Utrecht University

School of Economics

Impossibility of Universal Basic Income Revisited: A Comparative Review

Research paper applied economics research course

Academic year: 2017-2018

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Wordcount: 14377

Abstract

The debate surrounding the economic feasibility of universal basic income (UBI) has been going on for years and researchers have several methodologies available to try and answer that question. In a comparative review, this study analyses the strengths and limitations of lab experiments, field experiments, static models and general equilibrium models. Various case studies, such as the negative income tax experiments in the U.S. and Canada, W4L lottery games and different kind of macroeconomic models deliver insights into the different approaches to assess the economic feasibility of UBI. In a triangulation exercise, a number of suggestions on how the methodologies can complement each other are provided. The impossibility theorem is then applied to each of the methodologies, to test whether a UBI is economically feasible at an adequate level, defined as the poverty line.

Keywords: universal basic income, general equilibrium, economic feasibility, field experiments, NIT, microsimulations, RCT, lab experiments

Since the publication of Capital in the twenty-first century by Piketty (2014), developments of inequality are in the limelight of socio-political debate: the most recent World Inequality Report (2018) found that form 1980 until 2016, the top 1% richest people of the world captured 27% of worldwide wealth growth (Alvaredo, Chancel, Piketty, Saez, & Zucman, 2018). While the debate is mainly focused on top earners, the relative decrease of economic conditions of middle- and low- income earners, the bottom 40%, has often been overlooked (OECD, 2015). Intimately related to this issue is the concept of a universal basic income (UBI), considering that a UBI, set at or above the poverty line, can guarantee a reduction of poverty levels to 0% (Widerquist, 2018). While this statement is true by definition, the question whether it is actually economically feasible, is far more complex, as I will show in this study.

Multiple models have been set up in for different countries with different methodologies to assess this question. Caution is advised, as the devil is in the details: being aware of the methodological specifications and limitations of all different models is crucial to get the right grasp of the policy implications. However, methodologies are taken for granted, which can lead to either incomplete, misleading, or sometimes even wrong conclusions about the economic feasibility of UBI (Widerquist, 2018).

I deal with this issue, by conducting a literature analysis of a selection of currently used approaches in UBI research. The main question I ask is, to what extent are the currently used models for UBI policy analysis able to adequately assess the economic feasibility of a countrywide UBI scheme?

I conduct a careful analysis of the methodologies' advantages and limitations, which might impact the assessment of a UBI, to answer this question. The follow-up question is, whether UBI is actually economically feasible, according to the analysed models. It needs to

be said that the question of the economic feasibility of UBI is strongly linked to the level of the universal basic income grant, which will therefore be analysed for each model.

Conducting such a comparative study provides crucial insights that are of great value when it comes to the interpretation of the results of the models and could thereby help policy makers to assess the economic feasibility of UBI from a more impartial viewpoint. In the final analysis of this paper a triangulation is conducted, discussing how the methodologies can learn from and complement each other and how they could be improved.

The fact that a selection of models and case studies is used, provides a sound overview on the issue at hand, but remains an inductive meta-analysis, providing stylised facts, and should therefore be treated as such.

The study is structured as follows: In a first part, some key definitions and concepts are introduced and afterwards the papers' structure is described. An analysis of the different methodologies to assess the economic feasibility of UBI follows. The final part is based on the research question, discussing first whether the analysed models allow for an adequate assessment of the economic feasibility of UBI. The follow up question is based on the impossibility theorem, discussing whether, based on the results of the models, a UBI scheme is economically feasible at an adequate grant level. To conclude, the paper conducts a methodological triangulation and discusses policy implications.

2 Definitions and Key Concepts

2.1 UBI and the Negative Income Tax

The term universal basic income, has been defined by many and therefore this paper uses the definition as given by the umbrella association Basic Income Earth Network (BIEN), functioning as a recognised authority (Torry, 2017). They define a universal basic income in the following way:

"A universal basic income is a periodic cash payment unconditionally delivered to all on an individual basis, without means-test or work requirement" (BIEN, 2017). In addition to this, the two following characteristics are also part of the understood meaning of UBI. The income does not vary except for regular annual upratings and the amount depends on the recipients' life stage (e.g. child, adult, retired) (BIEN, 2017).[1]

As will be seen in the course of this paper, some models and experiments have tested UBI by using the negative income tax (NIT). The effect on disposable income resulting from an NIT and UBI are similar enough to use the outcomes on behavioural changes from NIT experiments as a proxy for UBI, and thus the findings can safely be considered as conclusive for UBI (Widerquist, 2005; Torry, 2016b). Widerquist (2005) describes the main difference between the two in the following way: "Basic income ensures a minimum income by paying everyone regardless of their private income. The negative income tax ensures a minimum income by paying anyone whose private income slips below a certain level." (p. 50).

The main difference between the two is administrative, which is important especially when incorporating the administrative costs in an economic feasibility analysis (for further detail see Widerquist, 2005 and Torry, 2016b).

2.2 Economic Feasibility, Impossibility Theorem and Funding

2.2.1 Defining economic feasibility

To be able to financially set up a UBI depends on two intimately connected aspects, the sum of money paid out to each individual and the government revenues available to pay for this sum (Torry, 2016b; Widerquist, 2017).

[1] This opposes the unconditionality aspect, but this particular breach is permitted (Torry, 2017).

According to BIEN, a UBI must be sufficient to allow a dignified human existence (BIEN, 2017), which is often interpreted as the official poverty line (i.e. about 50 percent of the median income) (Raventós, 2007; OECD, 2018). I consider a UBI at or above the poverty line as an adequate amount, in a situation where most of the existing social security benefits are abolished. Given that most models keep the social security and contribution system to a certain extent in place, this is taken into account when assessing the adequacy of the models' UBI grant.

The following will be used as a reference point, when speaking about an economically feasible UBI policy throughout this paper: A hypothetical UBI policy, at the just stated adequate level, is considered economically feasible, if the public budget for the policy can sustain itself, while distortions in the economy, caused by the reform, are supportable over the long term, both in terms of effects on public budgets and in terms of a functioning economy.[2]

2.2.2 Impossibility theorem

The dilemma surrounding the discussion about the UBI grant level is known as the impossibility theorem, which, broadly speaking, states that a UBI is either affordable but not adequate, or adequate but not affordable. The models that are analysed during this paper, are tested against this theorem, if possible.

The theorem originates from the debate where some argue that an adequate UBI would lead to excessively high (flat) tax rates and risks of a downward spiral. After the introduction of a UBI scheme, the high tax rates would shrink after tax income of middle and low-income workers. Those would react by decreasing labour supply, while disincentivised unemployed face improved conditions due to a tax-free UBI grant, thus reducing overall

[2] To allow for comparability, I will only look at developed countries.

labour supply and thereby adversely affecting GDP and putting even further pressure on the public. To avoid those risks, a UBI would have to be significantly lower, so that it does not diminish GDP. Such an amount would presumably be too low to be socially acceptable or to fulfil the, by UBI proponents, claimed positive effects (Groot, 2004).

2.2.3 The funding debate

When looking at the funding aspect specifically, the government can opt for revenue neutral schemes. Strict revenue neutrality is based on reducing means tested and other benefits, increasing income tax rates and adjusting personal income tax allowances.

There are, however, alternative ways of funding. Widerquist (2018) states that "UBI requires taxes, or it will cause rampant inflation" (p. 17). The logic behind this is that if money is created without levying taxes, then money will lose its value and inflation occurs (Widerquist, 2018). Since the European Central Bank announced the expanded asset purchase programme in 2015, this basic economic dogma has been questioned, since no inflation of bond and share prices, nor a trickle-down effect was observed (Torry, 2016b).

According to Torry (2016b), there are various alternative ways of funding a UBI. Examples are a financial transaction tax, a land value tax, money creation[3], a dividend (e.g. royalties from oil extraction) and redirecting money from subsidy funding (e.g. subsidised food programmes) towards the funding of UBI. Moreover, changing wealth and expenditure

[3] A UBI provided by the central bank would enter the real economy directly and would therefore be more likely to have positive effects (Torry, 2016b).

tax rates and adjusting allowances, other than those mentioned under strict revenue neutrality, provide further measures for funding a UBI (Torry, 2016b).[4]

Standing (2016) argues that broadly speaking the current tax system is not neutral, but selective, meaning that tax rates on capital have been going down and those on labour and income have been going up in the past. Taxes on corporate incomes, intellectual property rents, windfall gains, and other taxes on capital income, in short taxes on rent (rentier income), are significantly lower than taxes on labour income. Moreover, financial transaction taxes are almost inexistent. In addition, wages have stayed relatively constant over the past decades, while the economy has seen increases in productivity, corporate profits and employment (Standing, 2016).

A more neutral scheme could be a possible alternative to fund a UBI. (Standing, 2017). Moreover, governmental funds from other departments (e.g. military or industries with negative externalities on society or the environment) could be used for the funding of UBI to achieve predicted (Standing, 2016) effects such as eliminating poverty and reducing inequalities and insecurities. It would correspond to a shift in public priorities towards the common good.

Barnes (2014), defines the term rent as “the money paid to businesses over and above their costs of labour and capital in competitive markets and a potentially virtuous flow of money paid to all of us for use of our co-owned wealth” (p. 12). Business benefitting from all sorts of public infrastructure (i.e. commons, e.g. clean air or internet), often extract rent (being paid for the value added through the commons), while the rent is not paid back to society, which co-owns this public wealth.

[4] Adding those latter aspects to the definition of strict revenue neutrality is equal to the definition of revenue neutrality (Torry, 2017)

Moreover, labour income is being squeezed more and more, the share in rentier income keeps growing (money begets money) and is taxed at considerably lower rates. According to Barnes, bringing this disproportion closer to an equilibrium (what Standing calls a neutral tax system) needs to be done through a continues flow (opposed to sporadic inflows, with repeated funding by the government) of revenues, a process which he describes as building pipes. According to Barnes (2014), collecting rentier income from a variety of sources could build up to a UBI system.

The background knowledge and the concepts from this section are important for the following discussion on the economic feasibility of UBI and for discussing policy implications afterwards.

3 Methodology

The analysis begins with a one by one examination of the four different methodologies where the advantages and disadvantages are highlighted and explained, and a short presentation of the main findings that are of importance for the economic feasibility of UBI are presented. The analysis follows a clear path (see figure one), which starts with micro-analysis models and ends with macroeconomic models. Laboratory experiments look at how individuals behave, trying to find out what the foundations of microeconomic behaviour are, using an approach which I call a mini-micro examination (see figure one). Given that it is only intuitive to start with a micro perspective and construct a macro perspective from there, lab experiments will open the analysis.

In the following part, field experiments, which still look at microeconomic behaviour, but which take a sample of the economy (micro examination) and project their behaviour as an estimation on the whole population, are analysed. The methodologies of three types of experiments, namely randomised controlled trials, saturation studies and natural experiments,

are used to show how experiments contribute to the assessment of the economic feasibility of UBI.

