Universal Basic Income and Sweden

- A simulation of the Swedish economy

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Sincerely

Maksat Allaberdyev

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Abstract

What if you could separate your salary from work, what would happen? How would individuals in a society react? Would they invest more in human capital, would they work halftime or at all? These are questions that follows if Universal Basic Income (UBI) would be implemented. What is Universal Basic Income? UBI is a suggestion of a welfare system where every month the state gives its citizens a sum of money without conditions. The idea is old but has resurfaced lately due to the fear that automation is destroying jobs in a faster rate than new jobs can be created. But Sweden also faces other challenges. After the crisis in Syria, Germany and Sweden were the two European countries who took in the most refugees which will contribute to the rising gap of unemployment between natives and people who are born outside of the country. Research done by Försäkringskassan, a public institute in Sweden shows that people who end up in long term illness has increased over time, and the prediction is that more people are heading towards that direction. With these challenges, the potential of UBI was interesting to examine.

With an DSGE-model, the behaviour of the agents in the economy was simulated in a closed economy. The results showed that the UBI grew the sectors size compared to the baseline model without the UBI. Households of various skills increased their purchasing power with UBI compared to households without UBI. The simulations also showed that the price that the firms had to pay to compensate workers for labour increased with UBI, indicating that UBI is possibly inflationary. The simulations were compared with two surveys about the attitudes towards UBI and the labour market. Some of the answers about labour hours were in line with the simulations, while others were not. The majority of the respondents answered that UBI would not affect their labour hours, indicating that the model with rational expectations does a poor job of catching attitudes, because agents don’t always act rational. It could also depend on that most of the respondents are highly educated and have different preferences compared with other individuals who have lower skills. An improvement of the study is firstly to include a central bank as an additional agent to capture the effects of monetary policy and inflation, secondly open up the economy to capture the effects of trade.

**Keywords:** Fiscal policy, Universal Basic Income, UBI, Dynamic Stochastic General Equilibrium model, DSGE-model, Real business cycle, Welfare, Technology.
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1. Introduction

In the first section I will review the purpose and problem formulation so that the reader gets an understanding of the essay's action and the problems that form the basis for the purpose. The section will be finalized with questions and arguments for the essay.

I remember the first time I saw Terminator 2. I was about seven years old but I remember the intro like it was yesterday. The film begins with a wasteland of what used to be Los Angeles. The year is 2029 A.D. Dramatic music is playing, everything is in ruins and you can see human bones lying on the ground. The colours are dark and grey to add that extra dramatic effect to it. All of the sudden a mechanical foot crushes a human skull and a battle between humans and robots break out while a female narrator tells the horrible story of how the machines took over the world.

Terminator was not a unique film in its genre. Especially in the film industry during the 80s and the 90s. The threat from robots has been there for a long time, and naturally the threat has now spread to reality and to the labour market. Much of the fear originates from the belief that technology is eliminating jobs in a faster rate than new jobs can be created. This raises the question on how to deal with unemployment rate, duration and wage setting in the future when future job growth is much lower or gone. The existence of Artificial Intelligence has also fuelled that fear. Because much like in the movie Terminator people are now at war with the machines. In this scenario, the battle is for employment and not the survival of the human race.

Of course, technology is not the only threat to mankind in the labour market. The rising health issue, immigration and outsourcing are contributing factors to the disruption. After the refugee crisis in Syria, Sweden and Germany were the two European countries who accepted the most refugees (Svensson 2016). The increase in sick leave in Sweden is mostly due to stress and job insecurity (Försäkringskassan 2016). Therefore, many have opened up the discussion off the implementation of Universal Basic Income (UBI) as an alternative welfare system. The idea is that citizens in a certain country are getting tax free transfers from the government without conditions. The idea is not new but has resurfaced. UBI has been met with mixed critique. The biggest question is how to fund it and the impact on the labour market and other welfare systems that already exist today. Therefore, it is interesting to see how a developed economy like
Sweden would perform if UBI would be implemented today. Sweden has one of the best welfare systems in the world, and widely known as a welfare state. It is therefore interesting to examine if UBI would be beneficial. The purpose of this study is to implement UBI in Sweden. By breaking down the economy into different sectors and agents with different skills and simulate them separately will give a more micro-based explanation of how UBI affects the economy.

1.1. Background

To begin with let us go over the concept of Universal Basic Income. What does the three words mean? To answer that I will refer to Delphine Prady (2017) who is an economist at Fiscal Affair Department at the IMF. In her lecture, she defines Universal as all of the individuals. In Sweden that would be every individual in Sweden. Basic as in a common amount to every individual. Income as in a cash transfer from the government. The idea of Universal Basic Income started centuries ago, where Thomas Paine (1796) suggested the first concrete idea of how to fund it through his book Agrarian Justice. In modern society, the most famous form of UBI exists in Alaska, where citizens of the state receive a small share of the state’s revenue from the extraction of gas and oil through the Alaska permanent fund (APFC, 2018). Other forms of UBI has been implemented through various pilot projects in Namibia, Canada and Finland (Worldbank 2016). Finland whose structure of the economy is fairly similar to Sweden, is the first country in the world to run the natural experiment on a larger scale. Over a two-year period 2000 randomly selected unemployed individuals over the whole country between the age of 25-58, shall receive 560 euros a month, approximately 5960 Swedish kronor (Svens 2018). At the end of 2018, the treatment group will be compared to a control group of 173000 individuals (Khan 2018).

What is the argument for UBI? Milton Friedman (1962) named some of the advantages in his book Capitalism and Freedom. He discussed that negative income tax (alternative version of UBI) would end the welfare trap. By getting a small amount of money would increase the incentive to work because one never loses the privileges unlike the current welfare systems. Removing the liability on money can motivate an individual to become more productive in other areas. In the case of absentees of work, a chance to fully recover without the fear of being excluded from social insurance. Olli Kangas, the project manager for the Finnish experiment hopes to provide some answer to the productivity issue and find simple solutions to a complex economy, where all productivity is not represented in the statistics (Svens 2018).
The opinion against UBI is that it is too expensive to be funded. Robert Greenstein who is a public policy analyst have calculated that it would cost more than three trillion dollars to fund a UBI of 10000 dollars a year. The number represented three-fourths of the U.S. of the yearly federal budget and it is close to a 100 percent of the fiscal revenues (McGahey 2016). It could eliminate the current welfare states (McGahey 2017) and it would make people lazy since there is no incentive to go to work.

