp” is created to give an estimation of the level of “kontanthjælp” a person on income insurance potentially could have received in “kontanthjælp”. Thereby the model can estimate the additionally amount in “kontanthjælp” a person will receive if the level of income insurance is lower than the level of “kontanthjælp”. In contrast to calculating the level of income insurance one can get the calculations for the level of “kontanthjælp” considers both income, dependent status, wealth, and the income of the spouse.

The Markovmodel is built to calculate the equilibrium levels of employment and unemployment, to do this the population is divided into three groups: Receivers of income insurance, employed and receivers of other social benefits. Within each group people are further divided into groups based on their “dagpengeanciennitet” (1-208 weeks) and “beskæftigelsesanciennitet” (0-3 quarters). In contrast to the static model for income insurance, it is not possible to follow a single individual.

In the Markovmodel there is then estimated the probability of changing in between the three groups. As mentioned before the behavioral effects used in the Markovmodel is the exit rate and approach rate, the behavioral effect is split into two parts:

Estimated behavioral effects: Indicating that a change in the level of income insurance changes the departure from unemployment to employment in the period up until the reduction and in the period immediately after. This effect is mostly concerned the unemployed with the best job opportunities to get off income insurance. Estimations from the 2010 reform mentioned in the introduction shows an effect up till 78 weeks before the reduction in income insurance till 26 weeks after, this can bee seen from the effect staircase shown below, indicating that a 10% increase



The behavioral effects are specified as elasticities meaning that a relative change in the exit rate from unemployment to employment is a function of the relative change in the gross compensation rate. Thereby the effects of an increase in the compensation rate of 30 and 10% will following their estimates have the following effects:

### The approach rate

The approach rate discussed in section two, is build in a way that looks at if people on their way into the income insurance program will find employment before entering the program. One issue is that data can’t show how many people are on their way to enter the income insurance program or how large their exit rates to employment is.

Therefor the commission must assume that the behavioral effects for people being close to going into the insurance program (fx from terminated positions) are comparable to the behavioral effects of people already being in the income insurance program and thereby have been in unemployment in up till 2 years.

The commission therefor creates a baseline for the exit rate to employment, for employed in terminated positions, more specifically the commission uses a week-to-week basis for looking at people going from income insurance till employment after joining the program.  
To construct the exit rates for people going into the insurance program there is made three assumptions:

1. They assume the exit rate is 0% 26 weeks before entering the income insurance program
2. The exit rate is assumed to be linear going from 26 weeks before joining the program till the first week of the program
3. The exit rate is the same just before joining the insurance program as right after. Meaning the green and red line should meet at week 0



(DØR 2022) Argues that there are missing empirical evidence for all three assumptions made, they claim that people on income insurance might have more time for job searching than people being in terminated positions. On the other hand, they expect people being close to joining the income insurance program to increase their job search to avoid the fall in income.

As seen above the estimated behavioral effects from a 10% decrease in the level of income insurance indicates a 26% increase in the exit rate in the start of the unemployment period This effect is included in figure B by increasing the exit rate by the values estimated from the effect staircase. Meaning a 26% increase in the exit rate in week 0.

From figure B we can now see the effect of an increase in the exit rate for people in terminated positions by looking at the change in the red line showing the change in the exit rate prior to joining the income insurance program. Therefor less will join the income insurance program, when decreasing the level of income insurance. As significant effects are found up till 78 weeks before the change in the level of income insurance for the exit rate, changes in the level of income insurance in the first 78 weeks of the income insurance program will influence the approach rate.

**Effects fra Andersen?**

Måske skrive noget med at dagpengemodellen bygger på denne, men at de kun viser de og de effecter, hvorimod (DØRS 2015) også inkludere disse effecter. Og effekten på participation kommer vel fra Mikael og Hamids papir samt ADAM.

Most of the empirical evidence used for the dagpengemodel comes from the literature review made by (Andersen) This review was made specifically for the income insurance commission, and thereby we must assume have had an influence on the effects used in the dagpengemodel.