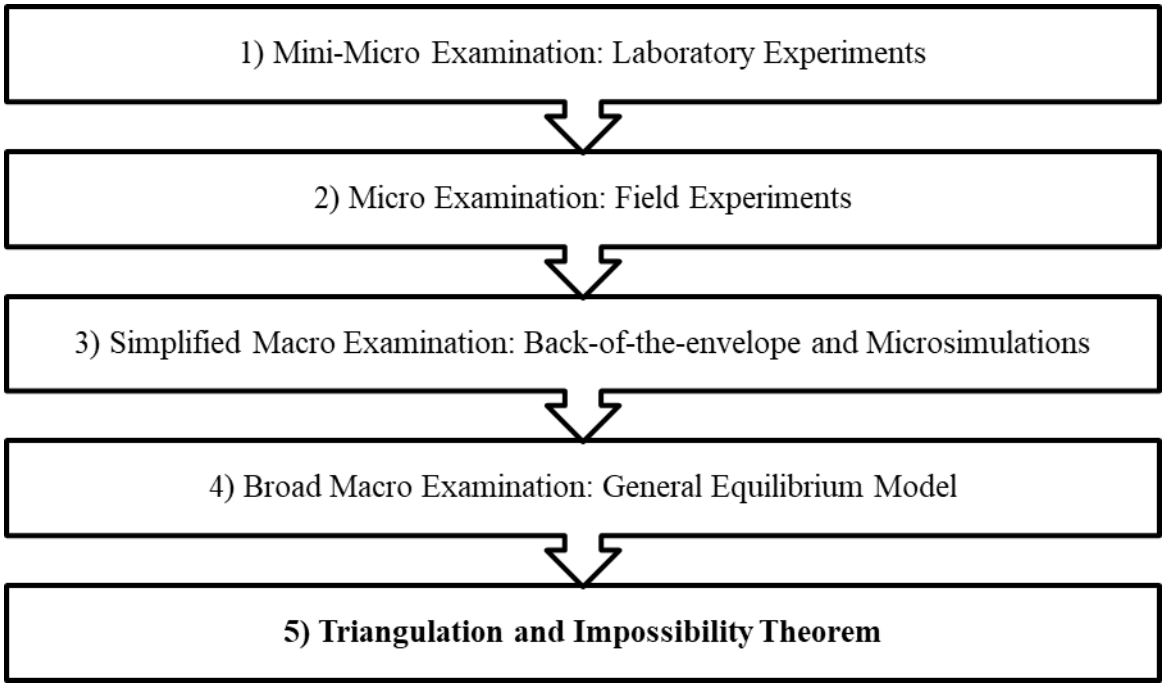

Figure 1. Overview of the different methodologies and structure of the analysis

Macroeconomic models run countrywide simulations of a UBI scheme. First back-of-the-envelope calculations (looking at the isolated cost of UBI in a vacuum) and microsimulations of the net cost of UBI (when implemented in the current social security system) are analysed.

An analysis of general equilibrium models, a more comprehensive version of countrywide UBI simulations, follows. There, UBI is also implemented in the institutional system, but in addition, behavioural changes, and their impact on the economic feasibility, are also taken into account.

Finally, the research questions are answered based on the findings of the analysis. First, the question, to what extent the analysed models allow for an adequate assessment of the economic feasibility of UBI, is discussed. This is followed by analysing whether the

impossibility theorem applies to the models' results, in other words, discussing whether, based on the results of the models, a UBI scheme is economically feasible at an adequate grant level. In the last section, the key outcomes resulting from the analysis of the different methodologies are used to triangulate the best methodology, discussing how the methodologies can improve or complement each other.

4 Comparative Analysis

4.1 Laboratory Experiments

4.1.1 Methodological particularities and limitations

Lab experiment settings help to find out what the psychological reasoning of different people is and how this impacts their behaviour when faced with a UBI scheme (treatment group), compared to the current system (control group). Thus, including lab experiments in this paper is a valuable contribution, because they provide insights into the microfoundations of human preferences and behaviour, especially with regard to the psychological reasoning of individuals.

Firstly, lab experiments are not exposed to the public and can therefore be conducted in scientific integrity, with relatively low budget, guaranteeing financial independence (Noguera & de Wispelaere, 2006).

Camerer and Loewenstein (2004) stated that a critical feature of lab experiments is that they have promising techniques to improve the understanding of two basic behavioural categories. The first one is "judgement", giving insights into the conditionality on which individuals base their support or refusal of UBI (Camerer and Loewenstein, 2004). Support based on judgement is rather closely linked to political feasibility and will therefore not be elaborated on. The latter of the two categories is 'choice' and it shows, what behavioural decisions to expect, once UBI is in place (Noguera & de Wispelaere, 2006).

It is important to note that the factor influencing judgements and choices is not rationality (Kahneman & Frederick, 1990). An example given by Kahneman and Frederick (1990) is reference points. Reference points could be of importance when setting the level of a UBI and to assess the reaction of individuals to a UBI.

Ambiguity aversion could explain why and how people react differently under a simple and straightforward UBI scheme, opposed to a complex bureaucratic welfare system (Noguera & de Wispelaere, 2006). Analysing the role of fairness provides insights into the social perception of the UBI (Kahneman, Knetsch & Thaler, 1986; Frohlich & Oppenheimer, 1992) and whether this impacts aspects such as motivation and productivity, for example.

The extensive level of control (Camerer & Loewenstein, 2004) and the ability to conduct series, instead of one-shot experiments, enables researchers to modify key experimental design features, reproduce, confirm or reject hypotheses and refine research results (Noguera & de Wispelaere, 2006).[5] In a laboratory setting, control of various factors is simpler, so the experimenter could observe effort along with wages and rule out confounding effects, thereby improve the understanding of labour market functionality (Falk & Heckman, 2009; Camerer & Loewenstein, 2004).

4.1.2 Case study: UBI in the lab

Haigner, Höchtl, Jenewein, Schneider, and Wakolbinger (2012) published the first study that analysed labour supply, welfare and distributional effects of a UBI in a laboratory experiment, which shows how unexplored this field still is in the UBI research and literature. Throughout eight periods, people in different treatment groups could choose before each period between three options: individual income generation, group income generation or

[5] Another example is the gift-exchange game, testing the theory that workers reciprocate fair wages with high effort.

leisure. [6] Work consisted of tedious calculations, where each calculation led to a payoff. In the UBI treatment, participants received a payment approximately equal to their reference point for average earnings in lab experiments.

Two hypotheses were then set up, where the first one expects the choice frequency of option two and three to be higher for UBI and lowest in the control group and the second hypothesis expects work effort to be lowest in the UBI scheme and lowest in the control group. Furthermore, concepts such as loss aversion and reference dependence were studied (Haigner et al., 2012). The treatment effects were hardly present, and the hypotheses could not be confirmed. This might, however be due to several caveats.

Some aspects that drive the labour supply impact of a UBI could not be included and measured, such as financially allowing for taking part in trainings. The concepts of work and leisure were artificially simplified, without heterogeneity in the job offer and leisure being reduced to surfing on the internet (Haigner et al., 2012). Additionally, participants were likely to be prone to the experimenter demand effect, which states that participants perceive work as what is expected from them and behave accordingly. It should also be noted that all participants were (Haigner et al., 2012).

Lab experiments remain a highly simplified and artificial simulation of the real world and can only focus on a certain range of factors (Hogarth, 2005). On the other hand, this can

[6] More specifically: In Haigner et al. (2012), 108 participants took part in six sessions (changing treatment groups every two sessions) and were split up into three treatment groups. The control group had no taxes and no redistribution, the first treatment group had 50% taxes and redistribution and the UBI treatment group had also 50% taxes to finance the UBI. For the full description and the results of the experimetns, see Haigner et al., 2012. Before taking the test, participants filled out a social orientation test, which aimed at classifying them into either individualists or co-operators and then participants were allowed to have one trial period. Before each session, participants could then choose between the three options.

be an advantage, as different hypotheses with a different combination of included factors can be tested.

The incorporation of the complexity of our behaviour and the differentiation between the mechanisms that are behind this complexity, could provide crucial insights into the microfoundations that are needed to build models for the assessment of the economic feasibility of UBI (Noguera & de Wispelaere, 2006).

4.2 Field Experiments

While lab experiments act in a smaller, highly artificial environment, field experiments extent the study of economic behaviour to a sample of the population in the real world. Universal basic income field experiments offer the opportunity to benchmark "make-work policies" with a scheme that leaves it up to the participants what decision they want to take with regard to their work-life balance (Groot, 2005). According to Groot (2005), labour market effects are among the most debated issues in labour economics and they have the largest influence on the economic feasibility of UBI (Groot, 2005).

The three types of experiments analysed here are randomised controlled trials (RCT), saturation studies and natural experiments. An RCT is an experiment designed in a way that the factors which want to be studied are isolated, by using randomisation to control all other factors that might influence the outcomes. A saturation study identifies two relevant communities and gives the treatment to every individual who is part of one of the two communities, while the other community receives no treatment and is used as a control site (Widerquist, 2018). A natural experiment "includes any event not under the control of a researcher that divides a population into exposed and unexposed groups" (Craig, Katikireddi, Leyland, & Popham, 2017, p. 40).

Before looking at the specifications of the different experiments, a few general points, applying to all types of experimental studies in UBI research will be raised.

A first issue is that the sample is just an estimate of the population and one can thus not be sure whether the found effects are representative estimations for a population wide implementation of the policy (Widerquist, 2005).

A problem, which is only minimally discussed, especially in politics and in the public sphere, is the lack of the demand response in the measurements of experiments (Widerquist, 2005). Looking only at the supply response has the absence of a net market response as a consequence, which makes it hard, if not impossible, to come up with reliable estimates for the labour market reaction. The experiments thereby implicitly assume a completely elastic demand (firms will gladly hire labour at the current wage but would never pay higher wages to hire employees), which means that the market equilibrium is solely determined by the horizontal shifts in labour supply. Without including the elasticities of labour demand, experiments can only estimate the boundaries of an area of possible outcomes (Widerquist, 2005).

According to Widerquist (2005), a backward bending supply curve can be theoretically ruled out. [7] Having ruled out this specific case, the limitation regarding the estimation of the market response has some significant effects on the estimates, as listed by Widerquist (2005):

- A decrease in labour hours would be less significant than predicted by the experiments;

[7] A backward bending supply curve is present when workers (especially in the low wages segment) increase working hours when wages decrease, in order to sustain their current level of consumption. The reason why it can be ruled out here is that a substantial negative income tax in the low wage segment reduces the share of income attribuable to work.

- The rise in income of recipients and thus the impact of the programme on poverty would be bigger than predicted via augmented salary rates;
- The cost of the programme in terms of tax dollars would be less than predicted;
- The efficiency loss of the program would be smaller than projected;
- The growth in wages would generate a cost to employers that the experiments could not estimate.

The impossibility to estimate the market response in a negative income tax (or universal basic income) experiment is crucial to be aware of, especially for the discussion of this paper, since the issue surrounding the exclusion of demand weights heavier when researchers try to transfer the results over to the cost of a countrywide policy (Widerquist, 2005).[8]

Another fallacy of experiments is that no taxes can be levied on participants and this means that the experiment would make no difference between gross and net benefit. This difference has, however, a huge impact on the behaviour of people.[9]

The inability to study what the effect on net contributors will be, causes serious problems to evaluate the economic feasibility of BI, because the consequences of the lost income for high income earners under a UBI scheme, on overall economic activity are non-

[8] Jongen et al. (2014) argues that the assumption of a perfectly elastic demand is legitimate for a small open economy like the Netherlands. See the part on general equilibrium models and triangulation for further details.

[9] To solve this issue, experiments can simply ignore the issue (and thereby overrate the effect of UBI), only include people that already pay almost no taxes (creating a selection bias), or simulating taxes, by decreasing the UBI amount as income increases (which would be equal to a negative income tax and not a UBI) (Widerquist, 2018). The former solution is being employed by the natural experiment that will be …/… …/…analysed, since everyone winning the lottery received the money, without additional taxes. The second solution was used in Finland for instance, where only unemployed people received the UBI (KELA, 2016) and the latter was used in the U.S. and Canadian negative income tax experiments.

negligible (Widerquist, 2018). The assumption that, actual net contributors pay no new taxes, thereby ignoring their smaller budget, leads to an exaggeration of the effects on economic activity and a bias of the community effects, because net beneficiaries and net contributors interact in the market (Widerquist, 2018).

An example is a computer simulation that tried to adjust for this limitation in the Gary experiment. It estimated a work-reduction response, equal to solely one-third of the work-reduction measured in the Gary experiment. Whether it is 1.6% or 4.5% makes a big difference for the economic feasibility of UBI (Widerquist, 2018).

Moreover, since experiments are conducted in specific places and in a specific economic and social context, the results are harder to replicate (Groot, 2005). There are, however, also some experiment-specific advantages and caveats and those that play a role in the assessment of the economic feasibility of UBI, will be described for each different type of experiment.

4.2.1 Randomised controlled trials

4.2.1.1 Methodological particularities and limitations

Randomised controlled trials (RCT), reveal effects on the individual level, controlling for many, but therefore testing fewer factors. Feedback and community effects, however, are left out of the picture (Widerquist, 2018). This is a considerable issue, especially since community effects are likely to be extremely important in the UBI discussion (Standing, 2012). Figure two visualises stylised facts raised by Widerquist (2018) regarding community and feedback effects. The mechanism starts with the introduction of a UBI policy reform, which would negatively affect work, reducing labour supply and also reducing the tax base. To counteract this trend, employers improve wages (increasing the tax base) and working conditions overall, which decreases governmental expenditure for health care. Consequently,

workers start working more again, increasing labour supply and the tax base. Those three steps would probably lead to cultural, educational and other societal changes, which could lead to further, unknown feedback effects and most probably further changes on the labour market (Widerquist, 2018). An RCT experiment is only capable of measuring the first stage of what is a chain of complex feedback effects. This illustrates the complexity of such a far-reaching and broad policy reform like UBI.