1.2. Problem Discussion

How does this relate to Sweden? According to Swedish Public Employment Service (2018) unemployment keeps going down among the citizens born inside and outside the country. The economy is booming where GDP grew with 3.2 percent from 2016 to 2017 (Statistics Sweden). Therefore, it is hard to imagine the need for UBI in Sweden today. But Sweden is also faced with many challenges in the future. In 2015 there was a massive refugee crisis where the number of people who seek asylum in Sweden had its peak in 2016 with record breaking 163005 refuges (Statistics Sweden 2018). This will contribute to the raising gap between domestic and foreign citizen employment. The number of long-term sick listed has also increased since 2013 and the forecast is that more and more individuals will return to long-term sick leave for the duration of five years or longer. This creates efforts for the society to get them back into the labour force (Försäkringskassan 2017). The sick-leave depended mostly on stress-related factors where women stood for 73 percent of the increase. The proportion of sick-leave has become more common with individuals between 30-39 years (Försäkringskassan 2016). Six out of eight political parties in Sweden also wish to change the Employment Protection Act (Dagens Nyheter), which creates uncertainty in the labour market. With these challenges that Sweden face, the potential of UBI is worth examining.
1.3. Research issue

The purpose of this study is to evaluate the implementation of basic income in Sweden. The poverty line in Sweden for 2018 for a single adult is 4890 kronor (Kronofogden 2018). Based on the poverty line, the policy is that every individual between the age of 18-65 shall receive 5000 kronor cash transfer from the government. To fund the basic income the government will raise the consumption tax. Previous studies have focused on how UBI affects aggregate output, therefore to give a more micro-based explanation the economy was divided into the high skill, low skill and the manufacturing sector. The critics against UBI argue that productivity will go down and people will have no incentive to go to work. Based on this, the two most important question to evaluate are:

- How will the labour hours be affected?
- How will the basic income affect the sectors?

1.4. Delimitation

In this study, the focus will lie on three types agents; the households, the firms and the government. The households will choose between leisure and working, firms will maximize their profits and the government has the role of tax-levying entity whose budget is balanced from period to period. For simplicity, the economy will be closed. The economy only produces three goods which the households can consume. In addition, households cannot change the sector they work in. Therefore, the model will not take in consideration the effects of monetary policy, household debt, change of occupation and trade balance.
1.5. Method description

To run the experiment, quantitative methods will be applied. The computation will be done in Matlab and Dynare. The statistical method that is used is a Dynamic Stochastic General Equilibrium (DSGE) model. The model parameters such as consumption, investment, government expenditure etc. will be calibrated according to values from 2015. Some of the calibration of the model will be borrowed from literature and the DSGE-model from Adolfson et al (2013) who designed the DSGE-model for the Swedish central bank to save time on calibration. The results will be complemented with two surveys, to give information on the attitude towards UBI. The purpose of the surveys is to discover how UBI will affect decisions of the populations choice on labour and consumption, and attitudes towards welfare and taxes. The assumptions for the DSGE-model is built on rational expectations and to test the goodness of a fit of the simulations, the surveys will be used to compare how well the simulations represent the “reality”.
2. Theoretical Framework

In this section, the theoretical framework will be discussed. The section will discuss the role of technology and health in the labour market; previous research done on UBI and the critique against it. The section will also discuss the attitudes towards welfare and end with the formation of hypothesis.

2.1. The role of technology in the labour market

Much of the fear in the labour market and the discussion about UBI comes from the belief that technology is destroying jobs in a faster rate than jobs can be created. Labour economist has thus far not found any strong evidence for this argument, but are not rejecting the idea in the future (McGahey 2017). One thing that is clear that technology may have shifted the demand for workers with higher skills. Bartel, Ichniowski, Shaw (2007) found that new information technologies changed the manufacturing business in a fundamental way. The study showed that new computerized technologies raised productivity through time efficiency and reduced the cost for production. Autor, Katz and Kearney (2008) related some of the explanation for wage inequality in the U.S. to computerization relying on studies by Autor, Levy and Murnane (2003); Goos and Manning (2007); Spitz-Oener (2006) and many more. The same authors also show that technology may have shifted the demand for workers favouring the more skilled. They find support in studies done by Doms, Dunne and Troske (1997); Autor, Levy and Murnane (2002); Levy and Murnane (2004); Bartel, Ichniowski and Shaw (2007), where they found a strong correlation between the adoption of computer-based technology and the use of college educated labour. However, Doms, Dunne and Troske (1997) who studied plant level wages, workforce education and productivity could not find any evidence of skill upgrading in plants after the adoption of new technologies. This suggests that plants already had more skilled workers and higher wages before the adaptation of new technology.

Although technology may have favoured high skill workers and streamlined production, the presence of Artificial Intelligence (AI) may change the structure of the labour market in way that technology never done before. The AI robot Sophia is the first robot to receive citizenship in Saudi Arabia (Forbes 2017). Even though this was a publicity stunt, Sophia steps in to an area where she receives the same rights as humans. This puts the competition between humans
and robots in another category. For example, a division in IKEA and 300 other companies has hired the AI-robot Vera to handle recruitment. Vera is HR-specialist and can manage up to 1500 interviews a day (Myrén 2018) which is more than a one employee can do. Automation has now started to eliminate office jobs (Autor 2015). Economists as Autor (2015) views automation as another step in the evolution of technology replacing human labour. As history has showed us, even though technology is destroying jobs, technology also displaces capital and labour to create new jobs. Autor (2015) believes that the fear of automation is perhaps exaggerated. Understanding the interaction between employment and technology requires more thinking than just substitution. It is necessary to take in consideration the number of tasks involved in businesses and how employees can complement new technologies as well as how the elasticities for price and income affect output and labour supply (Autor 2015). Autor (2015) writes:

“automation does indeed substitute for labor—as it is typically intended to do. However, automation also complements labor, raises output in ways that lead to higher demand for labor, and interacts with adjustments in labor supply.”

2.2. Health and the labour market

The rising absence from work is a disquieting subject in Sweden. Between 2010-2015 the number of people in started cases of sick-leave increased with 98000. Psychiatric diagnoses made for 57000 of the increase in sick-leave where the increase for women was near 71 percent (58000 to 99000) and 67 percent for the men (24000 to 40000) (Försäkringskassan 2016). The massive increase has its roots in stress related factors. Individuals who work within occupations with negative psychosocial workload has and increased chance of being absent from work (Försäkringskassan 2016). Reports from Försäkringskassan (2017) has shown that the large part of the current rise in the long-time illness can be explained by previous increases in the number of started sick-leave and the duration in sick-leave. When the number of sick-leave increases the duration of it increases as well. This pattern seems to covariate over time no matter how the regulation for welfare may have changed (Försäkringskassan 2017). Over time fewer individuals has been granted sickness benefit due to the design of regulations. This have led to the increasing of individuals ending up in long term illness. The prediction from Försäkringskassan (2017) is that more individuals will end up in long term illness for the duration of five years or longer. The probability of coming back to the labour market is
decreasing the longer one individual is out. This demands an additional effort on society to integrate them back (Försäkringskassan 2017).