In one of the sections of (Andersen) They look specifically at the literature concerning a rise in the level of income insurance. They present 28 different studies looking at the exit rate from the income insurance program to employment. Looking at an increase in the level of income insurance, they find that 24 of these studies conclude a significant negative effect of the exit rate, the last 4 studies conclude non-significant negative effects.

The main theories explaining these results are the Moral Hazard effect, and liquidity constraints. The most commonly used explanation for the negative effects is the Moral Hazard effect, where an increase in the level of income insurance will result in lower incentive to search for a new job, and in addition to this also be pickier regarding job offers.

(Chetty) presents another explanation to why an increase in the level of income insurance increases the period in which people are unemployed. Claiming that unemployed are experiencing a budget constraint, as they are using their savings to keep a higher level of consumption. When one’s savings are running low, that person might be more likely to accept jobs that are not socially efficient. This effect will thereby lead to a worse job match between employer and employed, not taking advantage of the higher productivity the employer could have had in another job position with a better match. (Chetty) finds that the liquidity effect explains 60% of the effect on the unemployment period from an increase in the level of income insurance.

In another section (Andersen) looks at if there are found any empirical evidence for the effect of liquidity constraints on the quality of a job-match. The effect can arise through heterogeneity for both companies and workers that matters for a job-match. It will take time and costs for both companies and workers to localize a good match. In Addition to this there will be a lock-in effect as there are associated costs of firing/quitting and finding a new employer/employed. This means that workers might not be in the job where they are maximizing their productivity, and reallocation of the working force could therefore lead to a higher output.

Therefor when increasing the level of income insurance, there will be a decrease in job search lowering the employment quantitively, but the quality might increase duo to the above-mentioned effect. (Andersen) presents two measures for the quality of the working force, the salary and hiring period. Theoretically we should look at the reservation salary but as this is not observable which make it hard for studies to use this measure.

(Andersen) presents several studies, all indicating that a more generous income insurance program results in extended unemployment period, approximately half of the studies finds positive effects on the match-quality, the other half finds no effects, and one study find significant negative effects (most of these are from the US and might not be representative).

(Andersen) points out that the above effects have been based on a change in the behavior of unemployed and thereby not taking into account that the change in behavior could affect the situation for other actors in the labor market. At the time of (Andersen) he mentions that there isn’t much literature looking at these aggregated effects. He presents three main effects that should be accounted for.

Displacement-effects: when an unemployed person’s job search behavior affects other unemployed in their chance of finding employment.   
Match-effects: when unemployed changes their search behavior and in that way affects the recruitment costs of firms.

Lastly the wage-effect is when the change in level of income insurance will affect the wage negotiations, where you would expect that a higher level of income insurance would increase the wages demanded. As (Andersen) looks at a micro level, this will have a negative affect as this will lower the demand for labor and thereby reduce the number of unemployed. (ADAM) also includes a link between the compensation rate and the wages, the link goes through the structural unemployment, which is positively affected by the compensation rate, meaning an increase in the compensation rate increases the structural unemployment. In the wage equation the difference between the unemployment and structural unemployment is affecting the wages in the next period negatively. This creates a situation where employment above the structural employment worsens the wage negotiations for workers and thereby negatively affects the wages.

Another study (Mikael, Hamid) who uses the framework of a theoretical stock-flow consistent model, also includes the compensation rate in the wage equation, together with the rate of employment, and productivity. The inclusion of the compensation rate is an addition to the model used by (Godley/Lavoie 2012), (Mikael Hamid) Argues that incorporating the compensation rate is in line with standard models of wage setting, which plays an important role in the determination of the targeted wage (Henvis til nogle af dem de henviser til?)

(DØR 2015) also comments on the micro founded effects of changes in the level of income insurance. Mentioning Moral Hazard, they argue that most countries are accounting for this effect by demanding that unemployed puts in enough effort in their job search. This could add to the argumentation of the liquidity effect being the driving factor.