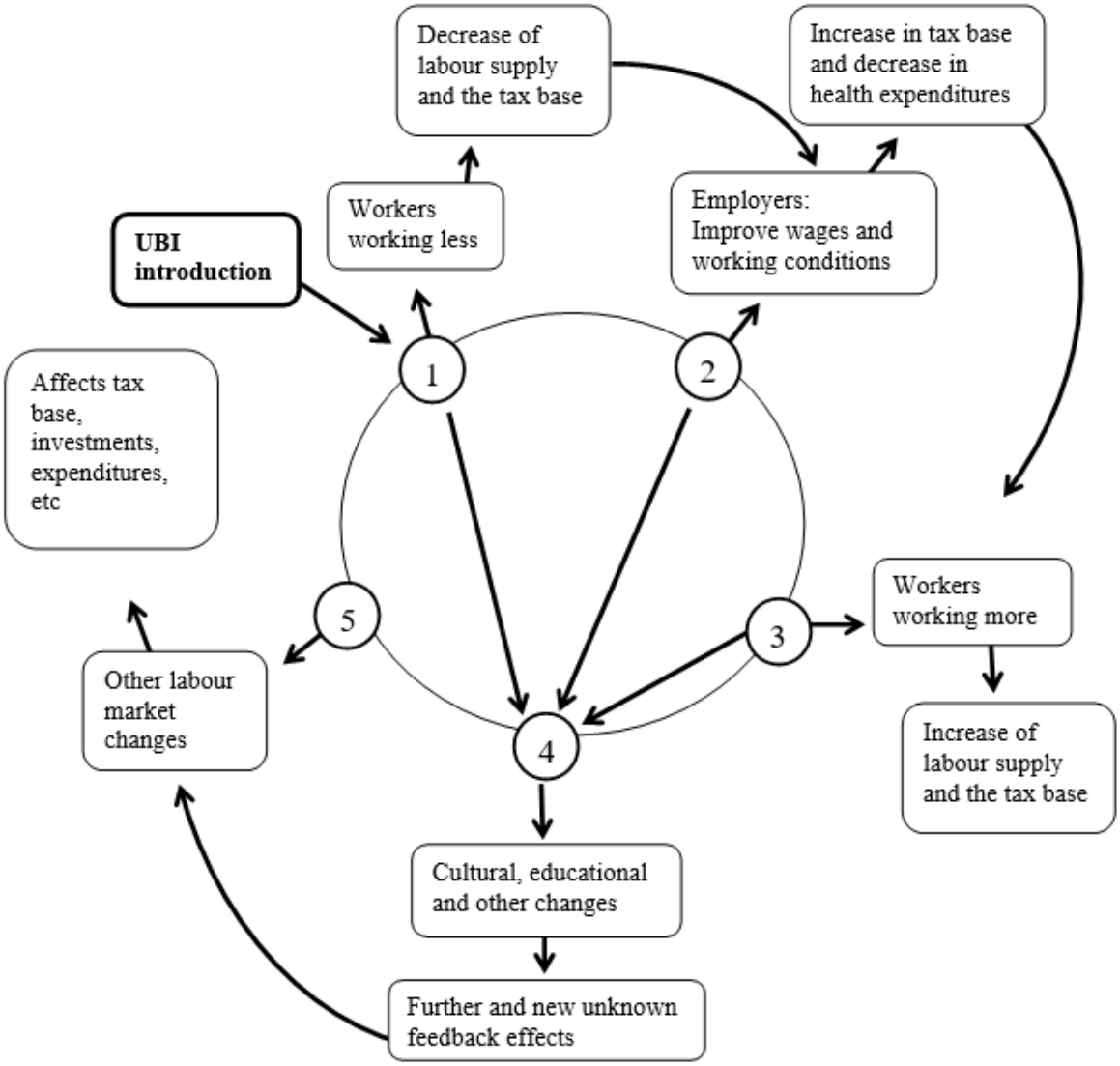

Figure 2. *Simplified visualisation of community and feedback effects of a UBI reform.*

4.2.1.2 Case studies

The negative income tax experiments conducted in the United States and Canada (see table one for a summary) are used as a case study to illustrate RCT and saturation studies.

It is important to note that the experiments all had grant levels that ranged between 50% and 150% of the poverty line (see appendix A for overview of poverty line calculations). Furthermore, various constant marginal tax rates[10] were used, meaning that all the experiments were employing a flat tax, except for two variations of the SIME/DIME experiment. This allowed for testing a larger variety of potential parameters, but it also decreased the statistical significance, by reducing the number of observations. The key question was about the effects of the different treatments on the average participants' hours of work (Widerquist, 2005). Various studies have estimated the effect that the negative income tax had on work reduction and the results were overall negative, with large divergences in terms of estimated effect (see appendix B).

An interesting result that came out of the negative income tax experiments is that the work reduction is partially due to the result that many (temporarily) unemployed workers take more time to find their next job, which could increase their bargaining position, corresponding to a social benefit and improve job matching, which corresponds to an increase in economic efficiency (Widerquist, 2018).

[10] Here this is also called the take back rate, which is the rate at which benefits are reduced as the participants increase their private incomes (Widerquist, 2005).

4.2.2 Saturation studies

4.2.2.1 Methodological particularities and limitations

In a saturation study, all people within a community (e.g. town) receive the same treatment and are then compared with a control community (a comparable town) that has been observed without receiving the treatment. Saturation studies are very useful to study community effects, because ideally everyone in the community is included in the treatment, which enables feedback effects on a community level to be revealed. This aspect is important especially for UBI studies (see figure two and associated description) since many expected effects occur at the community level and depend on the interaction of individuals in markets and cultural settings. Even though, saturation studies might be able to find local feedback effects (e.g. neighbourhood) or include the first couple of steps in such a feedback loop, at one point the feedback effects spread into so many fields, that it becomes nearly impossible to keep track of them, or the effects only occur at the national level (e.g. steps four and five in figure two). So, even when conducting saturation studies, feedback and community effects remain to a certain extent a grey area.[11]

Table 1

Summary of the U.S. and Canadian negative income tax experiments

[13] Furthermore, both the RCT and the saturation studies are prone to the Hawthorne effect, which states that people are likely to change their behaviour when being observed. This is exemplified in today's globalised world, where the media has constant access to participants through multiple channels (Widerquist, 2018). The Hawthorne effect also counts for laboratory experiements (maybe even to a stronger extent) due to the artificial environmnt (Specianova , 2018).

Name	Location(s)	Data collection	Sample size: initial (final)	Sample characteristics	G^*	t^{**}
The New Jersey Graduated Work Incentive Experiment (NJ)	New Jersey and Pennsylvania	1968–1972	1216 (983)	Black, white, and Latino, two-parent families in urban areas with a male head aged 18–58 and income below 150% of the poverty line	0.5	0.3
					0.75	0.5
					1.00	0.7
					1.25	
The Rural Income-Maintenance Experiment (RIME)	Iowa and North Carolina	1970–1972	809 (729)	Both two-parent families and female-headed households in rural areas with income below 150% of poverty line	0.5	0.3
					0.75	0.5
					1.00	0.7
The Seattle/Denver Income-Maintenance Experiments (SIME/DIME)	Seattle and Denver	1970–1976 (some to 1980)	4800	Black, white, and Latino families with at least one dependant and incomes below $1100 for single parents, $13,000 for two parent families	0.75	0.5
					1.26	0.7
					1.48	0.7–0.025y
						0.8–0.025y
The Gary, Indiana Experiment (Gary)	Gary, Indiana	1971–1974	1799 (967)	Black households, primarily female-headed, head 18–58, income below 240% of poverty line	0.75	0.4
					1.0	0.6
The Manitoba Basic Annual Income Experiment (Mincome)	Winnipeg and Dauphin, Manitoba	1975–1978	1300	Families with, head younger than 58 and income below $13,000 for a family of four	C$3800	0.35
					C$4800	0.5
					C$5800	0.75

Source: Widerquist (2018), with G^* = the grant level and t^{**} = the marginal tax rate.

RCT and saturation studies are short-term experiments, which means that participants know that they will not receive a UBI for the rest of their life. This has a significant impact on their behaviour and the results might be different from the long-term effects under an actual UBI policy (Widerquist, 2018).[12]

4.2.2.2 Case study

Until now, the only saturation study conducted in a developed country is the Mincome experiment in Manitoba (see table one for further detail). It combined an RCT with a saturation study, making a unique contribution to the literature (Widerquist, 2018). Many difficulties remain though. The study was a saturation site in the sense that everyone who

[12] An individual might, for example, keep working out of fear of not getting a job after the experiment finishes, while that same person would have stopped working if they had known the monthly payment would not cease after X number of years.

wanted to participate could do so, but only given they met the requirements of age and maximum family income (see column ‘sample characteristics’ in table one). This was a necessity, because otherwise the experimenters would have had larger withdrawal rates, with only those who expected their earnings to decrease in the future staying, and everyone for whom increases in taxes and liabilities more than compensated the negative income tax revenues, would have withdrawn. This means that community effects can still only be assessed to a limited extend and that the effects on net contributors could not be measured.

4.2.3 Natural experiments

There is also limited but valuable literature on natural experiments that can provide insights into UBI research. To demonstrate this, the Belgian win for life (W4L) lottery game, that was used by Peeters and Marx (2006) to set up a natural experiment study, will be taken as a showcase. W4L winners receive a lifelong monthly unconditional payment, which might look like a BI, but it has some important differences (Peeters & Marx, 2006). First, lottery grants always increase income, no matter how much you earn or what you pay in taxes. Opposed to UBI schemes, there is no breakeven point after which you pay more in taxes than you receive as a grant. Neither is the grant adjusted to inflation or welfare levels (Peeters & Marx, 2006).

At the time of publishing the findings (circa 2006), the lottery grant was approximately 120% of the Belgian poverty line (see appendix A). The results of such a study, regarding labour market reactions, can lead to interesting conclusions:

If singles, after winning the W4L lottery, do not stop working and do not become self-employed, then this same response can be expected after receiving a UBI. If one of the two responses does not hold though, then no inferences to a UBI scheme can be made. Couples must split the lottery grant, which would not be the case under a UBI scheme, so if they stop

working or become self-employed, then they would also stop working under a UBI. If they show different reactions, again no inferences can be made for the UBI situation (Peeters & Marx, 2006). Generalising findings, especially those for couples, to a UBI scheme, is bound to many assumptions and therefore needs to be done with caution (Marx, 2008).

Even though the experimental specifications cannot be changed in a natural experiment, a survey before winning/losing and, while receiving/not receiving the grant, can be conducted with the winners and a control group (lottery players that have not won yet) respectively (Peeters & Marx, 2006).[13] Other limitations are for example that individuals in general may react in different ways to different forms of unearned income. Thaler (1990) calls this fungibility, which could lead to a different response when receiving a monthly lottery grant, rather than receiving a monthly UBI. Furthermore, the number of tickets participants buy raises or lowers the chances of them winning, which needs to be statistically controlled for. Additionally, even if every player had an equal chance of winning, there is a selection bias of people who play the lottery (Peeters & Marx, 2006).[14] Besides this selection bias, the sample is more representative of the population than it is for RCT experiments, especially since also people with higher incomes are included (Groot, 2005). Since a random sample of lottery players all around the country receives the grant, community effects cannot be accounted for.

The fact that natural experiments like this one are long-run or even life-long experiments removes time horizon biases, such as the ones mentioned in the last section. Moreover, various countries have already set up similar lotteries, making comparison easier

[13] This allows to control for most differences between the treatment and control group and thus eventually to find significant differences that can be related to receiving the treatment, like in an RCT.

[14] Lottery players can differ in their behavioural responses compared to the average participant from a generalised sample (Peeters & Marx, 2006).

and allowing for an analysis of the effect of differing institutional systems, without having to set up new costly experiments in different countries (Peeters & Marx, 2006).

The results of the W4L study show that for almost all groups of participants, the situation with respect to the labour market (stop working, becoming self-employed, decreasing hours of work) did not change significantly.[15] Interestingly, many participants voluntarily added to the survey that since winning the lottery uncertainty about their future decreased, enabling more security, a more relaxed everyday life and the ability to make more balanced choices (Marx & Peeters, 2008).