Scholars have established that unemployment has a negative effect on health. Researchers at the institute of stress-research (Westerlund, Theorell and Alfredsson 2004) in Sweden showed that moderate redundancy of staff had an increasing risk on long term illness. They also found that a moderate expansion of the workforce had a decreasing effect on illness, while a large expansion increased the effect. A Finnish study done by Vahtera et al. (2005) examined the effect of redundancy of staff on municipal employees in four different cities. The results showed an increased probability of early retirement among workers who has been let go and the workers who were still employed before and after the redundancy. Researchers have found job insecurity as plausible explanation for sick leave (Arbetsmiljöverket 2011). Employees experience a certain threat against their employment which causes protracted anxiety. This evolves into chronic stress which causes absence from work. Job insecurity had also a strong correlation with shirking and negative work satisfaction (Arbetsmiljöverket 2011).

2.3. Universal Basic Income

Considering the technological advances and the rising health issues many have opened the idea of the implementation of UBI as an alternative welfare system. The idea is that individuals in a certain area are receiving a common cash transfer from the government without any constraints. The idea has been criticized as much as it has been acknowledged. In Switzerland, there was an initiative presented for UBI, but the population voted 77 percent against and 23 percent approved (McGahey 2016). The big shock was not that the initiative was voted down, instead the big shock was that so many of the Swiss-population approved.

Thus far experiments of UBI has been done on a small scale and mostly in poor regions of a country. The experiment of basic-income done in Oţjivero-Omitara region of Namibia in 2008-2009 showed that the average income grew with 39 percent without including the transfer for UBI, which increased household purchasing power, created markets and lowered household debt. Entrepreneurship increased where many recipients started their own small business and the number of school dropouts reduced with 40 percent (World bank 2016). As I mentioned earlier the experiment was done on a small scale and in a poor region, which is why the Finnish
experiment can provide answers to many unanswered questions such as how UBI would work in an evolved country and implemented over the whole country.

The Roosevelt institute (2017) simulated UBI through the Levy Institute macroeconomic model to answer the question of how UBI would work in an evolved country. The model is used to simulate medium run alternative policy effects on the U.S. economy. The Roosevelt institute suggested three propositions for the UBI: A child allowance of 250 dollars a month per child under 16; a base income of 500 dollars a month for all adults; a basic income of 1000 dollars a month for all adults. All of the proposals are implemented over a four-year period with different scenarios and take in consideration the distribution of income which are fully tax funded plus distribution; Government deficit; Government deficit plus distribution. Their simulation result showed real GDP growth in all of the proposals, in all of the scenarios. Observe that the simulation does not take in consideration the labour hour decisions of the households (Nikiforos, Steinbaum, Zazza 2017).

Joze Mencinger (2017) argued that Helicopter Money (HM) in the form of UBI instead of Quantitative Easing in the Euro Area would increase its GDP by 1.8 percent. He states that HM is both feasible and economically desirable. This could be a future tool for ECB because while fiscal tools are rigid monetary tools are more flexible (Mencinger 2017).

2.4. The critique against UBI

Even though the idea of UBI is growing, there is still a lot of issues to be considered. Many argue that it is too expensive to fund. To give away money, you need to raise fiscal resources, which can be a difficult task to achieve (Prady 2017). UBI could substitute other welfare systems such as health-programs, unemployment insurance (McGahey 2017). By discarding existing welfare systems and replace them with UBI could politically lead to a libertarian goal of reducing public spending (McGahey 2017). Robert Greenstein who is a public policy analyst have calculated that it would cost more than three trillion dollars to fund a UBI of 10000 dollars a year. The number represented three-fourths of the U.S. of the yearly federal budget and it is close to a 100 percent of the fiscal revenues (McGahey 2016). Others consider whether if UBI should be Universal. Is it just for the government to give free cash transfers to people that are rich or to people who haven’t earned it? Therefore, the argument is that UBI should be progressive. The more one individual earn the less transfer they get from the government. By
doing that, the concept of UBI is lost. There are also arguments that UBI would lead to more shirking and the incentive to go to work would disappear (Prady 2017). What are the implications of UBI on inflation? With UBI it is not unreasonable to assume that prices and nominal wages would be pushed up since households have more money to spend, which could have undesirable effects on inflation.

2.5. The Welfare in Sweden

The welfare system in Sweden is one of the most generous systems in the world. If you become unemployed or sick you can get up to 80 percent of your salary through A-kassa (Swedish Public Employment Service) or Försäkringskassan. This is funded through the public sector which is close to fifty percent of Swedish GDP, where 42 percent out public expenditure goes to social security (Carlgren 2018). Politicians, economist and society in general have different attitudes towards the welfare systems. Some say that is too easy to exploit, while other argue that the current cash transfer from the welfare system is too low. Assar Lindbeck (2008) refers to Modig and Broberg (2002) in his studies about social standards and social insurance. They found that under certain circumstances people found that it was okay to stay at home and live on sick-benefit even though you were healthy. Approximately 40 percent thought it was okay if there were family issues or it is stressful at work, 20 percent answered it was okay if you dislike your job or if you have a bad boss.

These attitudes don’t necessarily mean that it affects people’s behaviour, but some natural experiments have shown that attitude and behaviour correlate. For example, Skogman (2004) found a correlation between sick-leave behaviour among men and television broadcasted sporting events (Daytime). During Winter Olympics in Obersdorf, Germany 1987 the sick-leave increased with 16 percent among men (treatment group), compared to women (control group). Persson (2005) also found that during the World Cup in Japan/Korea 2002 sick leave increased with 41 percent among men compared to women. Men between ages of 16-35 also used the system to skip work during their birthdays (Skogman 2007). Other natural experiments have found that political changes had an implication on sick leave. For example, Larsson and Runeson (2007) showed that the probability of an unemployed becomes sick decreased with 35 percent when the ceiling for sickness benefit decreased. This could lead to people going to work earlier than they should and instead becomes long-term ill as shown in studies from Försäkringskassan (2017). The question is which role UBI would play in this?
2.6. Hypothesis

Research shows that technology have shifted demand for workers favouring the more skilled but automation could eliminate job growth in the future. Current welfare systems can be exploited, while research from Försäkringskassan shows that stress-related factors are one of the biggest reasons for people end up in long-term sick leave and the grant for sick benefit has been restricted. This creates difficulties for adjustment of welfare regulation. Experiments and simulations on UBI has shown positive outcome with GDP growth, increased buying power etc. but there are still some questions to be answered. With this theoretical framework, it is therefore interesting to analyse the implementation of UBI in Sweden. If an individual in Sweden received 5000 Swedish kronor per month, how would that individual choose between leisure, work and consumption. How would labour inputs change for firms and could UBI increase the size of the sectors. These hypotheses will be tested:

\[ H_{01} = \text{UBI has no effect on labour hours} \]
\[ H_{a1} = \text{UBI has negative effect on labour hours} \]

\[ H_{02} = \text{UBI has no effect on the price of labour input} \]
\[ H_{a2} = \text{labour inputs becomes more expensive} \]

\[ H_{03} = \text{UBI has no increasing effect on the output of the sectors} \]
\[ H_{a3} = \text{UBI has an increasing effect on the output of the sectors} \]
3. Methodology

The method section will provide information on the model that will simulate UBI and the calibration of the model. The model will describe the different agents of the Universe. The section will also lift the possible drawbacks with the model.