As (Andersen) mentions, (DØRS 2015) also claims that besides the effects of incentives, we should also look at the externalities associated with job search

In the next section, we incorporate some of the effects that the level of maximum income insurance has on the economy using the ideas from the dagpenge model (participation, employment). Adding to this we want to include the link between the compensation rate and the rate in which people want to be a member of the income insurance programs, this effect is not commented on by (Andersen), but as seen in the section 2, a large group claims that this effect should be included. Next, we will also look at the effect of the maximum level of income insurance on the targeted wage, and how this affects the wage negotiating process. All these effects will be included to get an idea of how the suppressing of the rate regulation has affected the Danish economy.

Also, the effect that the compensation rate might have on the targeted wage. Lastly, we will look at the effect of the compensation rate on the rate at which people participate in the insurance program

**Andre effecter der påvirker afgangsraten?**

As mentioned in section 2 (DØR 2022) claims that the commission is only taking into account one out of four effects when looking at the approach rate.

First, they claim that the model is neglecting the possible effect of changes in the level of income insurance on job separation meaning a change in the number of “opsigelser” or redundancies. This effect is found to have a possible effect duo to recent studies.

Second, the change in level of income insurance could also have an effect on the job creation rate by reducing the number of advertised vacancies

Third, there might also be an effect on the job-rotation.

The fact that it might have been hard to isolate the effect of changes in the level of income insurance from the change in the period might have biased the effects, in addition to this not all effects are included in the estimates of the approach rate, resulting in several papers criticizing the use of this effect for evaluating political suggestions.

# Model description

The focus of this model is to analyze the effect of a change in the regulation of the maximum level of income insurance a person can receive after unemployment. To do so, we utilize the features of a stock-flow consistent framework and build upon the existing empirical stock flow consistent model for Denmark developed by (xyz). We contribute to the work of (xyz) by endogenizing the maximum level of income insurance. The dynamics of the model should be able to explain the macroeconomic effects of the change in the political regulations of the maximum income insurance. The next section will focus on the central equations added to include the new dynamics.

## Labor market equations

One of the key variables in the labor market is the participation rate, showing the ratio of the population being in the labor force. In the baseline model we keep this variable as exogenous, in the second scenario we will then remove this constraint and endogenize participation. A main reason for having the participation rare exogenous in the baseline model is that within the dynamics of the Danish labor market, many have failed to determine what brings people into the labor force. One of the mostly used explainers is the generosity of benefits for being outside the labor force compared with the wage (xyz). (xyz) also use the employment rate and argues that a raise in the employment rate would have brought some from standing outside the labor force to join it. As will be seen in the 2. Scenario these explainers are used to endogenizing the participation rate and thereby creating a new channel for changes in the maximum level of income insurance through a compensation rate.

The compensation rate later included in the equation for participation appears as an endogenous variable in the model estimated as the fraction of the average amount an unemployed on income insurance would receive (dp\_person), to the average wage received given employment (wage\_trim).



To calculate dp\_person we use a simple ols regression linking the maximum level of income insurance to the average benefits received by unemployed eligible for income insurance. This is done as an alternative of using aggregated data of benefits received by households, as the gap between observed unemployment and estimated unemployment in the model is large, creating a lower average of benefits received. We also prefer the regression as we can capture the direct effect of an increased level of maximum income insurance but at the same time, we know that only around 85% eligible for income insurance receive the maximum level meaning that the increase for the people not getting the maximum level would be less. For this reason, we know that the coefficient should be between 0.85 and 1, and most likely closest to 1. This is also observed as the coefficient estimated is 0.9507 observed below.

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Now, after defining how the maximum level of income insurance (max\_dp) affects dp\_person, we now define the equation for max\_dp, the minestery of Finance will only calculate this once every year and the variable will therefor only change in the 1. Quarter and stay fixed for the rest of the year. In the baseline model “max\_dp” follows the political regulations stated in the introduction. It follows that the maximum level of income insurance grows by the state regulation percentage plus the rate adjustment percentage Each year.