Another survey of lottery winners analysed effects of winning 15,000$ a year for twenty years on labour supply, but also on other economic variables, such as savings, consumption or earnings (Imbens, Rubin, & Sacerdote, 1999). The results need to be treated with caution, since there might be survey biases and because of the biases already mentioned in this paper, regarding natural experiments.

Imbens et al., (1999) found that labour supply and earnings were not impacted significantly, savings decreased substantially in several categories (suggesting that there was no need for precautionary savings), while consumption (measured by housing and car prices, as well as debts) stayed rather constant. Moreover, some evidence indicates that labour

[15] Almost all the singles (13 out of 14), working at the time of winning kept working and can be expected to do so under a UBI. Working couples overall also kept working (37 out of 41) and in all couples, where only one partner was working before, no one quit working. None of the participants became self-employed and no single person reduced the hours of work. For singles, this can be seen as a sound approximation for the behaviour under a UBI scheme. Working couples did not diminish their working time apart from three couples. As has been stated in the natural experiments section, generalisations about couples, with regard to UBI, are based on many assumptions and can thus not be done in such a straightforward way as for singles. There seems to be a small trend that a minority of households tends towards reducing working hours when given sufficient financial incentives (Marx & Peeters, 2008).

supply of participants with zero earnings prior to winning the grant, increased after receiving the grant. Apparently, labour market participation elasticities only changed after a few years' time, suggesting that it took individuals some time to adjust to their new economic circumstances. This result again stresses the bias created by short term experiments (Imbens et al., 1999).

4.2.4 Conclusion of field experiments

The discussed experiments were publicly subsidised and not financed from UBI recipients' tax revenues and therefore cannot adequately provide insights into the financing in terms of costs and revenues of a UBI scheme (Specianova, 2018).

Nevertheless, experiments can research claims and provide insights into relevant microfoundations of economic behaviour, that are of crucial importance for macroeconomic models and for the debate about whether UBI is financially feasible or not (Widerquist, 2018).

Moreover, there are many studies that try to estimate how the work-effort response influenced the additional tax cost of the programme. The percentages show the cost of the programme without the labour market response as a fraction of the cost with the labour market response: 23-55% (Keeley et al. 1978a), about 33% (Burtless, 1986), 78% (Ashenfelter 1978), and close to 100% (Rees & Watts, 1975) (as cited in Widerquist, 2005, p. 63).

On the one hand, those studies show how important it is to include behavioural changes, as it can widely influence (negatively e.g. Keeley et al., or positively e.g. Rees & Watts) the economic feasibility of UBI (or in this case negative income tax). On the other hand, those studies show that it is crucial to properly analyse the caveats of research, because

all those studies ignore labour demand (assuming a perfectly elastic labour demand) and thereby overall market effects (Widerquist, 2005).

Atkinson (1995) states that the negative income tax experiments have reduced the range of uncertainty regarding the response of hours of work to taxation. Experiments in general can throw light on economic effects of policy reforms and provide clues on how it might work.

In the next part of this paper, simulation models that focus stronger on the financial feasibility and ignore behavioural changes are analysed. Doing this seems like an interesting exercise, considering the problems and uncertainties encountered when studying the impact of behavioural changes on the economic feasibility of UBI.

4.3 Back-of-the-envelope and Static Microsimulation Models

Whereas lab and field experiments look at the individual or groups of society respectively, and then project this behaviour on the whole population, other methods use simulations, which run a hypothetical UBI scheme on the whole economy. Those models are summarised here as macroeconomic models. In a first part, back-of-the envelope models, which look at the cost of UBI in a vacuum, and microsimulation models, where UBI is implemented in the social security system, both static models (excluding behavioural changes), will be analysed.

4.3.1 Back-of-the-envelope calculations: UBI in a vacuum

Widerquist (2017) criticizes the often-used gross cost as a way of calculating the financial cost of UBI. He states that the real cost of universal basic income is only a fraction of the often-stated gross cost (universal basic income amount times the population), because most of it consists in giving back the same money to people in the form of a UBI, which was

earlier collected in the form of taxes. The back-of-the-envelope model thus calculates the real cost, also called the redistributive burden or net cost.

4.3.1.1 Case study

In Widerquist's (2017) model, the size of the UBI is based on the official poverty line and set at 12,000$ for adults and at approximately half the poverty line per child (younger than 18).[16] The marginal tax rate of 50% is chosen for mathematical simplicity and because it balances "marginal incentives with the need to phase out benefits" (Widerquist, 2017 p. 5). The author also discusses two alternative scenarios where those parameters are altered (Widerquist, 2017). Widerquist (2017) keeps the model, which is based on the U.S. census data, simple, looking at UBI in a vacuum and not asking how to incorporate UBI into the current social security system or how exactly to pay for UBI.

The model looks solely at how much it costs, which means that it only considers net beneficiary households and it suffices to know that net contributors pay enough in taxes to pay for their own UBI. Therefore, the redistribution through collecting taxes and handing out UBI grants, represents nothing else than a transaction cost. This transaction cost is largely uncorrelated with the size of the transfer and Widerquist (2017) assumes it to be 0.7% of total budget, equal to the administrative cost of social security. The gross cost minus the tax collections provides the net cost, to which the transaction cost is then simply added

[16] The poverty line from my calculations (for 2017) differs from the poverty line estimated by the Census Bureau (for 2015), which might be due to different reference years or to differences in calculations.

(Widerquist, 2017).[17] The fact that Widerquist (2017) comes up with a net cost in the end shows that he uses a scheme that is not budget neutral.[18]

4.3.2 Static microsimulation models

Static microsimulation models use in essence the same methodology as Widerquist (2017), but they extend it by using microdata instead of averages and analysing how UBI would be incorporated in the current tax and benefit system. Doing this enables researchers to come up with a revenue neutral scheme, which balances out the net costs by modifying the tax and social security system (Torry, 2016b).[19] Microsimulation models use microdata at the individual and household level (preferably of at least 0.1% of the population) and then a computer programme simulates the effects of a certain policy reform on the whole economy. Income and expenditure information is used to generate household disposable income and then the social security system can be modified, to test the effect on households' disposable incomes.

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[17] The net cost is not comparable between countries, because of different population sizes and other intra-country differences. The net-gross cost ratio, however, can be compared between countries with similar levels of inequality and per capita income (Widerquist, 2017).

[18] Widerquist (2017) looks at households but calculates UBI based on the average number of adults (for each income range) and children living in the household. (Due to a lack of data, the number of children is the same for every income range and is based on the national average of children per household). Moreover, taxes are usually based on the household and not on an individual basis. Using averages means that also average breakeven points need to be used. There can be large differences within income ranges as to when a household reaches the breakeven point and some actual net contributors might show as net recipients within this model. If those differences do not cancel each other out, there is an additional limitation to the model that might bias the cost estimates (Widerquist, 2017).

[19] Torry's (2016a) scheme is strictly revenue neutral.

Comparing the initial level with the level after the policy reform enables the researchers to assess the net cost of the UBI (Torry, 2016b). This provides a more flexible and advanced method, compared to the back-of-the-envelope model. On the other hand, neither of the two methods can simulate contributions to the financing of UBI attained by changing the detail of tax allowances, relating to expenditures (Torry, 2016b). Moreover, in the schemes analysed in this section, no short run or long run behavioural responses are considered, which is the main difference to behavioural microsimulation models and general equilibrium models, which will be analysed in the next section.

4.3.2.1 Case studies

In the scheme set up by Torry (2016a) (looking at the UK), income taxes are raised by 3%, personal income tax allowances are abolished and adjustments to the national insurance contribution are being done,[20] which eventually corresponds to a progressive tax. The existing social benefit structure is left in place (Torry, 2016a). In the OECD (2017) model (looking at Finland, France, Italy and the UK) the social contributions system is kept in place, tax-free allowances are abolished, and the income tax thresholds are all shifted down simultaneously, corresponding to the amount of the zero-rate tax band. The model also abolishes most existing benefits but indicates a few specific ones that are retained.[21]

[20] People with above upper earnings income, the national insurance contributions increased from 2% to 12% and the primary earnings threshold is decreased to zero, meaning that people with low incomes have to pay no more taxes and people with higher incomes pay higher taxes.

[21] Public services such as health education or care, or other in-kind benefits are not affected and some benefits that are supposed to compensate costs linked to special needs are only reduced for the amount of the UBI. The same holds for housing benefits.

Abolishing social security benefits, leads to the fact that some low-income households might end up as net losers, whereas this is not the case under Torry's (2016a) scheme, where the social benefit system is left in place. To keep the UBI level high enough to eradicate poverty and to make poor people better off, the financing would require additional tax revenues (the model provides alternative scenarios with higher tax rates, like Torry (2016a) who raises income taxes by 3%) and maybe a progressive taxation of the UBI itself. This has the advantage that it is more targeted at supporting lower income groups (OECD, 2017).[22]

In the OECD (2017) model, adults at or below the working age initially receive an amount that is set at the current guaranteed minimum income benefits (GMI), but the exact amount depends on the tax and benefit system of the specific country and how this effects the financial resources to fund BI. Therefore, the amount is a bit higher or lower than the targeted amount (GMI), which is a less ambitious objective than the poverty line, but still better than just abolishing all social benefits and redistributing them among the population as a flat rate UBI (see table two for more details). Moreover, UBI would only be paid to working age people and children and, hence, not to pensioners whose benefits and taxes remain unchanged. As mentioned before, all current social contributions stay as they are, therefore the pension system stays in place as well (OECD, 2017).

Torry (2016a) sets the UBI at 60 pounds per week (approximately 240 pounds per month) which replaces the money people have to pay more, due to the abolishment of

[22] Exceptional for the methodology the OECD (2017) uses is that non-take up of benefits, before the introduction of UBI, is not ignored, which reduces the risk for underestimation of the cost of the UBI and the amount by which household income would increase.

personal income tax allowances and adjustments to the national insurance contributions (Torry, 2016a). This corresponds to about 32% of the UK poverty line (see appendix A).[23]

As stated at the beginning of this part, the microsimulation studies are purely static and do not analyse dynamic effects of a UBI and how those could affect the economic feasibility.

Thus, a simulation can be run without (in a vacuum) or including the cost of integrating UBI in the current benefit system. The former method conducts a simpler analysis and does not impose a way of implementation but provides an isolated UBI financial burden as a net cost. According to the results, the net cost corresponds to 539 billion dollars per year, the equivalent of roughly 16% of the gross cost (UBI amount times the population) (Widerquist, 2017).

Using a back-of-the-envelope model or a static microsimulation, where behavioural responses are completely left out of the picture, simplifies the analysis, but it also excludes a key factor which might substantially impact the economic feasibility of UBI. Aaberge and Colombino (2014) therefore interpret microsimulations as ‘the day after’ predictions, meaning short-term predictions, when economic agents and markets have not had time yet to adjust to the reform (p. 27).

Other scientists applied a microsimulation model including a demand effect to the cost of a negative income tax as examined in the experiments, or a general equilibrium model framework (Greenberg, 1983; Bishop, 1979) to analyse the effect of a negative income tax on efficiency (as cited in Widerquist, 2005, p. 63). Widerquist (2005) states, in the year 2005, that there are “unfortunately [no other] articles employing a demand response in otherwise

[23] Amounts are distinguished for children, who receive the lowest UBI (while children benefits remain in place), people above working age, people between 16 and 25 years old and, eventually, working age people who receive the full amount

comparable models that generate comparable estimates of tax cost, hours worked, efficiency lost, and impact on inequality" (p.63). In the following part of this paper about general equilibrium models, more recent models, including labour demand simulations will be presented and reviewed in more detail.

4.4 General Equilibrium Models

The possibly substantial impact of labour markets on the economic feasibility of UBI, was described at the end of the field experiments part. This part will show how macroeconomic models can contribute to this discussion.

For the sake of brevity, this paper is going to focus on one specific general equilibrium model, which is the MIMIC model (when applied by Mooij in 2006), a very comprehensive model, set up to find policy reforms that could improve labour market participation.[24] This model will be complemented with a few other general equilibrium models, such as the MICSIM model, or a general equilibrium model by Colombino, Locatelli, Narazani, and O'Donoghue, (2010), to show some differences in terms of approach.