3.1. Real Business Cycle

What causes the fluctuations of the economy, and understanding it, is a key factor in macroeconomics. Therefore, to understand the implications of the Universal Basic Income I will use the Real Business Cycle (RBC) theory to evaluate the fluctuations in the economy that is caused by the funding and the implementation of UBI. An RBC model is an extended version of Ramsey model, which is a natural Walrasian baseline model of an aggregate economy (Romer 2005, 194). Broadly speaking, the model builds the economy from the bottom to the top, compared to usual macroeconomic models such as Keynesian, where the economy takes a big picture approach. The two types of shocks driving an RBC-model are; a technological shock and government expenditure shock (Romer 2005, 194). Agents in the economy also have rational expectations and perfect foresight. This model is chosen to capture the behaviour of the government, firms and household after a technological and government expenditure shock and examine the evolution to a steady state.

3.1.0. The Universe

I will follow the works and model descriptions from Lizarazo, Peralta-Alva and Puy (2017), Torres (2015) and Mancini Griffoli (2007-2008) with modifications. The economy will be divided into three sectors: manufacturing sector, low skill service sector and high skill service sector; the households within those sectors and the government that interacts with them. Each sector will be simulated separately to measure the causality of the UBI on each sector and the households within the sectors. Observe that households cannot change the sector they work in. The households have different preferences in consumption and different education levels, which I take in consideration in the calibration of the model. The government raises taxes and balances its budget. The economy is closed.
Manufacturing sector
Manufactured goods are produced in the manufacturing sector. This is defined as Agricultural, Forestry, Fishing, Hunting and Mining (Lizarazo, Peralta-Alva, Puy 2015, 11) (see Appendix, Annex 1 for details). The market is assumed to be competitive and follows a Cobb-Douglas production function with constant return to scale (Torres 2015, 149). The households who are employed in the manufacturing sector vary between low, middle and high in skill level (see Annex 2 for description).

Low skill service sector
Low service goods are produced in the low skill service sector. The low skill service sector is defined as Retail, Transportation, Warehouse, Foodservices and Construction (Lizarazo, Peralta-Alva, Puy 2015, 11) (see Appendix, Annex 1 for details). The firms in this sector are assumed to be imperfectly competitive where firms have some kind of market power, i.e. monopolistic competition. The household that are employed in this sector are of the low skill (Lizarazo, Peralta-Alva, Puy 2015, 11) (see Appendix, Annex 2 for details).

High skill service sector
High skill service goods are produced in the high skill service sector. The high skill service sector is Finance, Insurance, Real estate, Leasing and Health care (Lizarazo, Peralta-Alva, Puy 2015, 11) (see Appendix, Annex 1 for details). The firms in this sector are assumed to be imperfectly competitive where firms have some kind of market power, i.e. monopolistic competition. The household that are employed in this sector are of the high skill (Lizarazo, Peralta-Alva, Puy 2015, 11) (see Appendix, Annex 2 for details).

3.1.1. The Households

Households in the economy work in different sectors but face the same economic problem. That is to choose between labour and leisure, consumption and saving etc. They are assumed to be born with different skills and have different education levels which affects their labour productivity and consumption behaviour (Lizarazo, Peralta-Alva and Puy 2017, 12). The education/skill level is low, 9 years in education; middle, 12 years in education; high 12 years or more (See Appendix, Annex 2 for details).
Consider any sector where households maximize their utility function:

\[ U(C_t, N_t \bar{H} - L_t) = \gamma_i \log C_t + (1 - \gamma_i) \log (1 - L_t) \]  

where private consumption is denoted by \( C_t \) and leisure is \( 1 - L_t \). \( \gamma_i \) is the preference between consumption and income parameter where \( \gamma_i \) is between \( 0 < \gamma_i < 1 \). \( N_t \bar{H} \) is the number of households that are fixed over time. The budget restriction for the households is given by:

\[(1 + t^c_t)C_t + S_t = (1 - t^l_t)W_tL_t + (1 - t^k_t)R_tK_t + G_t\]  

where \( G_t \) is the transfer sent by the government to the consumers, \( S_t \) is the savings rate and \( K_t \) is the private capital stock, \( W_t \) is the wage the consumers receive from the firms, \( R_t \) is the rental cost of capital and \( t^c_t, t^l_t, t^k_t \) are the tax rate on consumption, labour and capital. The budget constraint implies that total consumption and savings cannot exceed the amount of money the household receive from work, capital and lump sum transfers from the Government.

The private capital stock evolves according to:

\[ K_{t+1} = (1 - \delta)K_t + I_t \]  

where \( \delta \) is the depreciation rate on capital and \( I_t \) is the gross investment. By combining equation (1), (2) and (3), the problem faced by the households is to maximize their lifetime utility subject to their budget constraint, given the assumption that \( I_t = S_t \). Household chooses consumption, investment and the amount of effective working hours to maximize the Lagrange function:

\[
\max_{(C_t, L_t, L_t)} \mathcal{L} = \sum_{t=0}^{\infty} \beta^t [\gamma_i \log C_t + (1 - \gamma_i) \log (1 - L_t) - \lambda_t ((1 + t^c_t)C_t + K_{t+1} - (1 - t^l_t)W_tL_t - (1 - t^k_t)(R_t - \delta)K_t - K_t - G_t)]
\]

where \( \beta^t \) is the discount factor for the household and \( \beta^t \in (0,1) \). \( \lambda_t \) is the Lagrange multiplier assigned to the household’s maximization problem at time \( t \). The first order conditions for the household maximization problem are:
Combining equation (5) and (6) we obtain the marginal rate of substitution between consumption and leisure to the opportunity cost of one additional unit of leisure given by:

\[ \frac{1}{1-L_t} = \frac{\gamma_t (1-t^c_t) W_t}{(1-\gamma_t) (1-t^c_t) C_t} \]  

and by combining (5) and (7) we obtain the intertemporal equilibrium condition which represents the optimal consumption path (Torres 2015, 147-149).

\[ \frac{(1+t^c_t) C_t}{(1+t^c_{t-1}) C_{t-1}} = \beta \left( (1-t^c_t) (R_t + \delta) + 1 \right) \]  