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Automatisk genereret beskrivelse

As the Ministry of Finance determine the state regulation percentage it is held exogenous in the model. On the other hand, the rate adjustment percentage is calculated each year, using the adaption percentage. To match what was explained in the introduction we need to set up three conditions: First, if the adaption percentage is lower than 0 rate adjustment percentage is equal to the adaption percentage. Second, if the adaption percentage is between 0.0 - 0.3% the rate adjustment percentage is set to 0. Third, if the adaption percentage is above 0.3% the rate adjustment percentage is equal to the adaption percentage minus 0.3% points.   
As with “max\_dp” the rate adjustment percentage is calculated in the 1. Quarter and held fixed to the end of the year.

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Automatisk genereret beskrivelse

The adaption percentage is calculated by taking the wage growth two years before the financial year subtracted by 2% point, it should be noted that we use the yearly wage growth, which in the model is calculated using the 1. Quarter, therefor the adaption percentage is only calculated for 1. Quarter and held constant for the rest of the year.

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Automatisk genereret beskrivelse

The endogenization of “max\_dp” is now completed within the model, and we can adjust the same variables as the Ministry of Finance when making regulations to the maximum level of income insurance.

## Max\_dp effect on wage

Besides of the channel in which a higher level of maximum income insurance stimulates the economy through a higher demand, it also plays into the wage bargaining dynamics. The wage bargaining in the model is created through a targeted wage (wage\_ds\_t) which is set by the labor unions going into the wage negotiations. The labor unions got two agendas when determining the target wages. First, they want the wage to follow inflation so that workers keep their purchasing power over time. Second, they set a threshold for the minimum wage gap, in the model this is 40% of the wage, they would want to keep between the wage and the maximum level of income insurance, to make sure that there will still be a strong incentive for people to go into employment. In the case where inflation is not able to close this gap alone (thereby leaving the gap to be below 40% of the wage), the labor unions would set the target wage so that the wage gap is exactly 50% of the wage. The equation for the target wage and the wage gap can be seen below:

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Automatisk genereret beskrivelse

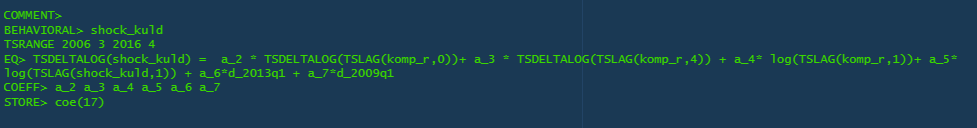


The targeted wage is now included in the behavioral equation determining the wage, estimated to have a positive effect on the wage in the long run.



## Komp\_r effect on kuld

A last channel that will be added to the model, is an endogenization of the insurance rate, measuring the percentage of the unemployed being member of an insurance company. This effect was argued by (xyz) to be missing in the work of the commission in 2015 neglecting the positive effects of an increase in the level of income insurance. The equation for the insurance rate is shown below:



We use the data from ADAMS databank for the insurance rate, therefor we only estimate the equation till 2016 quarter 4 as the variable is constant after this period. We get the following results when estimating the calculated compensations rate using the average income insurance per person.

Et billede, der indeholder tekst

Automatisk genereret beskrivelse

# Validation of the model

We will in this section look at the performance of the model, comparing the results from the simulation with actual data, with a specific focus on the variables in the labor market.

In the below figures we compare the simulated and actual data for GDP, Employment, maximum level of income insurance and compensation rate.



We observe that the model seems to capture the same dynamics of the real economy as (xyz) with a small overshooting in the economic activity in the period 2011 - 2016 explained by a higher simulated value of real investment and consumption compared with the data. Overall, the model seems to capture the medium to long-run tendency of the data even though there are some divergences in some quarters. The Overshooting in the activity also results in a higher level of the maximum level of income insurance in the baseline model, resulting from an increase in the wage growth. As the increase in wage growth goes directly into the compensation rate in the same period, meanwhile the maximum level of income insurance will be affected with a lag of 2 years, we observe that the compensation rate is a bit lower around 2010 - 2012, but as the adjustments happens it goes back to follow the real data.