MIMIC is based on the Dutch economy and institutions and thus, even when complemented with other models, it can only represent general equilibrium models to a certain extent (Graafland, de Mooij, Nibbelink, & Nieuwenhuis, 2001). The model conducts

[24] MIMIC is the applied general equilibrium model of the Dutch CPB, the Netherlands Bureau for economic policy analysis (Jongen, van Gameren, & Graafland, 2003), where MIMIC stands for Micro Macro model to analyse the Institutional Context. It has been used many times over the past 25 years by the CPB, but also by other institutions such as the European Commission and the international labour organisation. In 1987, work on the model started and after various improvements, Graafland et al., (2001) summarised the model.

a quantitative economic assessment of UBI and a few other possible policy reforms, to measure the structural effects of policy reforms on the Dutch labour market (Mooij, 2006).

MIMIC compares the baseline scenario which shows all developments of the variables until 2040, with a long-term equilibrium scenario when UBI is imposed, where the difference between the two scenarios is seen as the long-term impact of UBI in the Netherlands (Mooij, 2006).[25]

The model is based on an ex-ante balanced budget, meaning that taxes and net costs balance out. The strength of this model is that, to maintain the public budget balanced, it not only adjusts personal income tax rates proportionally, but it also takes into account changes in public revenues ex-post, which can be due to behavioural changes and which can impact the tax rates necessary to fund a UBI policy (Mooij, 2006).

4.4.1 Model particularities and limitations

4.4.1.1 Institutional framework

The model incorporates institutional details of the Dutch tax and social insurance system.[26] Included are institutional variables such as the impacts of UBI on the marginal tax burden, replacement ratio and income tax rates (Mooij, 2006). The interaction between the formal and the informal economy is also modelled in the MIMIC framework, which contributes to a more representative evaluation of the costs of UBI (Bovenberg, Graafland, & de Mooij, 2000).

[25] Changes in public revenues due to exogenous developments in the baseline scenario are not predictable and are therefore not included in the model.

[26] Overall, MIMIC is a model constructed for a small open economy like the Netherlands, which should be kept in mind when reading about the methodology and when interpreting the results (Graafland et al., 2001).

4.4.1.2 Heterogeneity and disaggregation

When redistribution of wealth takes place, such as from rich to poor households, then this has distortions in the labour supply as a consequence and subgroups often react in different ways to this redistribution. Identifying the heterogeneity of labour market responses of various sub-groups, which is usually measured by the wage elasticity of labour supply, is thus indispensable for an efficient design of tax and benefit reforms (de Boer, Jongen, & Mastrogiacomo, 2018).

MIMIC measures the impact on the income distribution and labour supply on 40 different household types. More specifically, the heterogeneity applies to labour market status, education levels (i.e. skill levels), wages and preferences for labour (Mooij, 2006). The income distribution relies on Dutch microdata, which allows for a simulation of the macroeconomic implications of policy reforms based on microeconomic reactions by economic agents. Making skill levels and investments in on- and off-the-job training or education part of the model is necessary because the increased marginal tax rate that comes with UBI, would probably adversely affect those investments, which in turn increases distortions on labour supply and further affects economic performances (Linden, 2002).

The disaggregation of households also enables the model to explore the trade-offs that policy makers are confronted with, such as the equity versus efficiency trade-off (Bovenberg et al., 2000; Graafland et al., 2001).

4.4.1.3 Theoretical framework

The model's behavioural equations are based on a collection of broadly accepted theoretical frameworks (Mooij, 2006), which will not be analysed in all detail in this paper, because that would be unnecessarily extensive. The key aspects that highlight the advantages

and disadvantages for an assessment of the economic feasibility of UBI will be highlighted instead. Combining a large degree of disaggregation with a strong reliance on theoretical frameworks is one of the reasons MIMIC has been set up. Pre-MIMIC macroeconomic models were lacking a sound microeconomic base and were thus prone to the Lucas critique (Graafland et al., 2001). The Lucas critique states that when models rely on empirically estimated reduced-form equations, then those equations may allow evaluations of marginal policy changes, but do not offer a valid framework when institutions change more than marginally (which is the case under a UBI reform) (Mooij, 2006). The reliance on a widely accepted theoretical framework thus avoids the Lucas critique.

MIMIC has three broad sub-models, describing household and firm behaviour and the functionality of the labour market. The interactions of households and firms take place at the goods market, the financial market and the labour market. [27] Allowing economic agents to go through an iterative process on different markets where they can interact, enables the model to simulate community and feedback effects to a certain degree.

For this analysis, focus will be on the labour market, where households supply labour, while the government and firms exert the demand for labour force. Wages are negotiated between firms and households and contractual hours data is used as an input for the model.[28] Various labour market imperfections are then introduced, so that unemployment is present, even in equilibrium (departing from the traditional assumption of market clearing).

[27] On the goods market, firms set prices and supply the ensuing demand for goods, while the public sector and households represent the demand for goods. With regard to the financial market, households are net suppliers of financial assets, while the public sector and firms put forth net demand to finance investments and public deficits respectively. The value of the currency and interest rates are exogenous.

[28] According to Jongen et al. (2014), using contractual hours might not be a good approximation of income for high income earners, since their hours might deviate from the contractually fixed amount.

The model further distinguishes between short term and long-term unemployment. Imperfections are considered using a wage bargaining model, efficiency wages and costly job-matching (e.g. search costs). This is combined with imperfections and distortions caused by the current institutional system (tax and insurance legislation, e.g. subsidised employment) (Graafland et al., 2001).

Furthermore, heterogeneous household behaviour is determined by maximising a utility function under a time and budget constraint. They can then allocate their time to different activities, where they choose the highest utility combinations among working (only discrete options regarding working time), black labour, housekeeping and leisure (Graafland et al., 2001).

Interestingly, Jongen, de Boer, and Dekker (2014) in their model (MICSIM) [29], ignore general equilibrium effects on prices and wages and this is since the Netherlands is a small open economy and on the statement by Aaberge and Colombino (2014), that in the very long run, labour demand can be assumed to be perfectly elastic. Ignoring a labour demand response (hence assuming a perfectly elastic labour demand), can be considered as the 'month after' prediction, including behavioural changes by households, but showing no reaction yet by the market, which takes more time to adjust (Aaberge & Colombino, 2014).

The strong reliance on microeconomic theory, which is based on many questionable assumptions, challenges the reliability of the simulation results (Pech, 2010). To counteract this issue and improve the reliability of the model, several sensitivity analyses can be and have been conducted with the MIMIC model (Graafland et al., 2001). De Boer and Jongen (2017), who use a structural model of labour supply that is comparable to the one used by

[29] The MICSIM model is also a behavioural microsimulation model for the assessment of structural labour supply effects resulting from modifications of the tax benefit system. For further details, see (Jongen et al., 2014).

Mooij (2006), suggest to comparing labour market reactions of an actual policy reform (quasi-experimental studies), with the simulation outcomes of the policy reform.[30] It has been tested whether the model can reproduce historical changes in the labour market in the Netherlands when using the institutional context of the seventies as an input. MIMIC was able to reproduce the changes in high and low skilled developments, vacancies and unemployment duration, rather well (Graafland et al., 2001).

4.4.1.4 Empirical basis

Besides the theoretical foundation, the model additionally has a sound empirical basis, which is a crucial factor for providing a firm quantitative assessment of policy measures. The model uses time series data to estimate production functions and wage formation processes (Mooij, 2006).

The calibration of the model parameters is based on data from 1993 and the utility function and distribution functions for heterogeneous preferences have a calibration of the parameters that is based on labour supply elasticities from a meta-analysis of empirical estimations in Dutch literature (Graafland et al., 2001). Using a non-recent institutional framework and data bears the risk of relying on an institutional and economic context that might not be representative of the current environment (Jongen et al., 2014). [31]

[30] In the case of UBI, however, there are no such quasi-experimental studies because there has never been an actual country-wide policy reform of a UBI. On the other hand, MIMIC can be tested for other policies. This can provide more credibility to the model overall and consequently also to the simulation results regarding UBI as well.

[31] Jongen et al. (2014) use in the MICSIM model a more recent dataset, which might include institutional changes, such as the significant increase of female labour market participation rate in the twenty-first century.

As stated earlier, not only economic but also many behavioural aspects play a role in the decision-making process with regard to individual or household behaviour on the labour market. The introduction of a UBI, accompanied by the presumably large tax and benefit changes, would create a new environment. Labour supply and other elasticities are complex mechanisms and taking pre-UBI elasticities and using them to estimate post-UBI responses is a critical manoeuvre.

According to Specianova (2018), the model estimates could therefore indicate the direction, but not the scope of the labour supply response. The issue of using empirical data to construct labour supply elasticities and applying them to the model after the introduction is also a reminder of the Lucas critique. The introduction of a UBI would be an institutional change that would alter the environment in which economic agents act more than marginally, thus labour supply elasticities would, most probably, alter as well (see triangulation section for further discussion).

Additionally, using solely the elasticity of labour supply might not be enough to assess the labour supply response. A possible addition to labour supply elasticities could be the elasticity of taxable income, which includes a broader range of behavioural responses, such as changes in effort more generally, occupational choice and tax avoidance (Saez, Slemrod, & Giertz, 2012).

In general, it seems though that workers' elasticity of taxable income does not significantly deviate from their labour supply elasticity. For high income workers, however, labour supply elasticity is lower, and elasticity of taxable income is higher (Jongen & Stoel, 2013). Thus, to capture the whole labour supply response of high income earners and

determine budgetary consequences of changes in taxes, the elasticity of taxable income needs to be additionally included in the model (Jongen et al., 2014).[32]

4.4.1.5 Exogenous to MIMIC

The model used by Mooij, features some further limitations and there are some important aspects that are exogenous to the model. There is, for instance, the lack of short term dynamics, which can lead to considerable errors[33] and the interpretation of the results should therefore be strictly limited to the long run results (Graafland et al., 2001).

Mooijs' (2006) analysis pays less attention to the aspect of productivity (innovation and technological adaption, for example). Even though, human capital is endogenized, having a more explicit indicator for labour productivity, such as in Jongen et al. (2014)[34], would be an interesting additional factor.

Also, several aggregate demand components, as well as innovation and entrepreneurship are exogenous to the model. Some argue that a UBI would stimulate risk-taking and thereby foster innovation and entrepreneurship, while others argue that the increased taxes would lower investments and innovation. Moreover, a UBI scheme could stimulate and stabilise demand (e.g. due to increased consumerism) or decrease demand and growth if the negative effects dominate (e.g. adverse labour market effects, inflation or a decrease in investments) (Widerquist, 2018). Jongen et al. (2014), look at indicators such as

[32] Moreover, for other countries the difference between the two elasticities might also be present for middle and low-income earners.

[33] Draper and Manders (1997) state that short run dynamics represent up to 5% of the actual employment figure.

[34] They use the change in hours in labour cost minus the change in hours. MIMIC could measure productivity by measuring the labour supply response of individuals with different skill levels. If labour supply of high skilled workers increases more than that of low skilled, then this could correspond to an increase in productivity.

consumption, for example. This could provide further insights into the discussion whether a degrowth of the economy would take place or whether consumerism would increase with a UBI.

Another exogenous factor which can influence labour supply is cultural preferences (Graafland et al., 2001) and the decreased cost of administration (including fewer costs for compliance, data security, transparency and privacy) is not considered in the model (Mooij, 2006). To assess the economic feasibility of UBI, the inclusion of this decreased cost would make sense, even if it would only be an approximation. Related to this are possibilities for reduced or increased leakages due to corruption and better or worse[35] targeting of the public expenditure beneficiaries (Widerquist, 2018).

A further crucial aspect which is exogenous to the model is the social cost that is often said to be decreased through UBI. The elimination of poverty, less exploitation of workers by employers, less economic inequality, less social isolation, better working conditions, less stigmatisation, increased social mobility, better health, a better work life balance, and increases in productive non-paid work are all examples of presumable effects of UBI on society that could reduce social costs considerably.[36] Budget savings especially through decreased health care and policing costs, decreases in subsidies and improvements in labour market efficiency could be achieved, potentially rendering a UBI scheme economically sustainable (Widerquist, 2018).

The different claims regarding the expected effects of UBI are partly testable with available techniques, but others are not. In any case, it is important to be aware of them and to be aware that those feedback effects are currently not included in very broad

[35] Benefits are not being captured by UBI recipients but by employers through decreased wages, by landlords due to an increase in housing costs, or by bureaucrats through increased overhead costs.