3.1.2. The Firms

Manufacturing sector

The firms in the manufacturing sector is assumed to be a competitive market. The manufacturing sector hires workers of all skill level. The problem firms in this sectors face is to find the optimal values for the use of capital and labour. Taking factor prices as given the firms rent capital and employ labour to maximize the profits at time t. The technology in the manufacturing sector is summarized by a constant return to scale Cobb-Douglas production function

\[ Y_t = A_t K_t^\alpha L_t^{1-\alpha} \]  

where \( A_t \) is the total factor productivity and \( \alpha \) is the output elasticity where \( 0 \leq \alpha \leq 1 \). The firms maximize their profits

\[ \max_{(K_t, L_t)} \pi_t = A_t K_t^\alpha L_t^{1-\alpha} - R_t K_t - W_t L_t \]  

The first order conditions for the firm’s maximization problem are

\[
\frac{\partial \pi_t}{\partial K_t} = R_t - \alpha A_t K_t^\alpha L_t^{1-\alpha} = 0 
\]  \hspace{1cm} (12)

\[
\frac{\partial \pi_t}{\partial L_t} = W_t - (1 - \alpha) A_t K_t^\alpha L_t^{-\alpha} = 0 
\]  \hspace{1cm} (13)

By rewriting equations (12) and (13) we obtain the price for production inputs (Torres 2015, 149-150).

\[
R_t = \alpha A_t K_t^\alpha L_t^{1-\alpha} 
\]  \hspace{1cm} (14)

\[
W_t = (1 - \alpha) A_t K_t^\alpha L_t^{-\alpha} 
\]  \hspace{1cm} (15)

The imperfect markets

The high skill service sector employs workers of high skill, while the low skill service sector hires labour from of the low skill. Firms in these sectors have imperfect competition. To introduce monopolistic competition in these markets, we first assume that there is a continuum of intermediate symmetric producers with market power who each produce and sell a different variety of intermediate goods (Mancini Griffoli 2007-2008, 13). The differentiated intermediate goods are later combined into a final good by the final good producer which are traded in a competitive market (Torres 2015, 249). Note that the high skill service sector and the low skill service sector are separated from each other. The final good producers of the high skill sector and the low skill sector chooses its optimal value for each intermediate good yielding the Dixit-Stiglitz downward sloping demand curve (Mancini Griffoli 2007-2008, 13). The problem that faces firms in the sectors are to maximize the use of capital and labour plus the pricing of the intermediate good. The intermediate good follows CRS production function defined as

\[
Y_{it} = K_{it}^\alpha (e^{Z_t} L_{it})^{1-\alpha} 
\]  \hspace{1cm} (16)

where the \( i \) varies between the intermediate producer. \( \alpha \) captures the capital elasticity in the production function where \( 0 < \alpha < 1 \), \( Z_t \) is the technology parameter which captures the productivity shock and follows a first order autoregressive process

\[
Z_t = \rho Z_{t-1} + \nu_t 
\]  \hspace{1cm} (17)
where $\rho$ captures the persistence of technological progress and $v_t \sim N(0, \sigma)$.

Solving this for the optimal sourcing problem produces the capital to labour ratio given by:

$$K_{it}R_t = \frac{\alpha}{1-\alpha} W_t L_{it}$$  \hspace{1cm} (18)

and the constant mark-up pricing condition for monopolistic competition:

$$p_{it} = \frac{\epsilon}{1-\epsilon} m_{c_t}p_t$$  \hspace{1cm} (19)

where $p_{it}$ is firm $i$'s specific price, $m_{c_t}$ is the real marginal cost of producing one more unit of output, $p_t$ is the average price of output (Mancini Griffoli 2007-2008, 13) and $\epsilon$ is elasticity of substitution between intermediate goods and $\epsilon > 1$ (Torres 2015, 255). This means that the firm with market power will set a price above its marginal costs and earn monopoly rent. Since all firms are symmetrical and therefore charge the same price we assume that $p_{it} = p_t$ and therefore equation (19) simplifies to

$$m_{c_t} = \frac{\epsilon-1}{\epsilon}$$  \hspace{1cm} (20)

To find the optimal value of the marginal cost we combine the optimal capital to labour ratio (equation 18) and use the CRS properties to solve for the amount of capital and labour that is required to produce one unit of output. The real cost of producing one unit of output using any factor is given by:

$$W_t L_{it} + R_t K_{it}$$  \hspace{1cm} (21)

We use this to replace out payments to the other factor with equation (18). When we solve for the marginal cost for the intermediate good producers we obtain

$$m_{c_t} = \left(\frac{1}{1-\alpha}\right)^{1-\alpha}\left(\frac{1}{\alpha}\right)^{\alpha} A_t \frac{1}{A_t} W_t^{1-\alpha} R_t^{\alpha}$$  \hspace{1cm} (22)

Observe that the marginal cost does no longer depends on firm $i$ and therefore the same for all intermediate producers. By combining the results for the marginal cost, its counterpart in terms
of capital together with the optimal pricing condition we obtain the equations for the price of firms input factors (Mancini Griffoli 2007-2008, 13-14).

\[ W_t = (1 - \alpha) \frac{Y_{it} (e-1)}{L_{it}} \epsilon \]  
\[ R_t = \alpha \frac{Y_{it} (e-1)}{K_{it}} \epsilon \]  

To find an aggregate production function for the final good producer we sum the production for each firm. After some extensive math which will not be described here\(^1\), we obtain the aggregate production for the final good producer that follows a Cobb-Douglas production function. The aggregate production function is equal to the quantity of goods bought from the intermediate producer and is summarized into a final good which is traded to the households in a competitive market (Mancini Griffoli 2007-2008, 13-14). Since all goods are traded in a competitive market and the firms are symmetric the production functions for the final good producer in the low skill service sector and the high skill service sector is therefore equal to equation (10).

### 3.1.3. The Government

The government in this economy has the role of the tax-levying entity. The government collects tax from consumption, labour and capital. The fiscal revenues are returned to the economy through lump-sum transfers to the households. The transfers enter as a constant in the consumers budget constraint and have no effect on consumption decision on the margin. We assume that the government balances its budget period by period given by (Torres 2015, 143-147, 150).

\[ G_t = t^C_t G_t + t^W_t W_t L_t + t^K_t (R_t - \delta K_t) K_t \]  

\(^1\) For details see Torres (2015), 254–262
### 3.2. Dynamic Stochastic General Equilibrium model

To run the numerical simulations on the Real Business Cycle theory and the implementation of UBI I will use a DSGE-model. Dynamic Stochastic General Equilibrium model, or DSGE model has become one of the most useful tools to analyse and run experiments on how the economy would respond to a disruption or a policy change (Torres 2015, 3). DSGE models were developed to give answers to two challenges in macroeconomics. The first is to solve the Lucas critique and the second is to build micro founded macroeconomic models (Torres 2015, 3). The Riksbank developed its own DSGE-model which is called RAMSES to run experiments on monetary policy and fiscal changes in the economy (Adolfson et al 2013, 4).