We can see that the compensation rate is slightly increasing, especially from around 2008-2016 (Ser ud til det er grundet aftagende løn, samtidig med at lønstigning inden perioden er høj og dermed påvirker max\_dp) comparing with the results of (DØRS 2015) the development fits very well, they as well use a macro-based calculation of the compensation rate. Still, we see a falling compensation rate in the years of suppressing the regulation of the maximum level of income insurance from 2016. Which was also expected looking at the results of (DØRS 2015)

## Scenario 1 Wage adjustment in maximum level of income insurance

In this scenario we change the equation for the maximum level of income insurance, so that it follows the growth in wages from two years before the financial year. Therefore, this scenario will show the counterfactual situation in which the regulation from 2003 doesn’t appear, which means increases in the maximum level of income insurance will no longer be subtracted by up till 0.3% each time the growth in wages exceeds 2%. Also, the regulation from the 2014 tax reform is removed in this scenario. The new equation for the maximum level of income insurance takes the following form:



We keep using the wage growth two years before the financial year for consistency, as the (quit large) increases in 2003 and 2004 would inflate max\_dp in the baseline but not in this scenario. As a result of the shock, we would expect max\_dp to increase. As can be seen from the graph below max\_dp increases by almost 6% from 2006q3 till 2020q1. We see that it is mostly coming of the removal of the suppressed adjustments in the unemployment benefits, isolating this effect can be observed from the last figure.





We can see that the increase in the maximum level of income insurance is quite large for those who are unemployed and eligible for this insurance. In comparison the macroeconomic consequence is minimal, in the figure below we can see….

Plot der viser det nærmest ingen effekt har på yk\_ds og makro variable.

At the moment there are only two real effects of an increase in max\_dp. First channel is the demand channel, as the larger max\_dp results in a larger average level of income insurance which increases the disposable income for those receiving the income insurance and thereby increasing the economic activity.  
The second channel goes through the wages, as an increase in max\_dp would require the employers to raise wages to attract workers, resulting in a positive relationship between max\_dp and wage\_ds in the model. The increase in wages will increase prices and lead to a contraction of the economy. In this scenario these two effects therefore seem to cancel each other out. In the second scenario we will perform the same shock defining max\_dp as a function of the growth in wages two year prior to the financial year, but at the same time add a new channel threw endogenization of the participation rate

## Scenario 2 effect of maximum level of income insurance on participation

The endogenization of the participation rate happens with a few changes in the model. For now, the participation rate is exogenous and goes into the function defining the labor force as a fraction of the overall population.



The development in the participation rate has over the years been “biased” as a result of an increasing ratio of older people in the population. Therefor, we created a new participation rate only looking at the population below 65 years of age. The difference in the two participation rates can be observed by the figure below.

We can see a difference in the trend of the two variables, where the participation rate of the population being younger than 65 years slopes upwards. Using this in the model with the explaining variables being the real wage, the compensation rate, and lastly the unemployment rate. This creates a new channel for max\_dp to affect the economy as an increase in max\_dp will raise the compensation rate. We find a positive relationship between the compensation-rate and participation-rate in both the long run and short run. The intuition is that people would rather stay in the labor force the higher the income insurance is compared to benefits when not searching for a job



In the graph bellow we can observe the participation rate for the entire population before and after the endogenization of the participation rate, when performing scenario 1. We observe that the participation rate increases, as more people are actively searching for jobs when the level of income insurance is larger.



## Scenario 3 Effect of compensation rate on the insurance rate

## Scenario 4 making max\_dp follow wages.

## Sensitivity analysis

# Behavioral equations estimated

## Participation

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Automatisk genereret beskrivelse

## Wage\_ds

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Automatisk genereret beskrivelse