[36] For further detail see Widerquist, 2018

macroeconomic models like MIMIC. The MIMIC model does, however, look at the effects on economic inequality (using the Theil index), but feedback effects of economic inequality are hard to measure. Colombino et al. (2010) used a different approach than Mooij (2006) which provides some insights into how welfare and community effects can alternatively be endogenized.

4.4.2 Case studies

The application to the Netherlands was done with a UBI amount equal to 550 euros per month, which corresponds to 50% of the poverty line.[37] The general tax credit and across the board earned income tax credit were abolished. Several public grants were adjusted by reducing the current benefit by the UBI amount. Other public grants were adjusted as to maintain the current level of the grant,[38] while singles and single parents kept supplementary benefits. After those changes to the social security system have been made, the remaining net cost amounts to 45 billion euros. A flat tax is then introduced and set at 53.5% (corresponding to a 7.8% increase in the marginal tax burden) on all income to fulfil the models' objective to keep the public budget balanced.

The results (see appendix C) show a falling unemployment rate (by almost 2%), a decrease in labour supply by 5.3%. Thus, the net decline in employment amounts to 3.8% (Mooij, 2006). For more details, see appendix C. As discussed, the exogenous factors and the limitations either worsen the effects, or have a positive influence on the budget, potentially compensating this negative effect on the labour market.

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[37] The percentage deviates from my calculations (see appendix A), which is due to different reference years or eventual differences in the definition of the poverty line.

[38] Public pensions are adjusted to maintain average incomes of pensioneers, same for student grants and current welfare benefits (as well as employee insurance benefits).

A study by Colombino et al., (2010) used a similar, but simplified and less comprehensive, methodology. Heterogeneity of labour supply behaviour was employed in a microeconometric model, where behaviour was then observed in response to modification in the tax system. Looking at different institutional background (Denmark, Italy, Portugal and the United Kingdom), the current tax-transfer structure was completely abolished and in an iterative process, optimal tax rates and revenues were then endogenously determined, ending up with a budget neutral scheme for a UBI reform. One scenario used a UBI at the poverty line, adjusted for household size and it was either combined with a flat tax or a progressive tax, which both only apply after a certain income threshold.

The major difference to the MIMIC model, is the employment of other evaluation criteria for the policy reforms. A social welfare function (either based on income or based on utility which was determined by average income and the Gini coefficient, a measure of inequality), the proportion of utility winners (households whose utility improved due to the reform) and the proportion of income winners, were the used criteria for the assessment of UBI.

Same as for Mooij (2006), there is a negative effect on labour supply could be found when UBI was either combined with a flat tax, or when UBI was below the poverty line and combined with a progressive tax, leading to lower average net available income. Colombino et al. (2010), found no decrease (and even a small increase) in labour supply for a UBI policy reform at the poverty line and with a progressive tax system. Moreover, the model by Colombino et al. (2010) did not end here, but an efficiency-equality trade-off was also incorporated. The possible decrease in efficiency through negative labour supply reactions, is more than compensated by the reduction in inequality. In general, a progressive tax also lowers a possible negative effect on labour supply, as it targets high income households, who have lower labour supply elasticities.

4.4.3 Conclusion of general equilibrium models

Due to the heterogeneity and disaggregation, the model can trace back the labour supply response of each household type, allowing policy makers or researchers to see the partial responses of labour supply and not only a general number.

As could be seen with the description of the sub-models' microfoundations, labour market interactions of economic agents in different markets are endogenous and supply effects can meet demand effects. Including such a sophisticated labour market structure with various imperfections, does create some uncertainties due to the discussed limitations, but it also allows for an adequate assessment of the responses of labour supply and demand on the market. While some degree of uncertainty remains, the model seems to be able to predict past changes in the labour market rather well, but the predictions are limited in the long-run.

5 Results

5.1 Assessment Capability

Based on the analysis, it is safe to say that all the methodologies are prone to several limitations, some avoidable, some improvable and some unavoidable. Statements such as by Barry (1997) saying that "We can speculate about the way in which they might respond, but it would be irresponsible to pretend that by cranking a lot of numbers through a computer we can turn any of that into hard science", are true since all models are bound to the issue of limited generalisability of their result (p.161). Models in social sciences abstract reality to make estimations, which means that turning methodologies or results into hard science is by definition not possible.

Being aware of the limitations of models and experiments is a crucial part of two processes. Firstly, the interpretation process, because it shows which results are robust and which are not. Second, the limitations contribute to the process of shaping the models because ideas on how to improve the models can arise, which will be part of the triangulation session.

Besides the fact that all the models are prone to a couple of limitations, there were two other findings that are important for the discussion about the economic feasibility of UBI. On the one hand, the different methodologies share some results and several trends emerge, such as the negative effect on labour supply. In addition to this, it was interesting to see how the models provided results at different levels, such as the individual, the labour market or at a community level. Many of the results suggest that a decrease in efficiency might be mitigated.

The major finding, however, is the fact that all the methodologies aim to answer the question with the same approach. This approach can be summarised as ‘taxing labour’. The perception of whether a UBI scheme is economically feasible or not depends a lot on what the assumed spectrum of funding methods is. After going through all the models, it became clear that the current research methods are often lacking alternative funding methods. Most of the models do not even consider a progressive tax scheme, which does is counterintuitive, given the improved results from the models that do use a progressive tax, given the literature on optimal taxation, and given the literature stating that high income people generally have low elasticities of labour supply.

In the beginning of this paper, alternative funding methods have been discussed and it became clear that there is large potential to fund a basic income partly from other sources than labour. According to Barnes (2014), there are enough channels to set up a funding programme, independent of regular government decisions on budget, that could fund a UBI at

5000$ in the US, without touching income taxes. While this UBI would not be adequate enough in terms of the definition that was used throughout this paper, it shows how biased the literature currently is towards using income taxes, which fall mostly on the middle and lower class.

To a certain extent, the currently used models for UBI policy analysis can provide answers to the debate surrounding the economic feasibility of UBI. Unfortunately, it must be stated that the models are not comprehensive enough to provide answers that can be generalised or that are representative for the broad concept of UBI. However, this is not due to the fact that the models are lacking too much in a sound methodology, but because they are using a too narrow-minded approach to answer the question, by using only taxes on labour.

5.2 Impossibility Theorem

At a very low level of UBI almost all schemes would be financially feasible. Thus, it is important to use an adequate amount as a standard, which has been done in the beginning of this study. The different methodologies will now be tested against this theorem.

Laboratory experiments could so far not come up with significant results about UBI effects on behaviour and decisions towards work and cannot say much about the economic feasibility of UBI so far. Decades of usage in other fields shows how valuable lab experiments could become for UBI literature and thus more research could provide useful results, as will be discussed in the triangulation section.

Table 2

Case studies overview

Method	**Study**	**UBI as % of PL**	**Taxes**	**SSS changes**	**Ls effect**	**Additional findings**
Lab experiments	Haigner et al., 2012	130*	50	0	/	
RCT	NIT experiments, U.S.	50-148	30-70 (2 progressive tax experiments)	0	-	Some temporarily unemployed take more time to find next job
Saturation	Mincome, Manitoba, Canada	80**	35-75	0	-	
Natural	Peeters et al., 2006	121	0	0	+-	
Back-of-the-envelope	Widerquist, 2017	70	50	0	n.a.	Net cost equal to about 16% of the gross cost
Micro-simulation	Torry, 2016a	32	Increase of progressive taxes by 3%	1	n.a.	Balanced budget with no net losers among low income households
	OECD, 2017	20-50	0	2	n.a.	Balanced budget with very divergent results for different countries
General equilibrium	Mooij, 2006	50	53.5	1	-	
	Colombino, 2010	25-100	Different levels of flat and progressive taxes	3	+-	

SSS = social security system, with the extent of the changes on a scale from zero (no changes), to one (small changes), to two (significant changes) and three (complete abolishment).

The effect on labour supply is either not part of the model (n.a.) negative (-), ambiguous (+-) or positive (+) or insignificant /

*The reference point for what students expected to earn at an experiment was used, which is interpreted as being a minimum wage, which is above the poverty line and arbitrarily set to be 130

**The Mincome experiment had grant levels that were near the poverty line, which is interpreted here as 80%.

As can be seen in table two, all experiments have at least one grant level at or above the poverty line, meaning that the amount is adequate. Furthermore, several studies have run simulations on how much the labour supply response would increase additional tax costs of the programmes based on the experiments' outcomes. Most of the simulations ignore labour demand effects and are bound to several caveats. Broadly speaking however, no evidence has found a labour supply reaction that could make programme costs rise above an affordable level, even ignoring the mitigating demand response. This includes UBI levels of 150% of the poverty line. Consequently, the impossibility theorem does not apply, based on the outcomes of the experiments. Still, estimates of the added cost vary considerably, indicating that the results need to be treated with caution and no definite conclusion should be given. Widerquist (2005) summarised the evidence accordingly stating that "[The experiments are] able to indicate only that a basic income guarantee is financially feasible at a cost of certain side effects that people with differing political beliefs may take to be desirable or disastrous. To claim more would be to overstate the evidence" (p. 69).

The available evidence from the natural experiment showed no signs of people working less, becoming entrepreneurs or stopping to work entirely, with an adequate grant level of approximately 120% of the poverty line. Hence, the evidence from natural experiments analysed here rejects the impossibility theorem.

Back-of-the envelope and microsimulation models do not take behavioural changes into account and the interpretation of the results is therefore more straightforward. Widerquist's (2017) back-of-the-envelope model uses a grant level set at the poverty line and a tax rate of 50%. The remaining net cost of such a programme amounts to $539 billion per

year, equal to less than 25% of current U.S. entitlement spending, less than 15% of overall federal spending, and approximately 2.95% of GDP (Widerquist, 2017). Since Widerquist (2017) does not implement the scheme into the social security system, one can only assume that further changes in the tax and benefit system would render the programme budget neutral. If this assumption holds, then the back-of-the-envelope model also rejects the impossibility theorem. Looking at the expected effects of labour supply (see appendix B), however, one could assume that the funding would have to increase. Since the marginal tax rate is the only endogenous adjustment mechanism in the model, it would have to correct for the decrease in the tax base. Moreover, according to Torry (2016a), income tax rates should not be raised by more than 3% and Colombino et al. (2010) determined an upper bound of 55% flat tax rate for his analysis. Considering that the current level of taxes in the back-of-the-envelope model already amounts to 50%, one can assume that behavioural changes would render this model unaffordable.

The microsimulations by Torry (2016a) and the OECD (2017) are both balanced budget simulations and therefore show that a UBI is affordable. Torry (2016a), however, only has a grant level equal to about 30% of the poverty line for households and the OECD (2017) aims at an amount close to the guaranteed minimum income benefits, which is also less ambitious than the poverty line.

A major difference that is mentioned in the description of both simulations is that the OECD (2017) model abolishes many social security benefits, while Torry (2016a) keeps the social security system in place. It is hard to say by how much exactly this brings a UBI closer to an adequate level, but it means that there are no net losers among low income households, opposed to the situation in the OECD (2017) model. Even though the simulation used by Torry (2016a) is close to an adequate level, both grant levels are not considered high enough to align with the standards set in this analysis. Since the models do not provide alternative

amounts, they confirm the impossibility theorem in the sense that the schemes are affordable, but not adequate. Whether an adequate level would be affordable requires additional simulations with scenarios using higher grant levels.

Finally, the MIMIC model, using a general equilibrium framework, uses a balanced budget and shows that the UBI scheme is economically feasible. The grant amount equals 50% of the Dutch poverty line, which can therefore not be considered as adequate and to do so would need to be doubled. Moreover, a flat tax of 53.5% is used and the model thus confirms the impossibility theorem. The UBI scheme seems affordable, but the amount is not adequate. Since the marginal tax rate has already been increased to 53.5%, further increases seem hardly possible. Also, the remaining tax and benefit system has already been altered, so a doubling of financial resources would mean that the social security and tax system would be further reduced or might even have to be eliminated. An adequate UBI at approximately 1,100 euros, which would correspond to the Dutch poverty line (according to appendix A already at about 830€), therefore seems not affordable and it seems that in the case of the MIMIC model simulations, the impossibility theorem applies.