In this model, there will be eight endogenous variables and four exogenous for each sector. There are eight equations in the model such as Euler equation for consumption, and the choice between labour and leisure; inputs for the firms, Cobb-Douglas production function, feasibility constraint, government budget and technology that follows a AR-process again for each sector. After granting initial values to the variables I will run simulations for the economy to find a steady state i.e. the baseline model. The baseline model will be compared to the model where UBI has been implemented. The agents in the economy know when UBI is implemented i.e. are assumed to have perfect foresight. The simulations will be done over a period of 200 years.
3.3. Calibration of the model

The purpose of calibration is to select parameter values with microeconomic evidence to base the model on. The variables are summarised in table 1.

<table>
<thead>
<tr>
<th>Table 1: Variable summerise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>K</td>
</tr>
<tr>
<td>I</td>
</tr>
<tr>
<td>L</td>
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<tr>
<td>G</td>
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<tr>
<td>R</td>
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<tr>
<td>W</td>
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<tr>
<td>Tauc</td>
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<tr>
<td>Taul</td>
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<tr>
<td>Tauk</td>
</tr>
</tbody>
</table>

The first eight variables are endogenous variables in the model. Output is normalized to 1 to calculate a variables proportion of output. Consumption is divided after education level and is calibrated after SCB (2003) report on how education affects consumption behaviour and total consumption share of GDP 2015 (Worldbank). The amount of labour hours spent at work is borrowed from Lizarazo, Peralta-Alva and Puy (2017) and represents one third of the day. Taxes are considered as exogenous variables and enter the model as constants. Average tax on labour are calculated after Stockholm county (Skatteverket) and takes in consideration the level of skills. The higher skills, the higher average tax. Information on consumption tax and capital tax is found at Skatteverket. Investment is calculated after the different sectors and divided with Sweden’s GDP year 2015 to get shares (SCB) of output. Government expenditure 2015 was 49.6 percent of GDP (OECD).
The parameters of the model are summarised in table 2.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>alpha</td>
<td>Output elasticity</td>
<td>0.35</td>
</tr>
<tr>
<td>beta</td>
<td>Discount factor</td>
<td>0.99</td>
</tr>
<tr>
<td>delta</td>
<td>Capital Depreciation</td>
<td>0.012 - 0.045</td>
</tr>
<tr>
<td>gamma</td>
<td>Preference parameter</td>
<td>0.3 - 0.45</td>
</tr>
</tbody>
</table>

Alpha, beta and delta are borrowed from Adolfsen et al. (2013) who designed the DSGE-model for the Riksbank. They run macroeconomic forecasts and alternative scenarios for the Swedish economy. Alpha is calibrated to yield capital output ratio slightly below 2 on a yearly basis. The discount factor is designed to yield a real interest rate of 2.14 percent annually (Adolfsen et al. 2013. 35-37). Capital depreciation rate varies between 1.2 (Adolfsen et al. 2013) percent to 4.5 percent annually depending on the sector. The high skill sector and the low skill sector is assumed to have lower depreciation rate on capital compared to the manufacturing sector due to the use of production. Preference parameter also varies between education levels. Following the works of Goldthorpe (2000) individuals with high education are assumed to have a lower preference for work than individuals with middle and low education. This depends on that workers with high education are harder to replace and doesn’t worry about job security as much as workers with different education level (Goldthorpe 2000).
3.4. Possible drawbacks

One important thing to understand is that a model is just a simplification of a complex reality. One common critique against DSGE-models that are built on RBC-theory is the existence of monetary policy. Monetary policy has important real effects on the adjustment of nominal prices and wages which RBC-models does not take in consideration (Romer 2005, 226-227). Secondly the Solow residual has a hard time capturing the technological improvement, suggesting that the Solow residual does a poor job capturing the technological shock (Romer 2005, 227). The model does not take in consideration, the household debt, which is a rising issue in Sweden. Because the economy is closed, the model does not capture the effects of import and export on output. The calibration of the model is done on secondary hand data.

The survey was spread through Facebook, which gives a poor representation of the distribution of age and education. Nonetheless it contains important information of the attitudes of UBI.
4. Result

Below, the results will be presented. The results summarize the most important information from the simulations in the form of tables and graphs. For additional results, see Appendix.

4.1.0. Result summary

The simulations of the UBI are done in Matlab. The simulations are divided in different sectors of the Universe. The variables that are presented in the tables are connected to the hypothesis and therefore not all variables are included. Tables with all of the variables can be found in the Appendix, Annex 3-5. The simulations concern a period of 200 years, between the year 2015-2215. Extensive details are presented in the sections below.

To connect the results to reality two surveys was done to examine the attitudes towards UBI. The surveys were spread through Facebook, where the respondents were asked questions about attitudes towards UBI. The questions on the survey can be found in the Appendix, Annex 6.

4.1.1. The high skill service sector

The results from the high skill service sector are summarised in table 3. Without any shocks, the sector over a 200 period will grow to a steady state where it is 3.79 times bigger than today. If UBI is implemented the sector grew 1.87 times more than the baseline model.

<table>
<thead>
<tr>
<th>Table 3: High skill sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS-baseline</td>
</tr>
<tr>
<td>Output</td>
</tr>
<tr>
<td>Consumption</td>
</tr>
<tr>
<td>Investment</td>
</tr>
<tr>
<td>Labour hours</td>
</tr>
<tr>
<td>Output per head</td>
</tr>
</tbody>
</table>

In this sector investments and consumption grew bigger with UBI compared to the baseline model. Households purchasing power increased more with UBI compared to the baseline model. Individuals would prefer leisure over work with the UBI. Figure 1 shows the
development of firm inputs. Over a 200-year period, the wage for producing one unit of labour is increasing in a decreasing rate. The reservation wage for the worker will be higher since they have extra money in their pocket. Therefore, the firm must give enough compensation to give incentive for the individual to go to work.

![Figure 1: Price of firm input](image)

The rental rate on capital is decreasing over time. Since rental rate on capital is decreasing the firms invest more in technology to use in production i.e. the price for technology is cheaper over time.

4.1.2. The low skill service sector

The results from the low skill service sector are summarised in table 4.

<table>
<thead>
<tr>
<th>Table 4: Low skill sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS-baseline</td>
</tr>
<tr>
<td>Output</td>
</tr>
<tr>
<td>Consumption</td>
</tr>
<tr>
<td>Investment</td>
</tr>
<tr>
<td>Labour hours</td>
</tr>
<tr>
<td>Output per head</td>
</tr>
</tbody>
</table>

As shown above the results are quite similar to the results in the high skill service sector. The magnitude of the change differs between the sectors. After the implementation of the UBI the sector grows approximately 4 times its size. The steady-state of the UBI is 0.26 times bigger.
than the steady-state of the baseline model. The purchasing power of the households has also improved compared to the model without UBI. Workers in this sector also prefers leisure over work. After receiving UBI workers in the low skill service sector have decreased the labour hours from one third of their time to one fifth.