Since the focus lies mostly on balanced budget models, the assessment of the economic feasibility is being done with only using changes in the tax and benefit system as a method of financing the UBI scheme. At the beginning of this paper some alternative methods to finance UBI were stated. Indeed Widerquist (2018) states that a UBI scheme can only be financed through changes in the tax and benefit system, otherwise there will be rampant inflation. Besides, the marginal tax rate of 50% is chosen for mathematical simplicity and because it balances “marginal incentives with the need to phase out benefits” (Widerquist, 2017 p. 5).

Whether the impossibility theorem holds or not, is ambiguous, based on the results from the analysed studies, since some reject the theorem, some partly confirm it, and others

do indeed confirm the theorem. It must be noted that the impossibility theorem is in part based on community effects, which are due to an increase in the taxes, leading to a number of negative feedback effects and eventually to a decrease in economic growth. Such community effects are only partially measured, by only a few of the models we analysed. The comprehensive model, the general equilibrium model, which includes community effects to a certain extent, confirms the impossibility theorem. This supports the claim that was raised in the assessment capability section, stating that models should consider alternative measures to fund a UBI. If for example a system based on income coming from rent, as suggested by Barnes, would be installed, the negative feedback predicted by the impossibility theorem might not apply, since the logic is based on labour income.

5.3 Triangulation

The concept of methodological triangulation is applied here by using different methodologies to improve the assessment of the economic feasibility of a UBI. Doing so can create innovative ways to reveal unique methodological features and challenge different theories and approaches, as well as lead to ideas on how to integrate methodologies into each other (Thurmond, 2001; Guion, 2011).

A combination of lab and field experiments could provide a more flexible approach: the lab could provide the first mini-micro insights and those could then be tested in the field with micro-examinations. On the other hand, observed mechanisms could be tested easier by using controlled and relatively cheap lab experiments. This could lead to a better understanding of mechanisms such as the reciprocity theory or psychological reasoning and preferences in general (Noguera & Wispelaere, 2006; Falk & Heckman, 2009).

A more expensive idea is to combine an RCT with a saturation study (e.g. Mincome), providing more randomness to the saturation study, which could thereby better control differences between two town. Moreover, if high income earners would be included[39] in saturation studies, then a large diverse sample would include nearly every part of a closed society, possibly providing valuable insights into community and feedback effects. Combining RCT and saturation studies seems like the most adequate method to assess the affects UBI has on individuals and community behaviour, but it is costly and remains a method with many limitations (Widerquist, 2018).

An alternative to costly field experiments would be to combine RCT and natural experiments, by setting up a state-run lottery experiment, such as the one proposed by Marx (2005). The lottery would provide a monthly, inflation-adjusted, lifelong, subsistence-level grant to the winners of the lottery. The behaviour of this group would then be compared to a control group. Due to the lotterylike set up, the experiment would finance itself, or would be relatively low cost, if experimenters decide to randomly distribute winning tickets, in order to reduce the selection bias of having only lottery players in the sample. Moreover, long term impacts could be measured, which would be a premiere in the UBI experimental research (natural experiments excluded). Based on calculations by Marx (2005), a conservative estimation of an experimental group that could be achieved in such an experiment would amounts to 360 to 480 observations. This would constitute a significant experimental group with a sound dataset, because winners would have to allow access to administrative records when winning the lottery. Such an experiment would represent proper longitudinal research based on a unique socioeconomic panel dataset with low exit-rates (Marx, 2005).

[39] High income earners would be compensated for paying higher taxes by receiving an increased (lump sum) UBI (Groot, 2005). Even though it is an artificial and simplistic inclusion of high income earners, it could be a better option than excluding them completely.

Macroeconomic models could be improved using the insights from lab and field experiments, which provide clues about how people's behaviour deviates from classical assumptions surrounding a rational homo economicus.

Many welfare effects are currently exogenous to a very broad general equilibrium model like MIMIC. Examples are labour productivity, innovative and entrepreneurial behaviour, aggregate demand components (e.g. consumption, saving and investment behaviour) and the effective targeting of benefit recipients.

The general equilibrium model by Colombino et al. (2010) showed, that there are ways to set up a general equilibrium model based on a social welfare function, including inequality for example. More complex models could include more social variables, while MIMIC excludes most social indicators, such as health, which could have considerable effects on healthcare costs.

Including findings from lab and field experiments bears the risk that a general equilibrium model such as MIMIC needs to relax too many assumptions to keep functioning. Moreover, the earlier stated Lucas critique would apply again since the model would base its' post-UBI reactions on pre-UBI estimated equations and historically estimated behavioural parameters.

A new approach could consist of using an experimental setting with a sound degree of control (e.g. lab experiments) in order to calibrate parameters of the behavioural equations of economic agents. Evidence on preference heterogeneity could be used for example, to improve the calibration of preference parameters in a more empirically founded way (Falk & Heckman, 2009).

Another concrete example would be to calibrate labour supply elasticities on behavioural responses and preferences observed for different individuals in a series of laboratory or maybe even field experiment. This would allow for basing policy predictions on

the estimated equations because the parameters could adapt to the new structural context and are calibrated on post-UBI behaviour, opposed to currently used pre-UBI behaviour. Using such structurally adjusted factors as microfoundations, would mean that the Lucas critique could be circumvented.

Based on the studied literature, the role of long term labour demand in reaction to changes in labour supply, is ambiguous. This represents a big impediment for a successful assessment of the economic feasibility of UBI. Lab and field experiments could try to find out what the labour demand reaction would be once a UBI scheme is introduced, instead of just focusing on labour supply.

According to Colombino et al. (2010), including a progressive tax in the model is sensible because it is more efficient due to the lower labour supply elasticities of high income households. In fact, the impact on labour supply is considerably lower for the progressive tax schemes, compared to the flat tax schemes.

Another interesting finding regarding labour supply, is the importance of the elasticity of taxable income which needs to be additionally included in order to capture the entire labour supply response of high income earners (Jongen et al., 2014). Not including the elasticity of taxable income might bias the response of high income household's labour supply. Thus, the differential effect regarding the progressive tax in the model by Colombino et al. (2010), might have been biased as well.

The back-of-the-envelope model highlights the importance of using the net instead of the gross cost when discussing UBI. This has the advantage that it provides a rough idea about the costs of the programme, enabling the government to have a preliminary assessment of the costs. Moreover, the model does not impose a way of implementation, except for using a flat income tax (Widerquist, 2017).

The microsimulation models are, however, getting closer to reality with their estimations since they simulate how UBI could be incorporated into the current benefit system.

Comparing the microsimulation of Torry (2016a) with the one of the OECD (2017) shows that the extent to which the social benefit system is abolished largely influences the extent to which low income households end up as net winners or losers. Those microsimulations provide a good starting point to assess the setting up costs of a UBI scheme. The resulting effects for household disposable income are an important part of the policy design process. It might in some cases not even be necessary to discuss behavioural responses if a microsimulation already shows economically unsustainable results. However, without behavioural changes, microsimulation results will remain just an indication and are therefore correctly called ‘day after predictions’.

Table 3

Model positioning on a behavioural changes - community effects matrix

		Behavioural changes	
		No	**Yes**
Community effects	**No**	BOE/Microsimulation	RCT/Natural/Lab
	Yes	N/A	GEM/Saturation

To summarise, a short overview of the major characteristics of the methodologies is presented (see table 3). Lab and field experiments all include behavioural changes, but only saturation studies can estimate community effects. It might be possible to simulate community effects in a lab, but that would be difficult to administer. General equilibrium models are able to simulate community effects (e.g. interactions in the market and feedback effects) and do include behavioural changes, which is the necessary condition in order to measure community effects. The back-of-the-envelope model and the static microsimulation models are not including behavioural effects at all.

Table 4

Model positioning on a behavioural changes – time horizon effects matrix

		Behavioural Changes	
		No	**Yes**
Time Horizon	**Short-term**	BOE/Microsimulation	RCT/ Lab/Saturation
	Long-Term	N.A.	GEM/Natural

A similar picture is plotted when the focus is on the time horizon (see table 4). Only natural experiments, such as the lottery experiment, can measure lifelong treatments. Saturation studies, same as for the other field experiments, are short-term projects, with a fixed time horizon. General equilibrium models are focussed on long term.

6 Discussion and Policy Implications:

As could be seen in this comparative analysis, lab as well as field experiments and standard economic models can all positively contribute to the literature of the economic feasibility of UBI. There should be no hierarchy among these methodologies and the issue of generalisability of results applies to all of them. This paper is therefore not going to consider the models as substitutes, but the models will be considered as complementary. The fruitful discussion of recent years is important and should continue, but instead of discussing which method should be used, or which method is best, we should discuss when which method should be used and how the different methods can complement each other.

Regarding the high uncertainty surrounding UBI, one should be careful about claiming what the future will be like and imposing a truth on the feasibility debate. Instead, researchers should work for the future, as maybe one day some developments require a UBI or similar policy and then the value of accomplished research will really crystallise. At the moment, however, countries with tolerable levels of poverty, unemployment and inequality, should be aware of the uncertainties surrounding the economic effects of UBI and should therefore be cautious with reshaping their whole social security and tax system.

In an extensive triangulation section, this study provides many ideas how the currently used methodologies in UBI research could be improved. It would be interesting to see further research on those ideas, especially for the more concrete proposals, like the experimental lottery or the usage of lab experiments to calibrate the parameters of macroeconomic models in order to avoid the Lucas critique.

A rather unexpected, but maybe key outcome of this study, is the uncover of a strong intuition to use income taxes to assess the financial feasibility of UBI. Widerquist's (2017) statement, which was mentioned at the beginning of this paper, saying that a UBI scheme

without taxes causes inflation, makes intuitive and economic sense. However, it seems like Widerquist (2017) implicitly assumes that those taxes must be income taxes. Also, the other models all base their balanced budget schemes on income taxes.

Based on the fact that global inequality is reaching unsustainable levels and looking at the imbalance of the global tax system, a call for mainstream research to explore how those trends could be counteracted in other ways than putting even more weight on the lower and middle class, is necessary. Therefore, the dominant rationale of using a substantial flat tax in combination with a UBI scheme is dangerous. It would cause tax systems to put further pressure on working people and the middle class, and alternatives of financing might be neglected. Especially for an economic assessment it is crucial to consider various ways of funding, in order to provide a more impartial and comprehensive picture, next to the neo-liberal standpoint.

Due to the lack of alternative funding schemes, this study claims that the current models are only able to give a narrow and partial answer to the question regarding the economic feasibility of a UBI.

To conclude, financing UBI solely by lowering benefits, increasing income taxes or even making the tax system more regressive (flat tax), should be reviewed and therefore, this paper is not only calling for a complementary research into the economic feasibility of UBI, but also for more research into possible ways of incorporating alternative ways of funding into experiments and models.

References

Aaberge, R., & Colombino, U. (2014). Labour Supply models. In C. O'Donoghue, *Handbook of Microsimulation Modelling* (pp. 167-221). Emerald Group Publishing Limited.

Alvaredo, F., Chancel, L., Piketty, T., Saez, E., & Zucman, G. (2018). *World Inequality Report.* World Inequality Lab.

Atkinson, A. (1995). *Public Economics in Action. TheBasic Income/Flat Tax Proposal.* Oxford Clarendon Press.

Barnes, P. (2014). *With Liberty and Dividens for All.* San Francisco: Berrett-Koehler Publishers, Inc.

Barry, B. (1997). The Attractions . In J. (. Franklin, *Equality* (pp. 157-171). London: Institute for Public Policy Research.

BIEN. (2017). *About basic income*. Retrieved from Basic Income Earth Network: http://basicincome.org/basic-income/

Bovenberg, L., Graafland, J. J., & de Mooij, R. A. (2000). Tax reform and the Dutch labor market: an applied general equilibrium approach. *Journal of Public Economics 78*, 193–214.

Camerer, C. F. and G. Loewenstein (2004) "Behavioral Economics: Past, Present, Future," in C.F. Camerer, G. Loewenstein and M. Rabin (eds.), Advances in Behavioral Economics. New York: Russell Sage Foundation.

Colombino, U., Locatelli , M., Narazani, E., & O'Donoghue, C. (2010). *Alternative Basic Income Mechanisms:An Evaluation Exercise with a Microeconometric Mode.* Bonn: The Institute for the Study of Labor.

Craig, P., Katikireddi, S. V., Leyland, A., & Popham, F. (2017). Natural Experiments: An Overview of Methods, Approaches, and Contributionsto Public Health Intervention Research. *Annual Review of Public Health*, 39-56.

de Boer, H.-W., & Jongen, E. L. (2017). *The best of both worlds - Analysing tax-benefit reforms using structural models and natural experiments.* The Hague: mimeo, CPB.

de Boer, H.-W., Jongen, E., & Mastrogiacomo, M. (2018). Tax-Benefit Reforms and Structural Models for Labour Supply. In J. de Haan, & J. Parlevliet, *Structural Reforms, Moving the Economy Forward* (pp. 239-264). Groningen: Springer.

Draper, D., & Manders, A. (1997). Structural changes in the demand for labor. *De Economist, 145(4)*, 521-546.

Falk, A., & Heckman, J. J. (2009). Lab Experiments Are a Major Source of Knowledge in the Social Sciences. *Science 326 (5952)*, 535-538.

Frohlich, N. and J.A. Oppenheimer (1992) Choosing Justice: An Experimental Approach to Ethical Theory. Berkeley: University of California Press.

Graafland, J. J., de Mooij, R. A., Nibbelink, A. G., & Nieuwenhuis, A. (2001). *MIMICing tax policies and the labour market.* Amsterdam: Elsevier.

Groot, L. (2004). First Steps Towards a Basic Income. In L. Groot, *Basic Income, Unemployment and Compensatory Justice* (pp. 115-133). Boston MA: Springer.

Groot, L. (2005). Toward a European Basic Income Experiment. *Citizen's Income newsletter*, 2-5.

Guion, L. A. (2011). *Triangulation: Establishing the Validity of Qualitative.* University of Florida.

Haigner, S., Höchtl, W., Jenewein, S., Schneider, F. G., & Wakolbinger, F. (2012). Keep On Working: Unconditional Basic Income in the Lab. *Basic Income Studies 7(1), 5*.

Hogarth, R.M. (2005) "The Challenge of Representative Design in Psychology and Economics," Journal of Economic Methodology 12 (2), pp. 253–263.

Imbens, G. W., Rubin, D. B., & Sacerdote, B. (1999). Estimating the Effect of Unearned Income on Labor Supply, Earnings, Savings, and Consumption: Evidence from a Survey of Lottery Players. *NBER Working Paper Series, No. 7001*.

Jongen, E. L., van Gameren, E., & Graafland, J. J. (2003). Exploring the Macroeconomic Impact of Subsidized Employment. *De Economist, 151, NO. 1*, 81-118.

Jongen, E., & Stoel, M. (2013). *Estimating the elasticity of taxable labour income in the Netherlands. CPB Background Document.* The Hague: CPB Netherlands Bureau for Economic Research.

Jongen, E., de Boer, H.-W., & Dekker, P. (2014). *MICSIM - A behavioural microsimulation model for the analysis of tax-benefit reform in the Netherlands.* The Hague: CPB Netherlands Bureau for Economic Policy Analysis.

Kahneman, D. and S. Frederick (1990) "Experimental Tests of the Endowment Effect and the Coase Theorem," Journal of Political Economy 98, pp. 1325–1348.

Kahneman, D., J.L. Knetsch and R. Thaler (1986) "Fairness as a Constraint on Profit Seeking," The American Economic Review 76 (4), pp. 728–741.

Kahneman, D. and A. Tversky (eds.) (2000) Choices, Values, and Frames. Cambridge: Cambridge University Press.

KELA. (2016). Basic Income Experiment 2017–2018. Retrieved from: http://www.kela.fi/web/en/basic-income-experiment-2017-2018

Linden, B. v. (2002). Is Basic Income a Cure for Unemployment in Unionized Economies - A General Equilibrium analysis. *Annales d'Économie et de Statistique, No. 66 (Apr. - Jun., 2002),* , 81-105.

Marx, A. (2005). Basic Income and Empirical Research, A Lottery Financed Social Experiment: An Alternative Proposal for a Basic Income Social Experiment. *Rutgers Journal of Law & Urban Policy, 2(1),* 167-185.

Marx, A., & Peeters, H. (2008). An unconditional basic income and labor supply: Results from a pilot study of lottery winners. *The Journal of Socio-Economics, 37*, 1636–1659.

Mooij, R. d. (2006). Reinventing the Welfare State. The Hague: Centraal Planbureau.

Noguera, J. A., & de Wispelaere, J. (2006). A Plea for the Usage of Laboratory Experiments in Basic Income Research. *Basic Income Studies*.

OECD. (2015). *In It Together: Why Less Inequality Benefits All.* Paris: OECD Publishing.

OECD. (2017). *"Basic income as a policy option: Can it add up?", Policy Brief on The Future of Work.* Paris: OECD Publishing.

OECD. (2018, June 27). *Poverty Rate.* Retrieved from OECD Data: https://data.oecd.org/inequality/poverty-rate.htm

Pech, W. J. (2010). Behavioral Economics and the Basic Income Guarantee. *Basic Income Studies 5(2), 3*.

Peeters, H., & Marx, A. (2006). Lottery Games as a Tool for Empirical Basic Income Research. *Basic Income Studies 1(2), 10.*

Piketty, T. (2014). *Capital in the Twenty-First Century.* London: Harvard University Press.

Raventós, D. (2007). *Basic income. The Material Conditions of Freedom, London.* London: Pluto Press.

Saez, E., Slemrod, J., & Giertz, S. (2012). The elasticity of taxable income with respect to marginal tax rates: A critical review. *Journal of economic literature, 50(1)*, 3-50.

Specianova , J. (2018). Labor Supply Elasticity in the Unconditional Basic Income System: Data Sources and Methodological Issues. *European Scientific Journal 14(4)*, 13-29.

Standing, G. (2012). Basic income pilot Schemes: Seventeen design and evaluation imperatives. In D. Jacobi, & W. Strengniann-kuhn , *Wege zum Grundeinkommen* (pp. 133-152). Berlin: Bildungswerk Berlin.

Standing, G. (2016). *The Corruption of Capitalism: Why Rentiers Thrive and Work Does Not Pay.* Biteback Publishing.

Standing, G. (2017). *Basic Income: And How We Can Make It Happen.* Penguin UK.

Thaler, R. H. (1990). Anomalies: Saving, fungibility, and mental accounts. *Journal of economic perspectives, 4(1),* 193-205.

The World Bank. (2013). *World Development Indicators*. Retrieved from The World Bank: http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators

Thurmond, V. A. (2001). The Point of Triangulation. *Journal of Nursing Scholarship*, 253-258.

Torry, M. (2016a, June). An evaluation of a strictly revenue neutral Citizen's Income scheme. In *EUROMOD woking paper series EM 5/16.* Colchester: Institute for Social and Economic Research.

Torry, M. (2016b). *The Feasibility of Citizen's Income.* London: Palgrave Macmillan.

Torry, M. (2017). What's a definition? And how should we define 'Basic Income'? . *BIEN Congress 2017.* Lisbon.

Widerquist, K. (2005). A Failure to Communicate: What (If Anything) Can we Learn from the Negative Income Tax Experiments? *The Journal of Socio-Economics 34*, 49-81.

Widerquist, K. (2017). The Cost of Basic Income: Back-of-the-Envelope Calculations. In *Basic Income Studies* (p. 12 (2)).

Widerquist, K. (2018). *The Devil's in the Caveats: A Critical Analysis of Basic Income Experiments for Researchers, Policymakers, and Citizens.* Draft prepared for the CIRS book workshop.

Appendix

Appendix A

Poverty line calculation

Study	Country	UBI Grant	Yearly MI	Data Year	Monthly MI	PL at 50% of MI	Grant as % of PL
Peeters et al., 2006	Belgium	1000€	19 773€	2006	1647€	823€	121%
Widerquist, 2017	US	1000$ or 100% of PL*	34 514$	2015	2846$	1423$	70%
Torry, 2016a	UK	240£	18 037£	2016	1503£	751£	32%
OECD, 2017	Finland	527€	25 837€	2016	2153€	1076€	49%
	France	456€	21 970€	2015	1830€	915€	50%
	Italy	158€	18 249€	2015	1520€	760€	20%
	UK	230£	18 037£	2016	1503£	751£	30%
Mooij, 2006	Netherlands	550€	19 958€	2006	1663€	831€	66%
Colombino et al., 2010	Denmark	0.25-100% of PL	223 514 DK	2010	18626 DK	9313 DK	25-100% of PL
	UK	0.25-100% of PL	15 405£	2010	1283£	641£	25-100% of PL
	Italy	0.25-100% of PL	17 944€	2010	1495€	747€	25-100% of PL
	Portugal	0.25-100% of PL	9 511€	2010	792€	396€	25-100% of PL

Data for columns 4 until 7 are from OECD (2018), in national currency, at current prices. All income data are equivalised income (by the square root of household size) (OECD, 2018). MI = median income, PL = line.

*According to US Census Bureau (2015) the poverty line was equal to $12,082 in 2015 (Widerquist, 2005). In a case where the numbers do not approximately match, the percentage from the study is used.

Appendix B

Summary of findings of work reduction effect

Study	Data source	Work reduction* in hours per year** and percent			Comments and caveats
		Husbands	Wives	SFH	
Robins (1985)	4 U.S.	–89	–117	–123	Study of studies that does not assess the methodology of the studies but simply combines their estimates. Finds large consistency throughout, and "In no case is there evidence of a massive withdrawal from the labor force." No assessment of whether the work response is large or small or its effect on cost. Estimates apply to a poverty-line guarantee rate with a marginal tax rate of 50%.
		–5%	–21.1%	–13.2%	
Burtless (1986)	4 U.S.	–119	–93	–79	Average of results of the four US experiments weighted by sample size, except for the SFH estimates, which are a weighted average of the SIME/DIME and Gary results only.
		–7%	–17%	–7%	
Keeley (1981)	4 U.S.	–7.9%			A simple average of the estimates of 16 studies of the four U.S. experiments.
Robins and West (1980a)	SIME/DIME	–128.9	–165.9	–147.1	Estimates "labor supply effects." It goes without saying that this is different from "labor market effects."
		–7%	–25%	–15%	
Robins and West (1980b)	SIME/DIME	–9%	–20%	–25%	Recipients take 2.4 years to fully adjust their behavior to the new program.
Cain et al. (1974)	NJ	–	–50	–	Includes caveats about the limited duration of the test and the representativeness of the sample. Notes that the evidence shows a smaller effect than nonexperimental studies.
			–20%		
Watts et al. (1974)	NJ	–1.4% to –6.6%	–	–	Depending on size of *G* and *t*.
Rees and Watts (1975)	NJ	–1.5 hpw**	–0.61%	–	Found anomalous positive effect on hours and earnings of blacks.
		–0.5%			
Ashenfelter (1978)	RIME	–8%	–27%	–	"There must be serious doubt about the implications of the experimental results for the adoption of any permanent negative income tax program."
Moffitt (1979a)	Gary	–3% to –6%	0%	–26% to –30%	No caveat about missing demand, but careful not to imply the results mean more than they do.
Hum and Simpson (1993a)	Mincome	–17	–15	–133	Smaller response to the Canadian experiment was not surprising because of the make-up of the sample and the treatments offered.
		–1%	–3%	–17%	

*The negative signs indicate that the change in work effort is a reduction; **hours per year except where indicated "hpw," hours per week. NJ, New Jersey Graduated Work Incentive Experiment; SIME/DIME, Seattle/Denver Income Maintenance Experiment; Gary, Gary Income Maintenance Experiment; RIME, Rural Income Maintenance Experiment; Mincome, Manitoba Income Maintenance Experiment; SFH, single female "head of household".

Source: Widerquist (2005)

Appendix C

Long-term effects of a basic income reform on the labour market

Producer wage	8.6
low skilled	5.9
high skilled	9.8
Labour supply in hours	– 5.3
primary earners	– 1.4
secondary earners	– 8.8
single persons	– 7.4
Female participation rate	– 10.0
Share of high-skilled labour supply	0.0
Employment	– 3.8
low skilled	– 0.3
high skilled	– 5.2
Unemployment rate (absolute change)	– 1.9
low skilled	– 4.0
high skilled	– 1.1
Production	– 4.0

Source: Mooij (2006)

Statement of Originality

I, Noah Schaul, 5652278, herewith declare to have written this document and that I am responsible for the content of it. I declare that the text and the work presented in this document is original and that no sources other than those mentioned in the text and its references have been used in creating it.

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