Figure 2: Price of firm input

Figure 2 displays that the price for hiring labour in the low skill service sector is also increasing over time. Notice that the price for labour is increasing in a faster rate compared to the high skill sector. The compensation for work is the highest over the first few periods and stagnates slowly. The pattern is the same for the rental rate on capital. This could implicate that investments in technology in the low sector service is lower compared to the high skill service sector and depends more on labour rather than capital.

4.1.3. The manufacturing sector

The results from manufacturing sector are summarised in table 5.

<table>
<thead>
<tr>
<th></th>
<th>SS-baseline</th>
<th>Values</th>
<th>SS-UBI</th>
<th>Values LS</th>
<th>Values MS</th>
<th>Values HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>1.59</td>
<td>Output</td>
<td>2.25</td>
<td>2.06</td>
<td>1.79</td>
<td></td>
</tr>
<tr>
<td>Consumption</td>
<td>0.21</td>
<td>Consumption</td>
<td>0.69</td>
<td>0.55</td>
<td>0.36</td>
<td></td>
</tr>
<tr>
<td>Investment</td>
<td>1.37</td>
<td>Investment</td>
<td>1.55</td>
<td>1.50</td>
<td>1.43</td>
<td></td>
</tr>
<tr>
<td>Labour hours</td>
<td>0.61</td>
<td>Labour hours</td>
<td>0.64</td>
<td>0.42</td>
<td>0.37</td>
<td></td>
</tr>
<tr>
<td>Output per head</td>
<td>2.60</td>
<td>Output per head</td>
<td>4.81</td>
<td>4.81</td>
<td>4.81</td>
<td></td>
</tr>
</tbody>
</table>
The baseline model evolves from 1 to 1.59 over a period of 200 years. After the implementation of UBI output increased within all skill levels compared to the baseline model. Low skilled workers in the sector had the biggest impact on output, while high skill workers had the lowest. Purchasing power of the households with different skills increased for all compared to the baseline model. Again, the UBI was most beneficial for workers with low skill and least beneficial for workers with high skill, suggesting that wage differentials may play a role here. What is interesting is that the simulations show that workers of low skill would increase their productivity by working more, while workers with midlevel skill and high skill would decrease their labour hours.

The price for firm inputs in the manufacturing sector are displayed in figure 3.

*Figure 3: Price of firm input*
The price for firm inputs follows the same pattern as in the high skill sector and the low skill sector. Since purchasing power for the households increases with the UBI, the cost of hiring labour increases for the firms. What is interesting is that evolution of the wage compensation is the same for all skill level. This can be explained by that equation (14) and equation (15) depends on capital and labour. Since the workers in the manufacturing sector uses the same capital and work the same number of effective hours, the model does a poor job of capturing the development of input prices within the sector.

### 4.2. Survey

Two surveys were done to find out about the attitudes towards UBI. 117 people answered the first survey. The questions asked was if you got 5000 Swedish kronor beyond your salary, how would it affect your working hours. Out of the responder’s 64 percent answered that it would not affect their labour hours, while 28 percent answered that they would reduce their labour hours and 8 percent answered that they would work more. On the question, what they would do with the extra money, 35 percent answered that they would save them, 47 percent of the responders would consume them and 18 percent would do something else. A third question in the survey was asked about if they have called in sick even though they were healthy? Out of the respondents’ 63 percent answered no, 1 percent was not comfortable to answer the question and 36 percent answered that they have called in sick even though they were healthy. In the second survey that was sent out one question was added: if UBI implied higher taxes, what would your attitude be towards it? Fifty-four people answered that survey. Out of the responders’ 50 percent would be against it, 25 percent would still be positive towards it and 25 percent had no opinion on it. Otherwise the answers did not deviate from the first survey.
The distribution of education among the respondents were skewed towards the individuals who has studied for 12 years or more. They represented 85 percent of the respondents, 11 percent of the respondents had been 12 years in education or lower, and 4 percent had 9 years in education or lower. It is important to point out that this survey does not represent the population of Sweden or how people would actually react if UBI would be implemented. This is mainly an observation of people’s attitude against UBI.
5. Discussion

This section is intended to discuss the strengths and weaknesses of the study results, as well as linking them with the theoretical framework. The point of this section is to see if the results answer the questions that have been stacked up.

The purpose of this thesis was to break down the Swedish economy into sectors and to evaluate how the implementation of the UBI would affect them and the agents within. Previous research has does far not found any strong evidence for if automation is destroying jobs in a faster rate than new jobs can be created, but companies like IKEA, PepsiCo and L’Oréal (Myrén 2018) has already begun to use AI in recruitment. The critics of the UBI believe that giving citizens extra money without conditions would lower workers productivity, and that UBI is too expensive to be funded.

With RBC-theory a DSGE model was built, involving three agents: the government, firms and households. The hypothesis that were tested were how the UBI would affect firm inputs and if UBI is beneficial. The universe was divided in different sectors with different level of worker skills. The simulations showed that UBI would grow all of the sectors and the purchasing power for the households would increase. This is analogues with previous research done by the Levy Institute and natural experiments done on UBI. The growth in the manufacturing sector was significantly lower compared to the low and the high skill service sector. This could be due to that the manufacturing sector already uses better technology in their production while other sectors depend more on their employees. Therefore, a technology shock in the manufacturing sector would not affect output as much as the other sectors.

Labour hours decreased for all workers in the various sectors except for workers of low skill in the manufacturing sector. This could be explained by that technology is crowding out workers of low skill and to compensate, the productivity increases. Other explanations could be that productivity increases because of the separation of work from salary as some of the theories suggest.

The compensation for work increased in all of the sectors, in all of the skill levels. Since agents in the economy have perfect foresight and rational expectations it is reasonable that firms must
compensate the workers more for producing one more unit of labour when the workers receive extra cash transfer through UBI.

After comparing the simulations with the surveys, I found that some of the answers were in line of what the simulations have showed. Many have answered that they would work less and some have answered that it would increase the number of hours they are at work, just as simulations show. The majority have answered that UBI would not affect their labour hours. This could be due to that most of the responders have been in education for 12 years or more and have more job satisfaction in the labour force compared to workers with lower skills. The survey also highlights the flaws of economic models with rational expectations, and that is most agents don’t act rational. The survey shows one clear thing, that is the majority of the responders would be against UBI if it meant raised taxes. This shows the attitudes towards taxes in Sweden.

One thing that can be improved for further studies is, in the DSGE-model is to include a central bank as one more agent to capture the effects of inflation when the sectors increase in size and wage increases. As the simulations show output, wage and investment increases one can presume that UBI is inflationary. To find out the health benefits with UBI further research need to be done, possibly with natural experiments. Another thing that can be improved for further studies is to open up the economy. The simulation showed that the wage compensation increased, and what would the consequence of that be in an open economy? If domestic labour force is expensive, perhaps the import of cheap labour or outsourcing is a plausibility, which can have an effect on employment. The model also restricts households from changing sectors, which can be unconstrained for further studies to capture the effect on productivity and the interaction between sectors. Simulating for a period of 200 years may miss shocks and other policies that can affect the economy, which can give unstable results.
6. Conclusion

The final section will give final words about the subject and summarise all of the components in this paper. To conclude the section will give some thoughts on UBI whether you are in favour or against UBI.

I believe that the concept of UBI is interesting. Most of the welfare policies today are about lowering or increasing the ceiling in the welfare system, but in the end, the benefits are lost. How would people react if salary was separated from work performance? Would human capital increase? That is why the end results from the Finnish experiment shall be interesting to find out.

But the answers in the survey surprised me. A large proportion of the respondents said that they have been absent from work even though they were not sick. Even though the survey does not represent the Swedish population, it is still interesting and disturbing information. The answers were also in line with social studies in Sweden and the critique against UBI.

What the future holds for the labour market is hard to say. We will probably never end up as we did in the movie Terminator, a more likely scenario is Blade Runner, but automation can cause troubles in the labour market and maybe, just maybe, UBI could give answer to automation by giving people a chance to develop their productivity. By no means does this study intend to have the last word on UBI, neither does this study try to push towards it. The intent is to raise discussion about the subject. But whether you are in favour of UBI or against it, what you have to consider is the trade-offs between leakage vs coverage; generosity vs incentive; cost vs revenue and finally program vs social preferences (Prady 2017).
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**Worldbank**
Appendix

Annex 1

Description of the universe

<table>
<thead>
<tr>
<th>Sector</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>Fishing, Forestry, Hunting, Agriculture, Mining</td>
</tr>
<tr>
<td>Low skill service</td>
<td>Retail trade, Transportation, Construction, Food services, Warehousing</td>
</tr>
<tr>
<td>High skill service</td>
<td>Finance, Insurance, Real estate, Leasing, Health care</td>
</tr>
</tbody>
</table>

Annex 2

Description of skills

<table>
<thead>
<tr>
<th>Skill</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>9 years or less i.e. Junior High</td>
</tr>
<tr>
<td>Middle</td>
<td>12 years or less i.e. High School</td>
</tr>
<tr>
<td>High</td>
<td>12 years or more i.e. University educated</td>
</tr>
</tbody>
</table>

Annex 3

Table 3: High skill sector full

<table>
<thead>
<tr>
<th>Table 3: High skill sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS-baseline</td>
</tr>
<tr>
<td>Output</td>
</tr>
<tr>
<td>Consumption</td>
</tr>
<tr>
<td>Investment</td>
</tr>
<tr>
<td>Gov. exp.</td>
</tr>
<tr>
<td>Capital</td>
</tr>
<tr>
<td>Labour hours</td>
</tr>
<tr>
<td>Output per head</td>
</tr>
</tbody>
</table>
### Annex 4

#### Table 4: Low skill sector full

<table>
<thead>
<tr>
<th>SS-baseline</th>
<th>Values</th>
<th>SS-UBI</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>3.79</td>
<td>Output</td>
<td>4.05</td>
</tr>
<tr>
<td>Consumption</td>
<td>3.25</td>
<td>Consumption</td>
<td>3.48</td>
</tr>
<tr>
<td>Investment</td>
<td>0.54</td>
<td>Investment</td>
<td>0.58</td>
</tr>
<tr>
<td>Gov. exp.</td>
<td>1.67</td>
<td>Gov. exp.</td>
<td>2.20</td>
</tr>
<tr>
<td>Capital</td>
<td>45.26</td>
<td>Capital</td>
<td>48.38</td>
</tr>
<tr>
<td>Labour hours</td>
<td>0.22</td>
<td>Labour hours</td>
<td>0.20</td>
</tr>
<tr>
<td>Output per head</td>
<td>17.20</td>
<td>Output per head</td>
<td>19.77</td>
</tr>
</tbody>
</table>

### Annex 5

#### Table 5: Manufacturing sector full

<table>
<thead>
<tr>
<th>SS-baseline</th>
<th>Values</th>
<th>SS-UBI</th>
<th>Values LS</th>
<th>Values MS</th>
<th>Values HS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>1.59</td>
<td>Output</td>
<td>2.25</td>
<td>2.06</td>
<td>1.79</td>
</tr>
<tr>
<td>Consumption</td>
<td>0.21</td>
<td>Consumption</td>
<td>0.69</td>
<td>0.55</td>
<td>0.36</td>
</tr>
<tr>
<td>Investment</td>
<td>1.37</td>
<td>Investment</td>
<td>1.55</td>
<td>1.50</td>
<td>1.43</td>
</tr>
<tr>
<td>Gov. exp.</td>
<td>0.46</td>
<td>Gov. exp.</td>
<td>0.75</td>
<td>0.74</td>
<td>0.65</td>
</tr>
<tr>
<td>Capital</td>
<td>9.37</td>
<td>Capital</td>
<td>13.23</td>
<td>12.11</td>
<td>10.55</td>
</tr>
<tr>
<td>Labour hours</td>
<td>0.61</td>
<td>Labour hours</td>
<td>0.64</td>
<td>0.42</td>
<td>0.37</td>
</tr>
<tr>
<td>Output per head</td>
<td>2.60</td>
<td>Output per head</td>
<td>4.81</td>
<td>4.81</td>
<td>4.81</td>
</tr>
</tbody>
</table>
Annex 6

Survey 1 questions:

Q1.
If you received 5,000 kronor unconditionally in addition to your salary, how would it affect your working hours? Would you...
  • Work less
  • Work more
  • Would not affect me

Q2.
What would you do with the money?
  • Consume
  • Save
  • Other

Q3.
Have you ever called in sick from work even though you were healthy?
  • Yes
  • No
  • I’m not comfortable answering this question

Q4.
How long have you been in education?
  • 9 years or less
  • 12 years or less
  • 12 years or more
Survey 2 questions:

Q1.
If you received 5,000 kronor unconditionally in addition to your salary, how would it affect your working hours? Would you...

- Work less
- Work more
- Would not affect me

Q2.
What would you do with the money?

- Consume
- Save
- Other

Q3.
If receiving UBI would lead to higher taxes would you be...

- Fore it
- Against it
- Neither

Q4.
Have you ever called in sick from work even though you were healthy?

- Yes
- No
- I’m not comfortable answering this question

Q5.
How long have you been in education?

- 9 years or less
- 12 years or less
- 12 years or more